UNIVERSITY OF SOUTHAMPTON

COST RECOVERY FOR SANITATION SERVICES: THE CASE OF POOR URBAN AREAS IN ZIMBABWE

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A thesis submitted to:

THE FACULTY OF ENGINEERING AND APPLIED SCIENCES
IN CANDIDACY FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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March 2003

UNIVERSITY OF SOUTHAMPTON

ABSTRACT

FACULT OF ENGINEERING AND APPLIED SCIENCE
CIVIL AND ENVIRONMENTAL ENGINEERING

Doctor of Philosophy

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Almost half of the world's population is living in urban areas and between 40 and 60 percent of them live in informal settlements with inadequate or no sanitation facilities. With rapid urbanisation, sanitation problems in cities of developing countries are expected to be critical.

Poor cost recovery has long since been identified as one of the major causes of failure of sanitation programmes. Therefore, current approaches such as the strategic sanitation approach emphasise full cost recovery in urban areas. However, poor sanitation is both a symptom and cause of poverty. There is need therefore, to cushion the urban poor from potential negative effects of full cost recovery policies. Ways through which cost and willingness to pay information could be used to set tariffs which improve cost recovery, without denying the urban poor access to basic sanitation services, are investigated in this thesis. Full cost accounting and the contingent valuation method are used to determine the cost of sanitation services and the willingness of households to pay for these services. The thesis differs from other willingness to pay studies by focusing on those who are unwilling or unable to pay for services.

Low tariffs, and restrictive institutional and regulatory frameworks are identified as major causes of poor sanitation in urban areas of Zimbabwe. The urban poor are willing to pay amounts which are substantially higher than the prevailing tariffs. However, it is found that the urban poor are not a homogeneous group and not all residents can afford to pay for the full capital cost of constructing sanitation facilities or for the recurrent cost of operating services. There is a real danger therefore, that pursuing full cost recovery and basing investment in sanitation solely on willingness to pay may exclude the very poor urban residents. Information on cost and household willingness to pay is used to illustrate the various classes of poor urban residents. Appropriate cost recovery policies are then suggested for each group.

It is recommended that instead of doing nothing or deferring investment in situations where willingness to pay is low, which is what most willingness to pay studies recommend, cost and willingness to pay information should be used to design alternative financing mechanisms which ensure that the very poor have access to basic sanitation services. Such mechanisms include community finance, loan and credit facilities, and subsidies.

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ACRONYMS AND ABBREVIATIONS

AABF	African Areas Building Fund
AIMS	Asian Information Marketing and Social Research
ATCRF	African Township Central Rates Fund
CBOs	Community based organisations
CRF	Central Rates Fund
CS	Consumer surplus
CSO	Central Statistics Office
CV	Compensation variation
CVM	Contingent Valuation Method
DA	District Administrator
DFID	Department for International Development
DRA	Demand Responsive Approach
DWSSC	District Water and Sanitation Sub-Committees
EPA	United States Environmental Protection Programme
ESAP	Economic Structural Adjustment Program
ETS	Ecotech services (India) Private Limited
EV	Equivalent variation
FCA	Full cost accounting
FPL	Food Poverty Line
IDWSSD	International Drinking Water Supply and Sanitation Decade
IMF	International Monetary Fund
IPA	Inter-country People's Aid
IRC	International Water and Sanitation Centre
IWSD	Institute of Water and Sanitation Development
GDP	Gross Domestic Product
LA	Local Authority
MHCW	Ministry of Health and Child Welfare
MLGPWNH	Ministry of Local Government Public Works and National Housing
NETWAS	Network for Water and Sanitation
NGOs	Non-Governmental Organisations
NOAA	National Oceanic National Oceanic and Atmospheric Administration, USA.
O&M	Operations and Maintenance
OECD	Organisation for Economic Co-operation and Development
OPP	Orangi Pilot Project
PHAST	Participatory Hygiene and Sanitation Transformation
PRA	Participatory rapid appraisal
PCB	Pollution Control Board

RDC	Rural District Council
RP	Revealed preferences
SADC	Southern Africa Development Community
SSA	Strategic Sanitation Approach
SWM	Solid Waste Management
TCPL	Total Consumption Poverty Line
UN	United Nations
UNDP	United Nations Development Program
UNICEF	United Nations Children Fund
USAID	United States Agency for International Development
USD	United States Dollar
VIP	Ventilated Improved Pit latrine
WB	World Bank
WEDC	Water Engineering and Development Centre
WHO	World Health Organisation
WSSCC	Water Supply and Sanitation Collaboration Council
WSP	Water and Sanitation Project
WTP	Willingness To Pay
ZBC	Zimbabwe Broadcasting Cooperation
ZIMPREST	Zimbabwe Programme For Economic and Social Transformation

ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to the poor urban communities and local authority officials who participated in this study for their time and cooperation. I would also like to acknowledge the Department for International Development (DFID) for sponsoring this study. In addition, I would like to express my sincere gratitude to Mr B. Fawcett, Dr C. Sukume, and Dr J. Ndamba for their invaluable guidance and overwhelming assistance. Above all I warmly appreciate the support and encouragement of all my friends and workmates at the Institute of Water and Sanitation Development.

WORKING DEFINITIONS

In order to avoid confusion the following working definitions have been adopted:

Access to improved latrine	The proportion of the population who have, within their dwelling or compound, a toilet connected to a sewerage system, any other flush toilet, or an improved pit latrine (WHO and UNICEF, 2000).
Cost recovery	Cost recovery refers to the process of setting a tariff which ensures that capital and/or recurrent costs are partially or fully covered, billing and ensuring that all users pay their bills on time.
Demand	Demand is an expression of desire for a particular service which is measured by the contribution people are willing to make in order to enjoy that service (Deverill et al, 2001).
Environmental sanitation	This covers the concept of controlling all factors in the physical environment which may have deleterious impacts on human health and well-being. It includes clean and pathogen free environments and treatment and safe disposal of human excreta, storm and wastewater and solid waste.
Externalities	Externalities occur when the production or consumption decisions of an individual (or household) affect the utility (satisfaction or welfare) or production possibilities of another person in an unintended way, and when no compensation is made by the producer of the external effect to the affected party (Perman et al., 1999). Externalities can have beneficial (positive) or adverse (negative) effects.
Food poverty line	The amount of income required to buy a basket of basic food needs for one person per year.
Full cost accounting	A systematic approach for identifying and determining, in an on-going fashion, the full cost of local solid waste management systems over a given time period (Hunt J.B. et al. 1997).
Gross Domestic Product	The total output of goods and services for final use produced by an economy by both residents and non-residents, regardless of the allocation to domestic and foreign claims. It does not include deduction for depreciation of physical capital or depletion and degradation of natural resources (World Bank, 2000).
Household	Household refers to an entity that takes and acts upon decisions about consumption and investment (Perman et al., 1999). In this thesis the term households is used interchangeably with "individual" or "consumer" depending on the context.
Informal housing	Housing of a temporary nature, often built from a range of materials such as plastics, iron sheets, mud blocks and plywood. This includes backyard shacks and housing in freestanding informal settlements.
Informal settlements	Poor urban settlements such as slums, shantytowns and peri-urban areas. These areas are characterised by high population densities, poor housing, sewerage and drainage facilities, few or no paved streets, irregular clearance, low income and professional diversity, mainly unskilled in nature (UNICEF, 1994). In this thesis the words

	"informal settlement", "poor urban areas", "squatter settlement" and "slum" are used interchangeably.
Institutions	The rules and regulations that govern the relationships between organisations, the standard of services and the way services are provided.
Local authority	Refers to local governments such as municipalities or Rural District Councils.
On-plot sanitation	Sanitation systems which are contained within the plot occupied by the dwelling. On-plot sanitation is associated with household latrines.
On-site sanitation	Includes communal facilities which are self-contained within the site (pit latrines for example), in contrast to sewerage and dry latrines where excreta is removed from the site
Peri-urban areas	These are areas inhabited by the urban poor which are located on the periphery of formal urban areas. These areas are characterised by high population densities, poor housing, inadequate water supply, poor sanitation, low priority in terms of urban planning, diverse socio-cultural composition, and low income (UNDP-World Bank WSP, 1997). (In this study peri-urban areas have also been referred to as squatter areas, slums or informal settlements).
Poor urban areas	This refers to formal low-income residential areas that have deteriorated to slums or shantytowns and peri-urban areas.
Sanitation agencies	All organisations involved in the provision of sanitation services. These include local authorities, central government, private companies, donor agencies, non-governmental organisations as well as community based organisations
Sanitation	The principles and practice relating to the collection, removal, and disposal of human excreta, refuse, storm water and wastewater, as they impact upon users, operators and the environment. In this thesis the term sanitation is used interchangeably with environmental sanitation.
Sewage	Wastewater that usually includes excreta and that is, will be, or has been carried in a sewer.
Sewerage	System of interconnected pipes or conduits through which sewage is carried.
Tenure	A bundle of rights, which regulate access, use and ownership over land and other resources (water for example).
Total consumption poverty line	This is the amount of income needed to meet both basic food needs and non-food items in a year.
Urban areas	Refers to places classified as "urban" under the Urban Councils Act of Zimbabwe. These areas are characterised by a concentration of people who depend predominantly on incomes derived from non-agricultural pursuits, and they usually contain certain services associated with towns and/or cities
Urban poor	These are people who live in informal settlements of the urban areas and earn incomes which are below the total consumption poverty

	datum line.
Urbanisation	The process by which an increasing proportion of the population comes to live in urban areas. Urbanisation also includes the process which causes this change which are usually a combination of economic, social and political change (Hardoy and Satterthwaite, 1995).
Utility	In this thesis "utility" refers to the satisfaction or welfare improvement which a household derives from consuming a certain good or service.
Wastewater	Water from bathing, laundry, preparation of food, cooking and other personal and domestic activities that does not contain excreta.
Willingness to pay	Refers to the maximum amount that a household can afford to pay in order to enjoy a service. Thus, in economic terms, it represents the limit of affordability of the service. In this thesis willingness to pay is also used interchangeably with demand.

CHAPTER 1: INTRODUCTION

This thesis is part of a broader project funded by the United Kingdom government's Department for International Development (DFID), entitled "Linking Sanitation Agencies with Poor Urban Community Needs". There now seems to be consensus among professionals in the water and sanitation sector that projects should be designed to meet demand as expressed by the users. The Demand Responsive Approach (DRA) which is being promoted by major organisations requires sanitation agencies to assess and understand the needs, perceptions and coping strategies of the poor communities and to design projects accordingly (DFID, 1998). However, sanitation agencies in most developing countries still use supply-led approaches in which projects are designed with little or no participation of the urban poor. The main goal of the research was to identify ways through which sanitation agencies could be made more responsive to the needs and wishes of the urban poor.

The project was implemented in three Southern African countries, Zambia, Zimbabwe and South Africa. Major finding of the broader project are found in a forthcoming book titled "Guidelines on linking sanitation agencies and poor urban community needs". A summary of the results is found in a paper which was presented at the WEDC conference in August 2001, in Lusaka, Zambia (Manase et al. in WEDC, 2001). This thesis focuses on financial issues that affect the provision of adequate sanitation services in poor urban areas of Zimbabwe.

1.1 Problem Statement

Zimbabwe is located in the Southern African region and is a member of the Southern Africa Development Community (SADC). The country's population stood at 11.7 million people in 2000 of which 4.1 million (35%) were living in urban areas (WHO and UNICEF, 2001). Like most developing countries, Zimbabwe has been struggling to improve the sanitation situation for its population.

Internationally, access to sanitary means of human excreta, solid waste and wastewater disposal is regarded as a universal need and, indeed, a basic human right which is key to human development and poverty alleviation (UNICEF, 2000). Access to improved sanitation[1] is also vital for human dignity and health. It is in the light of the importance of sanitation to the well being of society that the government of Zimbabwe and other national and international organisations have put a lot of effort to improve sanitation over the past twenty years. The United Nations (UN) declared the period 1981 to 1990 the International Drinking Water Supply and Sanitation Decade (IDWSSD). The goal of the declaration was to achieve safe drinking water supply and sanitation for all by 1990 (UN General Assembly, 1979). In 1990 UNICEF set the target of achieving universal sanitation coverage by the year 2000.

Yet, despite all these efforts, a recent report by the World Health Organisation and UNICEF (WHO and UNICEF, 2000) presents the "shameful" state of the world's water supply and sanitation situation. According to the report 2.4 billion people (40% of humanity) had no access to sanitary means of excreta disposal at the end of the 20th century while 4 billion did not have access to sanitary means of wastewater disposal. Consequently 4 billion cases of diarrhoea were reported each year between 1990 and 2000, resulting in an annual toll of 2.2 million deaths, mostly among children aged less than 5 years. This was equivalent to one child dying every 15 seconds. It is estimated that half of the world's population will be without access to improved sanitation in 2025 (WaterAid, 2002).

The explicit and implicit costs of poor sanitation to society in terms of medical costs, low productivity due to ill health, and lost earnings from tourism and agricultural exports, due to cholera outbreaks, are substantial. The Institute of Water and Sanitation Development (IWSD, 2000b) estimates that the African economy alone loses about US$3.2 billion every year due to low productivity and lost work hours. Treating diseases caused by poor

sanitation, unhygienic practices and unsafe water supply costs an additional US$20 billion every year (ibid.). It is suggested that eighty percent of the diseases in developing countries are due to poor sanitation and that people suffering from water-and-sanitation related diseases occupy more than half of the world's hospital beds (WaterAid, 2002). Yet these diseases could be reduced significantly through improved water supply and environmental sanitation. According to the World Health Organisation access to safe drinking water, improved sanitation and good hygiene practice can reduce diarrhoeal diseases by between 25% and 30% (WHO and UNICEF, 2000).

Although rural sanitation coverage[2] in developing countries lags far behind urban coverage, the urban poor live in overcrowded slums and informal settlements and often have to contend with inadequate or non-existent water and sanitation services. Global urban latrine coverage increased by only 4 percent from 82 percent in 1990 to 86 percent in 2000. Latrine coverage in Africa actually fell from 85 percent to 84 percent during the same period. As a result the number of urban people without access to adequate sanitation in Africa increased from 30 million in 1990 to 46 million in 2000 (WHO and UNICEF, 2000). In addition to poor human excreta disposal the urban poor also face critical drainage and solid waste management problems.

Although global latrine coverage statistics indicate that 80% of those without latrines are in Asia and only 13% are in Africa, a combination of rapid population growth and urbanisation, and poor economic performance and thus low investment in sanitation services makes Africa vulnerable. During the 1990s the population in Africa increased by 27.5%, a rate which was almost twice the global average. Africa's urban population growth rate of about 4% per annum was almost twice that for Asia and Latin America (ibid.).

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[1] In this thesis sanitation refers to the principles and practices relating to collection, removal, and disposal of human excreta, refuse, storm water and wastewater as they impact upon users, operators and the environment (Hogrewe et al, 1993).

[2] Sanitation coverage refers to the availability of sanitary latrines, drainage facilities and means of safe solid waste and wastewater disposal.

It is estimated that half of Africa's population will live in urban areas by 2020, yet at the moment between 40 and 70 percent of the urban population is already living in informal settlements (Mukami, 2000). With rapid urbanisation, sanitation problems in cities and towns of developing countries are expected to be critical. Developing country governments and international organisations face the huge challenge of providing sanitation services to the current and future populations. According to the WHO and UNICEF report (2000) an additional 834 million urban people in the world will need access to sanitary latrines just to maintain the current coverage up to the year 2015. In order to meet the VISION 21 target of reducing the number of people without latrines by half by the year 2015, an additional 1.085 billion people should be provided with latrines in urban areas alone. Meeting the VISION 21 goal of universal coverage by the year 2025 requires an investment of between US$25 and US$30 billion per year (WHO and UNICEF, 2000; Doyen, 2002). Governments and donors alone cannot apparently raise enough resources and the private sector, including households themselves, will have to contribute more towards improved sanitation services. Private sector investment in water and sanitation has been low over the past ten years. Of the US$250 billion that was invested in water and sanitation in the 1990s only 10% was from the private sector (Doyen, 2002). Therefore, dramatic changes in resource mobilisation mechanisms and project implementation strategies are required if the target of universal coverage by 2025 is to be achieved.

Although poor sanitation in informal settlements is a result of a number of factors (including rapid urbanisation, poor hygiene behaviour, restrictive institutional arrangements etc.) the main challenge which faces national governments and international organisations seems to be to mobilise financial resources to service poor urban areas. Poor cost recovery was identified as one of the major causes of unsatisfactory results of sanitation programmes in the 1980s and early 1990s (Evans, 1992; Wright, 1997). An often-used argument reasoning why authorities cannot provide water and sanitation services in poor urban areas is that residents in these areas cannot pay sufficient to cover recurrent costs, let alone capital investment costs (Wegelin-Schuringa, 1997a). However, this is not always true and studies have proved that in some

cases the urban poor pay more, especially for water supply, than middle-income residents (Whittington et al., 1991). A much more valid reason why service provision in these areas is low, appears to be that most utilities charge heavily subsidised tariffs that are not based on cost recovery[3] calculations (Wegelin-Schuringa, 1997a). This view is also supported by a number of authors (GHK, 2001; Prokopy and Komives, 2001; Yepes, 1999a; Wright, 1997) who identified low tariffs, and weak billing and revenue collection as the major cause of poor services in cities of developing countries.

Cost recovery rates for water and sanitation agencies in developing countries are typically 25-45% (Mwanza, 2002) with sanitation on the lower end. Local authorities presume that the poor are too poor to pay and base their tariff structure on that presumption. In some cases the determination of tariffs is a political issue and many governments regard sanitation as a public or social good which should be subsidized (Mendiguren and Mabelane, 2001). However, since the higher and middle-income residents are more likely to have access to sanitation services, the subsidies benefit them rather than the intended poor. In some cases, tariffs are kept low for political reasons (UNDP-World Bank WSP, 1999a). The situation is made worse by poor charging systems which are so rigid that tariff adjustment in line with inflation is either untimely or not implemented at all, by poor billing and by inefficient revenue collection systems (ibid.).

Low tariffs coupled with poor billing and revenue collection mean that little revenue is generated for operation and maintenance; thus local authorities cannot maintain the facilities and the quality of services falls still further. Low revenue also means that local authorities do not have enough resources to expand services to uncovered areas. Therefore, weak cost recovery is one of the root causes of both poor quality services and low coverage and is now the focus of new approaches aimed at improving the quality of sanitation services in poor urban areas (GHK, 2001; Prokopy and Komives, 2001; DFID, 1998; Wright, 1997). Low tariffs and the assumption that poor urban areas are

[3] Cost recovery refers to the process of setting a tariff which ensures that capital and/or recurrent costs are partially or fully covered, billing and ensuring that all users pay their bills on time.

uneconomical also discourage private companies from providing services in informal settlements (World Bank, 2000).

1.2 Rationale

As alluded to earlier, poor cost recovery was identified as one of the major causes of poor performance during the IDWSSD 1981-1990 (UN General Assembly, 1990; Evans, 1992). Therefore, much debate on the way forward in the water and sanitation sector in the 1990s focused on financing sanitation services and changing the general approach which was used in designing and implementing projects. It was found that agencies designed projects with little knowledge of community attitudes, priorities, preferences and, most importantly, their willingness to pay (WTP) (MacRae and Whittington, 1988; Wright, 1997). According to Arimah (1996) sanitation programmes failed to address urban environmental problems because they were ad hoc and did not take into consideration the willingness of communities to pay for improved environmental sanitation. Consequently, projects were designed to meet needs as judged by the providers, and not in response to demand[4] which was expressed by the users. It was not surprising therefore that many projects did not meet the needs of the users and facilities were not used or were poorly maintained (Cairncross, 1992). Agencies also paid little attention to cost recovery (DFID, 1998). Generally, approaches were based on social needs and rights and economic efficiency was not given enough attention. Realisation of these problems led to the Demand-Responsive Approach (DRA) which is now the principal approach of most External Support Agencies (ESAs) such as the World Bank and the Department for International Development (DFID) of the British government (UNDP-World Bank WSP, 1997; DFID, 1998).

The DRA is a market-oriented approach which emphasises cost recovery and the need to assess community demand and to design projects in response to this demand (Wright, 1997). The application of the DRA principles in urban areas is outlined in a

comprehensive document on the Strategic Sanitation Approach (SSA) written by Wright (1997). The SSA, which is now being promoted by the World Bank, puts great emphasis on full cost recovery in urban areas and argues that communities should be provided with services which they want and are willing to pay for (GHK, 2001). There seems to be general consensus among leading organisations in the sanitation sector that the major obstacle to increasing coverage of safe sanitation is no longer the availability of technological options, but rather the interest of potential users, which needs to be assessed through demand surveys (Wright, 1997; DFID, 1998; The World Bank Water Demand Research Team, 1993). There are also claims that sanitation programmes are not sustainable if they are not based on genuine demand, conventionally expressed as willingness to pay (DFID, 1998; Garn, 1997).

However, caution is needed when applying market-oriented approaches to the provision of sanitation. Sanitation has both private and public benefits and is a basic social service. Sanitation also has positive and negative externalities[5]. The sanitation condition has positive or negative effects on the whole neighbourhood or city and not just on those households with or without access to improved sanitation facilities. It is these externalities and the public nature of sanitation which makes it difficult to solve by purely market or commercial principles.

In addition, poor sanitation is both a symptom and cause of poverty and the majority of those without access to safe sanitation are poor (WHO and UNICEF, 2000). Although proponents of cost recovery argue that the poor are already paying more for poor quality services (especially for water) than wealthier urban residents pay for much better services (Whittington et al., 1991) and that cost recovery is consistent with equity (Evans, 1992), this seems not to be always the case. Enforcement of a US$10 connection charge and/or volumetric charges for water that used to be free in KwaZulu Natal, South Africa forced

[4]Demand is an expression of desire for a particular service which is measured by the contribution in cash or kind which people are willing to make in order to enjoy that service (Deverill et al, 2001)
[5] Externalities occur when the production or consumption decisions of an individual (or household) affect the utility (satisfaction or welfare) or production possibilities of another person in an unintended way, and when no compensation is made by the producer of the external effect to

thousands of villagers to revert to traditional unsafe sources. Within weeks, cholera broke out, claiming 250 lives and causing more than 100,000 cases of illnesses (Shore, 2002). Increasing user fees and enforcing payment in the health sector also resulted in large reductions in attendances at hospitals, with the poor being disproportionately affected (Watkins, 1997). Also, the fact that the poor are already paying more (especially for water) does not mean that they are doing so willingly, rather this is a matter of survival. The urban poor may buy water by making sacrifices which have long-term negative effects (Deverill et al, 2001). These sacrifices include deferring seeking health care, dropping children out of school or cutting expenditure on food (Watkins, 1997).

Economists argue that cost recovery improves the quality of services and can actually protect the poor by identifying them and designing subsidy mechanisms targeted at them (Evans, 1992, Whittington, 1998). However, very few of the willingness to pay studies which have been carried out so far in the water and sanitation sector give any discussion about how to design cushioning mechanisms in practice or give examples where this has worked.

The problem addressed in this thesis is:

- *How can local authorities set tariff structures that improve cost recovery without denying the urban poor access to basic sanitation services?*

Essentially I argue that not all residents can afford to pay for the full cost of improved services and that information on the actual cost of sanitation services and willingness to pay for these services can be used to classify residents into various groups. Appropriate cost recovery mechanisms can then be applied to the different groups of residents.

The purpose of this thesis therefore is not to put a value judgement on the merits or demerits of cost recovery for sanitation services or the validity of contingent valuation but rather to see how demand assessment can better inform cost recovery policies in developing countries. The debates on cost recovery or the validity of the contingent

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the affected party (Perman et al., 1999). Externalities can have beneficial (positive) or adverse (negative) effects.

valuation method are adequately addressed elsewhere, for example, by Evans (1992) and Bateman and Willis (1999).

1.3 Objectives

1.3.1 General Objective

The overarching objective of this study is to identify ways through which cost and willingness-to-pay information can be used to design tariff structures that improve cost recovery without denying the urban poor access to basic sanitation services.

1.3.2 Specific Objectives

The specific objectives of the study are to:

1. assess the level of sanitation services in selected poor urban areas in Zimbabwe,
2. identify weaknesses and strengths of the current cost recovery policies of local authorities,
3. calculate the actual cost of providing sanitation services, and
4. determine the willingness of poor urban households to pay for improved sanitation services.

1.4 Outline of the thesis

The section above has described the nature of sanitation problems in poor urban areas and how this study intends to contribute towards improving sanitation services in poor urban areas. However, sanitation is a multi-faceted problem which cannot be solved by economic tools alone. Therefore, in the next chapter the extent and causes of sanitation problems are discussed. Approaches that have been used to tackle sanitation problems, and their merits and demerits, are also discussed in this chapter. The literature gives a historical review of past approaches and the logic behind the movement from former

"rights and needs" based approaches (supply-led) to current "market-oriented" (demand-responsive) approaches which emphasise cost recovery and willingness to pay. The methods which are used to assess demand for sanitation are also discussed in detail. The literature review also puts the contingent valuation method (CVM) into perspective by discussing the role of CVM in the current line of thinking and approaches in the sector.

In order to understand the concept of willingness to pay and methods which are used to measure it, economic principles which underpin valuation of environmental services are discussed in Chapter 3. The theoretical framework in Chapter 3 also discusses the different methods which can be used to measure willingness to pay and their merits and demerits. Based on this theoretical framework, the methods which were used to achieve the objectives of this study are presented in Chapter 4. Chapters 5 to 7 present results in the same order as the objectives above are listed. The housing, water supply and sanitation situation in the selected study sites is presented in Chapter 5. Chapter 6 starts by analysing the current financing mechanisms for sanitation facilities and services and cost recovery policies of local authorities in Zimbabwe focusing on growth points. Results of the costing and demand assessment exercises are then presented and discussed. In Chapter 6 simple statistical tools which can be used by local authorities in developing countries are used to determine willingness to pay for improved sanitation services. In Chapter 7 more rigorous econometric models are used to analyse the factors which affect willingness to pay (determinants of willingness to pay) and to calculate mean willingness to pay bids. Econometric models are also used to assess the validity of the results of the contingent valuation surveys.

Chapter 8 ends the thesis by discussing the results and drawing conclusions from them. The policy implications of the results are also discussed in this chapter. Since this study could not address all issues leading to poor sanitation due to the complex nature of sanitation problems, areas that require further investigation are listed at the end of Chapter 8.

CHAPTER 2: COST RECOVERY FOR SANITATION INFRASTRUCTURE AND SERVICES: A HISTORICAL REVIEW

Poor sanitation in urban areas of developing countries, as discussed in the preceding chapter, is a result of complex interactions among a number of variables. These variables include rapid urbanisation, poor economic performance, poverty and other social and political factors (Hogrewe et al., 1993). The complex nature of sanitation problems in developing countries is evidenced by failure of programmes to significantly improve the welfare of the poor, despite concerted efforts by governments and international organisations (Evans, 1992; WHO and UNICEF, 2000).

Failure to accomplish previous goals was attributed to weaknesses with approaches that were adopted in designing and implementing sanitation projects (Wright, 1997). It is argued that past approaches did not adequately address the issue of cost recovery, therefore projects were not sustainable (Garn, 1997). The people's needs and willingness to pay were not assessed. Projects were designed to meet needs, as judged by the provider, and not in response to demand expressed by users (Wright, 1997). Realisation of this weakness has led to a major movement away from rights-based approaches of the 1980s and early 1990s to contemporary market-oriented approaches such as the Demand Responsive Approach. However, market-oriented approaches have potential devastating effects on the poor and vulnerable groups. It is therefore important to critically analyse the pros and cons of market-oriented approaches and to identify mechanisms that should be put in place to cushion the poor. This chapter will therefore discuss factors that have led to the promotion of market-oriented approaches and the potential effects of these approaches on the urban poor. Financing of sanitation services and cost recovery policies will also be reviewed in this chapter. But first the sanitation situation in poor urban areas and the factors leading to it are discussed.

2.1 The Sanitation Situation in Poor Urban Areas

Rapid urbanisation and increasing poverty pose the greatest challenge to sanitation improvement in urban areas of developing countries. Whereas the proportion of the global population living in urban areas was only 13 percent at the start of the 19th century it more than doubled to 28 percent in 1980 (World Bank, 1990). By the year 2000 almost half of the world's population was living in urban areas (WHO and UNICEF, 2000). Urbanisation was particularly high in Africa during the 1990s. The average population growth rate of cities in Africa of over 4% was almost twice that for Asia and Latin America (ibid.). Zimbabwe's urbanisation rate of almost 5% between 1990 and 2000 was higher than the average for the Southern African region (IWSD, 2000b). Globally it is estimated that 160,000 people migrate to urban areas daily (WaterAid, 2002).

The major problem with rapid urbanisation in developing countries, especially in Africa, is that it is not matched by economic growth. Whereas urbanisation in Europe and North America was in response to expanding industries in urban areas this is not the case in most developing countries. In developing countries a combination of rapid urbanisation and poor economic performance has led to unemployment and high incidences of urban poverty (Gilbert and Gugler, 1997). In 2000, some 500 million poor urban dwellers in developing countries were living on less than US$1 per day (World Bank, 2000). However, many more people may actually be living in poverty, since the World Bank scale of urban poverty of one dollar per person per day is an underestimate given the high cost of non-food essentials such as transport, water and sanitation in many cities (Satterthwaite, 2001). Whereas the numbers of people living in poverty are declining in Asia and Latin America, in Africa numbers actually increased during the 1990s. According to The Economist (2001) 300 million people in Africa lived on barely US$0.65 a day at the beginning of the 21st century. The United Nations Millennium Declaration resolved to halve, by the year 2015, the proportion of the world's population whose income is less than one dollar a day (United Nations General Assembly, 2000).

A combination of rapid urbanisation, urban poverty and a shortage and/or high cost of formal accommodation has resulted in the mushrooming of informal settlements within or at the periphery of most cities in developing countries. It is estimated that half of the urban population in developing countries was living in informal settlements in 1990 (Gilbert and Gugler, 1997). In Harare, Zimbabwe the proportion of people living in informal settlements increased from 10 percent in 1990 to 17 percent in 2000 (WHO and UNICEF, 2000).

The increasing number of people living in slums and the expansion of peri-urban areas has created immense sanitation problems. Informal settlements are generally characterised by high population densities, poor housing, inadequate water supplies, poor sewerage and drainage facilities, unpaved streets and little or no garbage collection (ibid.) Although health benefits are usually used to justify sanitary interventions it is important to remember that poor sanitation is not just a health, but also an economic and developmental problem. According to Khan (1997), denying people basic sanitation is more than just inhumane, it also kicks the first step out from a country's ladder of development. The impacts of poor sanitation on the economy and development in general are immense, as quantified in Chapter 1.

There seems to be consensus among professionals in the water and sanitation sector, government officials, and those in international and national agencies on the need to solve the sanitary crisis. This is evidenced by concerted efforts to solve sanitation problems in the last two decades. For example, the United Nations Millennium Declaration resolves to halve the proportion of people without access to safe drinking water and sanitation by the year 2015 and to improve the lives of at least 100 million slum dwellers as proposed in the "Cities Without Slums" initiative (UN General Assembly, 2000). However, sanitation problems are easy to identify and the causes are well documented (Hogrewe, 1993; Wright, 1997) but solving the sanitary crisis seems to be a complex and daunting task. Meeting the United Nations and VISION 21 target of reducing the number of people without latrines by half by the year 2015, for example, requires providing latrines to about 400,000 people daily for the next 15 years (WHO and

UNICEF, 2000)! This is a mammoth task which requires dramatic changes to be taken. For example, this requires a 28% increase in effective annual expenditure on sanitation compared to the investment rate between 1990 and 2000 (ibid.).

The complex nature of sanitation problems in informal settlements and failure of water and sanitation projects in these areas has led to more focus on the approaches which are used in implementing sanitation projects. Approaches used to design and implement sanitation projects have been the focus of research in the 1990s (Wright, 1997). This has led to a movement away from universalist concepts of 'rights to water and sanitation', rooted in the rights of citizenship, to more market-oriented approaches (Watkins, 1997) such as the Demand Responsive Approach (DRA) and social marketing for health and hygiene promotion (DFID, 1998). The evolution of different approaches in the water and sanitation sector and how they addressed cost recovery are discussed in the next section.

2.2 The Evolution of Approaches in the Water and Sanitation Sector

Before discussing approaches it is important to note that most of these approaches (except squatter upgrading programmes and the strategic sanitation approach) were not designed explicitly to tackle urban sanitation which is the focus of this study. What is discussed here are approaches which were aimed at tackling housing in informal settlements or rural water supply and sanitation and general principles which are applicable to any other projects. Urban sanitation was tackled implicitly, mainly through urban housing programmes (Matovu, 2000).

The success or failure of sanitation projects in informal settlements is, to a great extent, affected by the government's attitude towards informal settlements and the subsequent approaches it adopts in designing and implementing sanitation projects in these areas. Gilbert and Gugler (1996) give a detailed account of changes in government policy and attitude towards the urban poor. According to these authors government policy towards urban informal settlements generally evolved from one of being unconcerned, to one of

hostility and eviction. Attempts to provide low-cost public housing were made and then slums and squatter settlements became tolerated and even accepted and self-help housing schemes were supported. Finally slum-upgrading projects were adopted.

Demolition of squatter settlements in Africa has been going on since the 1960s (Matovu, 2000) and is still practised today in Zimbabwe (The Herald, 2001). Government hostility towards poor urban settlements was based on the belief in the "culture of poverty" which simply states that "the poor are poor because they are poor" (Gilbert and Gugler, 1992). This belief, according to Gilbert and Gugler (1992), saw the poor as people trapped in a social environment which was characterised by "apathy, gratification and frequent endorsement of delinquent behaviour".

Appreciation of the initiatives taken by the poor and mounting criticism of the demolition policy in the 1960s saw most governments embark on housing programmes in which they built and subsidised housing units for the urban poor. These programmes involved construction of heavily subsidised blocks of public housing flats, or houses with private or communal flush toilets connected to the sewer, tarred roads and drainage facilities (Matovu, 2000). Sanitation services were free or heavily subsidised. Subsidies for sanitation services were based on the belief that the public health or environmental benefits of sanitation were far higher than the cost (Sanitation Connection, 2002). Unfortunately, such programmes could not be replicated at a large scale since governments could not raise enough resources. High subsidies on relatively expensive houses and sanitation services also meant that only a limited number of houses could be built (The World Bank Water Demand Research Team, 1993). In some cases houses remained unoccupied due to high costs which were beyond the reach of the urban poor. High standards pushed the cost up. Houses were also not occupied due to poor location. Consequently, the majority of the urban poor did not benefit from government public housing programmes and informal settlements proliferated. According to the World Bank (1993) informal settlements actually became the prominent source of new housing in developing countries.

Failure of government public housing programmes saw most governments change their approach to "sites and services". Sites and service schemes involved servicing areas, building a basic housing unit (incomplete house with one or two rooms), providing basic amenities (water and sanitation, electricity, roads) and community facilities (schools, police, clinics etc.) for residents. Informal settlements were then destroyed as the people were expected or forced to move to the serviced sites. The service level was characterised by basic but high standard housing and water borne sewerage. Since the urban poor could not afford the full cost of this high quality service, government subsidies for both capital and recurrent costs were inevitable. The aim of these schemes was to attract the urban poor in squatter settlements by providing them with an economically accessible physical framework for their shelter and employment related needs. Although sites and service schemes were successful where they were carefully planned and implemented, in general they did not benefit the targeted urban poor. Instead the middle class, and not the intended very poor, benefited from such projects since the very poor did not have the resources to complete houses (Magatu, 1991). Sites and services schemes also involved moving the urban poor from locations that had some advantages to the outskirts of the city (Matovu, 2000). Housing was expected to conform with the imposed high building standards which pushed the cost beyond the reach of the poor. The fact that the urban poor could not afford to complete their houses led to the "aided self-help" approach.

According to Matovu (2000), aided self-help schemes comprise a self help component in which tenants provided labour to construct their houses and an aided component in which designs, sanitary cores, and site development finance was provided by the government or other donors. Aided self-help schemes significantly reduced the cost borne by tenants and were successful in Ethiopia, Senegal, Sudan and Burkina Faso. But once again not many very poor urban residents benefited from these schemes (ibid.). Governments then adopted the squatter upgrading scheme.

Upgrading schemes do not resettle people but implement on-site improvements in areas that were occupied without adequate basic services. The aim of upgrading programmes is to provide basic services such as water supply and sanitation, schools and roads in an

already existing informal settlement (Matovu, 2001). In slums where services already exist they are improved to suit the demand of the local communities. Upgrading is reported to be cheap, preserves kinship and friendship and maintains the established socio-economic networks of the urban poor (ibid.). Epworth (one of the study sites for this thesis) is a good example of on-site upgrading in Zimbabwe. The history of Epworth is discussed in more detail in Chapter 4.

The approaches which are described above had two major weaknesses. First, they are characterised by top-down planning, and community input in planning and designing programmes is limited. In some instances poor urban communities were taken as people who did not know what they want; it was considered that town planners and engineers knew what best met poor urban community needs (Gilbert and Gugler, 1992). Second, and most important, they did not address cost recovery and financing of new sanitation services (Evans, 1992). Failure of most sanitation projects during the 1980s and early 1990s (Cairncross, 1992) and the need to treat water and sanitation as economic goods (Dublin Statement, 1992) led to a more market oriented approach, the Demand-Responsive Approach (DRA) (World Bank, 2002). The DRA is a more general approach which emphasises the need for communities to make informed decisions on whether or not to participate in a project and to choose the type of technology and level of service which they want and for which they are willing to pay (Deverill et al, 2001). (See Box 2.1 below for key characteristics of the DRA). Agencies should assess and respond to demand which is expressed by the communities (Wright, 1997). The Strategic Sanitation Approach (SSA), which is discussed in the next section, gives a more comprehensive account of how demand-responsive principles can be applied in sanitation projects in poor urban areas.

Box 2.1: Key Characteristics of the Demand Responsive Approach (DRA)

1. Community members make informed choices about:
   - whether to participate in the project;
   - technology and service level options based on willingness to pay (based on the principle that more expensive systems cost more);
   - when and how their services are delivered
   - how funds are managed and accounted for; and
   - how their services are operated and maintained.
2. Government plays a facilitative role, sets clear national policies and strategies, encourages broad stakeholder consultation and facilitates capacity building and learning.
3. An enabling environment is created for the participation of a wide range of providers of goods, services and technical assistance to communities, including the private sector, and non-government organisations.
4. An adequate flow of information is provided to the community, and procedures are adopted for facilitating collective action decisions within the community.

Source: The World Bank Group, 2002

2.3 The Strategic Sanitation Approach (SSA)

Most of the water and sanitation projects that were implemented in the 1970s and 1980s failed due to poor financial management and cost recovery, among other things (MacRae and Whittington, 1988). Other causes of failure which were identified included supply-led approaches, poor community participation, emphasis on new facilities with poor planning for operation and maintenance, bias towards high capital cost projects and little attention given to health and hygiene education (Wright, 1997). By 1992 these weaknesses had combined to point clearly to the need for new approaches which called for changes (Garn, 1997). The Strategic Sanitation Approach (SSA), which is now being promoted by the UNDP-World Bank Water and Sanitation Program, is a more comprehensive document on tackling sanitation problems in urban areas. According to Saywell and Cotton (1997), the SSA is distinctive from previous approaches due to its emphasis on demand responsive principles and the use of incentives to shape institutional

and personal behaviour. The key characteristics of the SSA are presented in Box 2.2 below.

Box 2.2: Key Characteristics of the Strategic Sanitation Approach

The UNDP–World Bank Water and Sanitation Programme developed the Strategic Sanitation Approach which emphasises two fundamental principles, the need for a **demand** orientation and attention to appropriate **incentives**. Demand is seen primarily in economic terms and is strongly related to users' **willingness to pay**, leading to an emphasis on demand assessment studies. Key concepts of the strategic sanitation approach include:

- A commitment to **sound finances**
- A concern with **cities as a whole** rather than with discrete projects
- A **wide view of sanitation**, encompassing storm water drainage, sludge disposal, the disposal of human wastes, and solid waste management
- The use of different sanitation options in different areas within a city, depending on local conditions
- The **division** and **devolution** of responsibilities for the management of sanitation services—in other words, recognising that one organisation does not have to be responsible for all aspects of sanitation provision
- The use of a **small-steps** approach, which portrays sanitation provision as a process rather than a series of large projects.

Source: Wright, 1997

Conceptually the SSA seeks to address social, technical, institutional and economic factors that affect the sustainability of services in an integrated way (Saywell and Cotton, 1997). Although the SSA is a holistic approach which looks at all the above factors which affect the provision of sanitation services in poor urban areas, its economic principles are most significant. The goal of the SSA is to achieve a sustained improvement and expansion in the provision of sanitation services through investment and operational efficiency (Wright, 1997). The economic goal of the SSA is the **full recovery**[6] of capital investment and operation and maintenance costs in urban areas. Users of sanitation services are expected to pay the **full cost** of services. In order to achieve this, agencies are expected to provide sanitation services in response to the expressed effective demand or willingness to pay of users. Therefore, thorough demand

assessment surveys are pivotal in the implementation of the SSA (Saywell and Cotton, 1997). Communities should also be given choices and information to enable them to make informed decisions about technologies and service levels which they can manage and are willing to pay for (Sara, 1997). However, there has been a lot of debate on the SSA in general and particularly the issue of basing investment in sanitation on willingness to pay (Parry-Jones, 1999; IRC, 1999). Although GHK (2000) developed a guidance manual on the practical application of the SSA this does not address how local authorities should assess demand in practice and how the information generated can be used to design cost recovery policies.

The SSA is based on the principle of assessing and responding to demands which are expressed by users (Wright, 1997). However, the term "demand" has been understood differently by different professionals in the water and sanitation sector. Demand for sanitation services has a different meaning to engineers, social scientists and economists since they are all concerned with different aspects of planning and designing projects (Parry-Jones, 1999). The term demand has also been used too loosely to the extent of being misused in the water and sanitation sector. Garn (1997) noted that the term demand was being "seriously devalued through overuse and vagueness". Not surprisingly, a significant part of the debate on the practical application of the SSA has focused on the definition of the term "demand" and how to assess it (DFID, 1998; Parry-Jones, 1999; UNDP-World Bank WSP, 1999).

An internet conference on the DRA which was organised by the Water, Engineering and Development Centre of the University of Loughborough (WEDC) and a follow-up workshop showed that demand is interpreted differently by different professionals (IRC, 1999; Parry-Jones, 1999). During the debates it emerged that engineers equate demand with future consumption, which is estimated using design norms, taking into account the level of service to be provided (Deverill et al, 2001). Therefore to engineers demand assessment meant assessing the quantity of service that needs to be delivered in future to

[6] Full cost recovery in this thesis refers to the process of setting a tariff which ensures that capital and recurrent costs are fully covered, billing and ensuring that all users pay their bills on time.

satisfy the concerned population (Parry-Jones, 1999). To social scientists demand is an expression of one's "right" to basic services. On the other hand economists describe demand as willingness of households to pay (WTP) for a particular service. Demand expressed in the economic sense is known as effective demand. Thus to economists demand is willingness to pay which is interpreted as willingness and ability to pay (Deverill et al., 2001). There now seems to be consensus that the economic interpretation of demand should be adopted (GHK, 2000; Parry-Jones, 1999). After all the Demand Responsive Approach was designed mainly to tackle the issue of cost recovery (an economic issue) which was identified as the major weakness of past approaches (Evans, 1992).

Related to the definition of demand is the issue of which methods should be used to assess demand. Different definitions of demand resulted in different data needs and thus different tools were used to assess demand. Engineers used the Revealed Preference (RP) and information on population growth and systems design and capacity to meet demand for services (Parry-Jones, 1999). Social scientists used Participatory Rapid Appraisal methods (PRA) and relative demand which is assessed during community meetings. Since economists defined demand as willingness to pay, the Contingent Valuation Methods (CVM) and Revealed Preferences (RP) were used to assess demand. Although the last two methods, CVM and RP, are recommended by many organisations (DFID, 1998; UNDP-World Bank WSP, 1999) there is still debate on which one is more appropriate and which can be easily applied by sanitation agencies in developing countries. The underlying economic principles of demand for environmental services, and thus the use of CVM are presented and discussed in detail in the next chapter.

In brief, although the SSA emphasises full cost recovery and demand assessment it does not give practical guidelines on how local authorities in developing countries can do this. Even the practical guidelines on the SSA (Tayler et al., 2002) just discuss various methods which can be used to assess demand without giving clear advice on how the information generated can be used to set tariff structures. The plight of the urban poor who may not be able to pay for sanitation services is not addressed. The feasibility and

implications of pursuing **full cost recovery** for sanitation services in informal settlements, given that poor sanitation in these areas is both a symptom and cause of poverty, are discussed next.

2.4 Cost Recovery and Poverty

The major controversy surrounding the Strategic Sanitation Approach (SSA) is the issue of full cost recovery and poverty. The SSA advocates full cost recovery in urban areas (Wright, 1999). Whereas full cost recovery from users may be feasible in middle- and high-income areas this may not be the case in low-income and informal settlements. The vast majority of people without sanitation services are poor (living on less than US$2 per day (World Bank, 2001)) thus it is feared that full cost recovery in informal areas will aggravate their situation (Deverill et al, 2001). Watkins (1997) also argues that although the poor may seem willing and able to contribute towards improved services, in practice they may do so by reducing food consumption, selling productive assets, borrowing, making sacrifices or getting assistance through extended family nets. Such choices which are made under duress should not be treated as indications of willingness to pay since they may inflict long-term costs to the household.

Therefore, in practice, it looks difficult to achieve the seemingly conflicting general sanitation agency objectives of financial sustainability, effectiveness, equity, efficiency and replicability in poor urban areas. Financial sustainability entails charging users for services so that systems are able to meet their capital, operation and maintenance costs. On the other hand equity emphasises protection of the poor through subsidies which in turn restrict replicability since resources for subsidies are limited (DFID, 1998). The key question is whether to pursue full cost recovery for capital and recurrent costs or pursue full cost recovery for recurrent cost only and to subsidise capital costs in informal settlements. There seems to be consensus about the need to improve cost recovery to acceptable levels first and then to progress gradually towards full cost recovery (Evans, 1992). However, it is not clear what level of cost recovery is feasible and acceptable. This

thesis tries to address this by looking at actual costs of services and the willingness of households to pay for these services.

It is argued that improving cost recovery to acceptable levels is consistent with equity since the ramifications of poor cost recovery and subsequent project failure may have far reaching implications for the poor (Watkins, 1997). For example, proponents of cost recovery claim that, contrary to the belief that cost recovery hurts the poor, the poor actually suffer most from poor cost recovery. For example, free water and sanitation services in Africa between 1981 and 1990 meant inadequate provision or no provision at all to many people, particularly the poorest and the most vulnerable (Evans, 1992). The poor suffer most when services are not provided or breakdown due to poor operation and maintenance caused by poor cost recovery. On the other hand high cost recovery frees resources from public subsidies which can then be directed towards extension of services to the poor instead of subsidising existing consumers. Surveys have also shown that what appear to be free services could actually be more expensive. For example, although water from public taps was 'free' in Dehra Dun, India, Choe et al. (1996a) found that residents spent US$1.5/m^3 in queuing time. Inadequate latrines in India force women to travel long distances under cover of darkness to relieve themselves and retain urine during the day resulting in health problems (UNICEF, 1997).

However, proponents of cost recovery acknowledge potential threats of full cost recovery to equitable access and use of sanitation services. There is consensus that if cost recovery is to be based on ability to pay then the rich households, and industrial and commercial consumers should cross-subsidise the poor. Everyone should contribute to the cost, but not necessarily in the same proportion, in the same way or at the same time (Watkins, 1997; Evans, 1992). Evidence from cost recovery for water and health services in Africa attests to the need to protect the poor. For example, in 2000 the provincial government in KwaZulu Natal (South Africa's poorest region) began charging rural residents a US$10 connection fee and/or volumetric charges for water that used to be free. Thousands could not afford this and were forced to revert to traditional unprotected water sources. The

results were devastating. Within weeks cholera broke out in the area claiming 250 lives and causing more than 100,000 cases of illness (Shore, 2002).

Increasing user-fees and enforcing payment in the health sector in Africa excluded vulnerable groups from access to basic health provision, with adverse consequences for equity and, more importantly for their health. In Zimbabwe in the early 1990s out patient attendances dropped by 18% while inpatient admissions increased by 12% showing that patients were only seeking health care when it was absolutely necessary or too late (Hongoro and Chandiwana, 1994). Failure of cost recovery in the health sector is partly attributed to the failure of exemption systems to cushion the poor despite their being supposedly comprehensive (Watkins, 1997). Many countries lacked the capacity to develop and implement welfare systems designed to protect the poor.

These observations are worrying especially when demand-responsive approaches which are being promoted in the sanitation sector do not give clear advice concerning systems that need to be put in place to cushion the poor from potential adverse effects of market approaches. Markets naturally do not address human "need", but rather monetised consumer preference termed "demand", as expressed through the price system (ibid.). Although willingness to pay surveys can identify those who cannot afford to pay for services (Parry-Jones, 1999) such studies do not give clear guidelines on subsidy, credit or exemption systems that need to be applied to protect the identified poor and vulnerable groups.

However, exemption systems or subsidies themselves present another major problem. Subsidies risk becoming an end in themselves, with success of sanitation programmes judged not by the number of and quality of facilities constructed or services provided, but by the amount of the subsidy delivered.

This discussion shows that although cost recovery is necessary, there is a real danger that pursuing full cost recovery principles may deny poor households access to basic

sanitation services. The fact that subsidies failed in the past does not make full cost recovery the automatic solution.

2.5 Cost Recovery and Micro-Credit

Although micro-credit is not discussed in the Strategic Sanitation Approach (SSA) this could play a crucial role in improving sanitation in poor urban areas. The urban poor may have cash flow problems and they may have difficulties especially in paying the lump-sum, up-front cost of investment in sanitation facilities. Micro-credit can help the poor to pay for connection fees or construction charges, thus increasing demand for these services. A review of micro-credit in ten countries by Varley (1995) found that the use of credit increased investment in latrines. Credit improved demand for services by opening up new opportunities through which households managed cash flow over time. This is also supported by the success of community finance and micro-finance projects such as the Orangi Pilot Project (OPP) in Pakistan, low cost sanitation in Lesotho, a co-operative housing foundation programme in Honduras, and self-help provision of family toilets in Indonesia (Saywell, 1998). Credit repayment rates in these programmes were high, 80% in Lesotho, 95% in Honduras and 100% in Indonesia (ibid.). Information on local micro-finance activities and willingness to pay may be useful in designing financing mechanisms for sanitation projects in poor urban areas.

2.6 Cost Recovery and Willingness To Pay (WTP)

The preceding sections have discussed the justification for and potential effects of cost recovery. But the willingness of households to pay is pivotal in any cost recovery policy. Information on the ability of communities to pay is also important in designing cushioning mechanisms that protect the poor, in order to avoid disasters as happened in KwaZulu Natal, South Africa. Therefore, assessing willingness to pay is a key component of approaches which promote cost recovery, such as the SSA. This section reviews willingness to pay studies that have been carried out and policies that have been

drawn from their results. (Methodological and theoretical issues are addressed in Chapter 3). Gaps, which form the objectives of this thesis, are also identified and discussed. However, it is important to note that most of the willingness to pay surveys have focused on water and only a few looked at sanitation. Therefore most of the examples which are used to illustrate points in this section pertain to willingness to pay for water.

The World Bank is promoting cost recovery and market oriented approaches based on two main reasons. First, an annual investment of between US$25 and US$30 billion is required to achieve and sustain universal water and sanitation coverage by the year 2025 and governments and donors alone cannot, it is suggested, raise this amount (Doyen, 2002). Therefore, the private sector and households themselves may have to contribute more towards achieving this goal. Second, cost recovery seems to be supported by encouraging results of surveys which show that households are willing to pay for improved services, especially water supply. For example, a study of water vending and WTP in Onitsha, Nigeria found that poor communities were not only willing to pay for improved water supply, but that they were actually paying more to private water vendors (Whittington et al., 1991). The poorest households were spending up to 18% of their income on water. As a result, private water vendors collected a revenue of US$60,000 in the dry season, an amount which was 24 times that of the public utility (ibid.). In Port-au-Prince, Haiti the poorest households were spending 20% of their income on water (Foss, 1988). These observations are generally supported by other WTP surveys for water (Whittington et al., 2000; Lauria et al., 1999; Vaidya, 1995; Choe et al., 1996a; and Griffins et al., 1995). Studies which have assessed demand for sanitation have also found that households were willing to pay substantial amounts for improved sanitation. For example, in Kumasi, Ghana Whittington et al. (1992) found that households were willing to contribute US$1.47 per month towards the construction of a Kumasi VIP latrine while in Chennai, India households were willing to pay US$1.3 per month for refuse collection and transportation (Anand, 1999).

Although a number of willingness to pay surveys have been conducted in developing countries it is important to note that the focus has been on water and there is a dearth of

information on demand for sanitation, especially in Africa. Africa presents a unique situation which is characterised by urbanisation of poverty (World Bank, 2002). Whereas urbanisation in Asia and Latin America may be due to pull factors such as employment opportunities in urban areas, in Africa it is, to a large extent, due to push factors such as wars and droughts. The situation is further complicated by the fact that high- or middle-income residents may live in the same neighbourhood with very poor residents (Arimah, 1996). This situation poses a huge challenge to willingness to pay studies that recommend tariff increases based on mean willingness to pay and that target subsidies based on geographical locations. More research is therefore necessary to investigate demand for sanitation services in Africa.

Although willingness to pay information is important in convincing politicians to charge realistic tariffs, clear cushioning mechanisms should be put in place to protect those who cannot afford to pay for services. Most willingness to pay studies (AIMS Research, 1996; Choe et al., 1996a; Whittington et al., 1991; Arimah, 1996) make policy recommendations based on mean willingness to pay bids and the plight of poor households who cannot afford to pay that amount is given little attention. In Punjab, India for example, AIMS Research (1996) recommended contributions towards construction of a household latrine of between Rs400 and Rs700 per month despite the fact that 65% of the respondents reported zero bids. In that study zero bids were completely excluded from the analysis.

In Davao, The Philippines Choe et al. (1996b) observed low willingness to pay bids and concluded that investments to improve water quality in rivers and the sea should "wait until incomes are higher and willingness to pay has risen". Lauria et al. (1996) drew a similar conclusion about investment in piped sewerage and treatment aimed at improving water quality in Laguana de Bay, in Calamba, The Philippines. They also observed low willingness to pay and concluded that since full cost recovery was not feasible, then investment in piped sewerage should wait until income and thus willingness to pay has risen. In Zimbabwe, The World Bank Research Team (1993) observed low willingness to pay for water among rural communities and concluded that there were no financially

viable options for improved water supply at that time. Once more their policy recommendation was "simply to do nothing". Altaf and Deshazo (1996) put the same recommendation more politely by suggesting that demonstration projects should be implemented in areas of high willingness to pay first in order to raise general willingness to pay in other areas. This was after they observed that households in Gujranwala, Pakistan were willing to pay only Rs.8-10 per month for refuse collection yet the cost was Rs.350. Although such conclusions may simply show that the service in question is not a priority and that financial resources are better used elsewhere, they reinforce fears that the poor may be left out if investment is based solely on willingness to pay (Watkins, 1997). The examples given earlier about charging for water in South Africa and health fees in Africa, show that the danger of excluding the poor is real and not just theoretical. There is need therefore to investigate ways through which willingness to pay information can be used to improve cost recovery without disadvantaging or excluding the poor. The public nature of sanitation and the high incidence of urban poverty mean that sanitation services cannot be provided based on pure market or commercial principles (Perman et al. 1999).

Generally, willingness to pay surveys have had limited influence on tariffs and cost recovery policy. Whittington et al. (1992) noted that although the limitations of traditional master planning procedures had been identified and the need for demand assessment to inform the planning process emphasised, demand assessment was not used as a planning tool. Unfortunately this issue has not been resolved up to now. This is partly because the general objective of most willingness to pay studies (Arimah, 1996; AIMS Research, 1996; Choe et al., 1996a; Vaidya, 1995) has been to prove to politicians that even the very poor are willing to pay more for improved services, without investigating ways through which demand assessment could be adopted and used as a planning tool by local authorities in developing countries. A review of 17 WTP studies (eight of which were in water and sanitation) in India showed that although these studies proved that rural and urban communities were willing to pay more for improved water and sanitation services, they did not have much impact on policy and tariff reform (UNDP-World Bank WSP, 1999).

There are a number of possible explanations for this. First, policy makers in developing countries keep tariffs low based on the presumption that the poor are too poor to pay for services. Although this assumption may be wrong, policy makers are most unlikely to implement the recommendations of willingness to pay studies that recommend tariff increases without giving detailed ways of cushioning those who may not be able to pay. The contingent valuation method[7] which is used to assess demand is also complex and relies on the input of experts, who are international consultants in most of the studies (DFID, 1998). The complex nature of the CVM may imply that local policy makers are not fully involved in all the stages of the research. Therefore, in some studies, policy makers are presented with results and recommendations which they are expected to adopt without fully understanding how they were derived. The complex nature of CVM also means that it may not be readily adopted as a planning tool by policy makers in developing countries.

The second reason why links between WTP surveys and cost recovery policies appear weak is because demand surveys that have been carried out so far concentrate on assessing WTP without analysing the prevailing cost recovery policies and institutional, political and regulatory environment. Most of the demand assessment surveys (Arimah, 1996; Whittington et al., 1991; Lauria et al., 1999; AIMS Research, 1996) do not present the prevailing national or local government cost recovery policies. The existing cost recovery policies are important in assessing whether charging realistic tariffs, billing, and enforcing payment is feasible. In Rural Punjab, India the government declared a populist policy of free water which rendered results of a World Bank supported willingness to pay survey useless (UNDP-World Bank WSP, 1999). In Zimbabwe tariffs charged by the Central Rates Fund (CRF) and Rural District Councils (RDCs) are controlled by statutory instruments (Lenneiye, 1989). These conditions make timely tariff review to reflect inflation almost impossible, resulting in a situation in which households are willing to

[7] The Contingent Valuation Method is a direct method of determining willingness to pay in which households are presented scenarios of improved services and then asked how much they would be willing to pay in order to enjoy the service.

pay but local authorities are unwilling to charge due to complex tariff-setting systems. Therefore demand assessment surveys should analyse prevailing cost recovery policies and institutional arrangements and identify potential ways of introducing demand assessment in the planning system of sanitation agencies. Otherwise demand assessment studies may continue to have limited influence on cost recovery policies.

Most willingness to pay surveys have also concentrated on assessing willingness to pay (demand) and not enough attention has been given to actual cost (the supply-side). Fang (1999) observed that willingness to pay studies focused on demand and no effort seems to have been made to relate this to the actual cost of services. Results of the few studies that have done so seem to suggest that WTP may not cover the full cost and subsidies are necessary. For example, Whittington et al. (1992) found that although households were willing to pay US$1.47 per month for the construction of a Kumasi VIP the actual cost was estimated to be US$250. They then used information on cost and willingness to pay to design subsidies for latrine construction. Lauria et al. (1999) also found that less than 10% of the respondents were willing to pay the estimated cost of connecting to a sewer system (US$8) in Calamba, the Philippines. This shows that subsidies or alternative financing mechanisms may be necessary in order to achieve universal sanitation coverage. Yet most willingness to pay studies do not address issues of targeting subsidies or alternative financing mechanisms that ensure that the poor have access to basic sanitation services.

Presenting information on actual cost and willingness to pay to politicians may also give them a more complete picture of expenses, current charges and what people are prepared to pay. This shows them the magnitude of the subsidy they are giving to different consumers, which may be more convincing when it comes to encouraging them to increase tariffs. Likewise, presenting both cost and WTP information may also in some circumstances show a surplus, which might indicate that a utility may be self-sufficient and attract private companies.

Similarly, when communities are asked to pay more they want to know the exact cost of sanitation services. When tariffs are increased, mere rough estimates of costs may no longer be sufficient to convince the communities (Evans, 1992). Costing of sanitation services becomes critical as tariffs are increased since it will be unfair for users to pay for inefficiencies of service providers. This calls for detailed costing of sanitation services.

2.7 Summary

Almost half of the world's population is living in urban areas and between 40% and 60% of them live in informal settlements with inadequate or no sanitation facilities. Although poverty is one of the causes of poor sanitation in urban areas, there is need for users to pay more for sanitation services. This is based on the fact that past approaches which relied on government or donor funding and in which sanitation services were provided free of charge or were heavily subsidised failed to improve significantly and sustain sanitation coverage. Therefore, although there is still some debate on how far to carry this notion, cost recovery is inevitable and it should be an important goal for sanitation agencies.

Having said this, it is important to note that blind enforcement of full cost recovery principles which are suggested by the SSA, without taking into consideration the appropriateness of technologies and the economic situations of users, may hurt the urban poor. Although practical guidelines on the SSA (Tayler et al., 2002) discuss willingness to pay, the plight of the urban poor who may not be able to pay for sanitation services is not mentioned. Willingness to pay surveys have the potential to identify the poor and inform appropriate cost recovery policies for them. However, studies which were reviewed in this thesis seem to suggest that investment should only be implemented in areas where full cost recovery is feasible, therefore adding to fears that the poor may be left out in demand responsive approaches. There is need therefore to investigate ways through which willingness to pay information can be used to set tariffs that improve cost recovery without hurting or excluding the urban poor.

This study has tried to address this issue by identifying practical tools which use cost and willingness to pay information to design tariff structures that improve cost recovery but at the same time ensure that the poor have access to basic sanitation services. The methods which were used to achieve the objectives of this study are discussed in Chapter 4 but first there is need to define demand for sanitation and to understand the theory of willingness to pay for environmental services. This is discussed in the following chapter.

CHAPTER 3: THEORETICAL FRAMEWORK

In the preceding chapter the pivotal role of demand assessment in improving cost recovery and thus financial sustainability of projects was highlighted. Demand is the key principle in current approaches such as the Demand Responsive Approach and the Strategic Sanitation Approach. However, confusion about the definition of demand by different professionals in the water and sanitation sector was also highlighted in that chapter. It is therefore important to define demand, and understand the theoretical principles underpinning it. The theory behind demand will also determine which methods should be used to measure willingness to pay. In this chapter the economic theory of demand and how it is applied to environmental goods and services will be discussed. This chapter serves two main purposes in this thesis. First, it highlights the difference between demand characteristics of environmental sanitation (or public goods in general) and other usual (private) goods. Second, it discusses the economic theory behind the concept of willingness to pay, the methods which are used to measure it and how the data are analysed. The methods which were used to achieve the objectives of this study (which are presented in Chapter 4) and tools which are used to analyse the data in Chapters 6 and 7, are based on the economic principles which are discussed in this chapter. However, it is important to note that presenting a detailed explanation of the theoretical concepts used in environmental economics is beyond the scope of this thesis. The intention here is to introduce concepts and methods which are used in Chapters 6 and 7. Therefore the concept of demand is discussed only as far as it relates to the provision of sanitation services. For a detailed discussion of the consumer theory of demand and environmental economics readers are referred to Varian, 1999; Mas-colell et al., 1995; Perman et al., 1999; Bateman and Willis, 1999 and Kolstad, 2000.

3.1 Demand for Environmental Services

Demand for a normal[8] good can be defined as "the quantity of a commodity that a consumer will buy and consume at a given price" (Mas-colell et al., 1995). Demand for an ordinary good decreases as its price increases. However, this definition applies to private commodities which are traded in the market economy[9] like bread, but it may not apply as it is to environmental services such as drainage. For example, demand for bread can be defined as the number of loaves (**Q**) that an individual will buy at a given price (**P**) and the income level (**Y**) of that individual. Mathematically, demand for bread can be expressed as a function of price and income as:

$$\mathbf{Q = f(P, Y)} \qquad \mathbf{(1)}$$

Bread is traded freely in the markets and the markets are well developed. On the other hand markets for environmental services such as drainage are either non-existent or they are not well developed. Therefore environmental services are not traded freely between consumers and producers in the market. This is because environmental services are more public than private goods and they generate externalities. A public good is a commodity for which once it is produced use of a unit of the good by one person does not preclude use of that same unit by another (Mas-colell et al., 1995). For example, once drainage facilities are constructed in a neighbourhood, benefit by one household from such facilities does not mean that other households will not benefit as well. All the households can benefit from the same drainage facility at the same time (non-divisibility[10]) and it is difficult to stop other households, say those who do not pay drainage charges, from

[8] A commodity is normal if consumption of that commodity increases with income (Mas-colell et al. 1995)

[9] A market economy refers to a setting in which the goods and services that the consumer may acquire are available for purchase at known prices (Mas-colell, et al, 1995)

[10] Non-divisibility or non-rivalness occurs when if one of unit of a commodity is consumed by one person the same unit remains available for consumption by other people (Perman et al., 1999)

benefiting from the facilities (non-exclusivity[11]). This creates the problem of "free riders", people who enjoy the benefit of a service without paying for it.

In addition to being public goods most environmental services also produce externalities. Externalities occur when the production or consumption decisions of an individual affect the welfare (satisfaction or utility) of another person in an unintended way, and when no compensation is made by the producer of the external effect to the affected party (Perman et al., 1999). Externalities can have beneficial (positive) or adverse (negative) effects. A negative external effect occurs when say a household chooses not to build a latrine and practices open defecation. This contaminates drinking water sources leading to the outbreak of diarrhoeal diseases which may affect even those households with latrines. The household that is practising open defecation neither pays the medical expenses incurred by affected households nor is it held accountable for any deaths that may occur. In other words the household is not held accountable for its actions. In sanitation, positive externalities can be analogous to public health benefits. If a household constructs and uses a latrine this will bring private benefits to the household and public benefits to the community, neighbourhood or city. The household benefits by making the household pathogen-free by confining excreta (in the case of pit latrines) while the whole community benefits from a pathogen-free environment.

Clearly the public nature of environmental sanitation services, difficulties with charging and enforcing payment due to the possibility of free riders, and the presence of external benefits mean that if the supply of these services is left to the market there will be undersupply (Carson et al. in Bateman and Willis, 1999). It is not surprising therefore that there is a small number of private-for-profit companies which are active in the sanitation sector (except in situations where laws are designed to internalise the externalities[12]) leaving governments, NGOs and households themselves with the burden of providing sanitation services, especially in informal settlements. Of the US$250 billion

[11] Non-exclusivity occurs when the producer of a commodity cannot prevent (exclude) other people from benefiting from the commodity or when it is extremely expensive to do so
[12] Externalities are said to be internalised when the producer of the adverse external effect compensates the affected party

invested in water and sanitation between 1990 and 2000 only US$10 billion was from private companies (WHO and UNICEF, 2000).

This discussion shows that environmental services in general, and environmental sanitation in particular, are different from normal goods and cannot be provided adequately through the market economy. However, this does not mean that sanitation has no economic value, or that households do not value sanitation and therefore there is no demand for it. Definitely households value sanitation services (as shown by private household investments in latrines) it is just that their preferences and thus demand cannot be valued using standard micro-economic theory due to the peculiar nature of environmental services. A search for ways of valuing the unique demand for environmental benefits led to Environmental Valuation techniques which were developed mainly to value environmental impacts for Benefit-Cost Analysis (Perman et al., 1999). These techniques are discussed below.

3.2 Valuing Environmental Benefits

Application of economic principles to environmental services is based on treating a service, such as drainage, as a commodity or good. This is termed commodification of environmental services (Perman et al., 1999). This then allows the application of standard economic theory of consumer behaviour to an environmental sanitation service such as drainage. In this case, valuation of improved drainage is based on the fact that people derive utility (satisfaction or welfare improvement) from the improvement and the fundamental notion that households[13] have **preferences** (tastes) for drainage (Field, 1997). That is, given a choice, households can choose the type of drainage facilities they want and can afford to pay for.

[13] In this thesis household means an entity that takes and acts upon decisions about consumption. As in much of the economic literature such an entity will also be referred to as an individual or consumer depending on the context (Perman et al., 1999)

As alluded to earlier, environmental sanitation services give direct (private) benefits to the household and indirect (public) benefits to the whole community. The value which a household places on these benefits is expressed by what that household is willing and able to sacrifice (willing to pay) in order to enjoy the benefits. The maximum amount that a household is willing to pay is determined by a number of factors which include social characteristics, income and wealth. Therefore willingness to pay reflects both the willingness and ability to pay of a household (in economics this is referred to as effective demand). That is why economists interpret demand as willingness and ability to pay.

Whereas willingness to pay for commodities like bread can easily be determined by finding what people are paying in the market this may not be possible for environmental sanitation. This is because markets for services like drainage usually do not exist. Even in situations where they exist, demand will only reflect what households are willing to pay for private household benefits and not the wider public health benefits. Therefore alternative ways have to be used to value the total benefits of environmental services. Two methods which are commonly used to value environmental benefits are the Revealed Preferences and the Stated Preferences. Revealed Preferences infer demand for environmental services from observed market behaviour. In cases where markets do not exist stated preference methods like the Contingent Valuation Method (CVM) are used to ask respondents directly to state their preferences. Since the CVM was used in this study it is important to discuss its theoretical basis. The following sections try to explain (albeit in very simplified form) utility theory and the concepts of compensation variation and compensation surplus on which the Revealed Preference and contingent valuation methods are based.

3.3 Compensation Variation

This section borrows heavily from Perman et al. (1999) and Mas-colell et al. (1995). Illustrations are adopted from Perman et al. (1999). Methods which are used to measure willingness to pay (WTP) can be divided into two main classes, indirect and direct

methods. Indirect methods, such as Revealed Preferences, infer willingness of individuals to pay for an environmental service from observed actual behaviour in the market. For example, willingness to pay for improved water supply is inferred from observed investment in coping strategies such as storage containers or buying water from water vendors. Indirect methods are based on the concept of Compensation Variation (CV). This concept explains how changes in prices of say storage containers can be used to estimate the willingness of the household to pay for improved water supply. In order to illustrate this concept environmental sanitation matters are left for a while.

The satisfaction or welfare status of an individual is summarised by her utility curve. For the purpose of exposition, a simple model with two goods only (**A** and **B**) is used. The individual's preferences can be represented by the utility function (**U**):

$$\mathbf{U = U(A,B)} \qquad \mathbf{(2)}$$

Preferences over combinations of the two goods are assumed to have the conventional neo-classical properties (see Mas-Colell et al., 1995) so that the level of utility can be shown by a smooth, convex downward sloping indifference curve. The utility curve connects all combinations of the two goods **A** and **B** (referred to as consumption bundles) to which the individual is indifferent. Indifference here means that the individual cannot choose between the consumption bundles since they give the same level of satisfaction. The utility curve is shown in Figure 3.1 below. One key axiomatic assumption of economics is that consumers aim to maximise utility[14] (satisfaction or welfare) (ibid.). However, their aim to maximise utility is constrained by their income (the budget constraint). Therefore, consumers maximise utility subject to a budget constraint.

Assume the price of good **B** to be unit and that of **A** to be $\mathbf{P_1}$ and that the individual has a fixed income $\mathbf{Y_0}$. A utility maximising consumer will choose a consumption bundle of **A**

[14] In this thesis the term utility is used to refer to the satisfaction or welfare improvement which an individual derives from consuming a combination of two goods. The terms utility, satisfaction and welfare are used interchangeably.

and **B** which maximises her utility (U_0) subject to the budget constraint. The consumer's budget constraint can be written as:

$$P_1A + B = Y_0 \qquad (3)$$

The solution to equation 3 is found where the budget line is tangent to the utility curve (U_0). This gives two consumption quantities **B'** and **A'**. Figure 3.1 below illustrates this point. The Y-axis can be interpreted as being in units of income. This is because the price of good **B** is unit and if the individual is spending all her money on good **B** alone (that is **A** = 0) then **B** is equal to the money income Y_0.

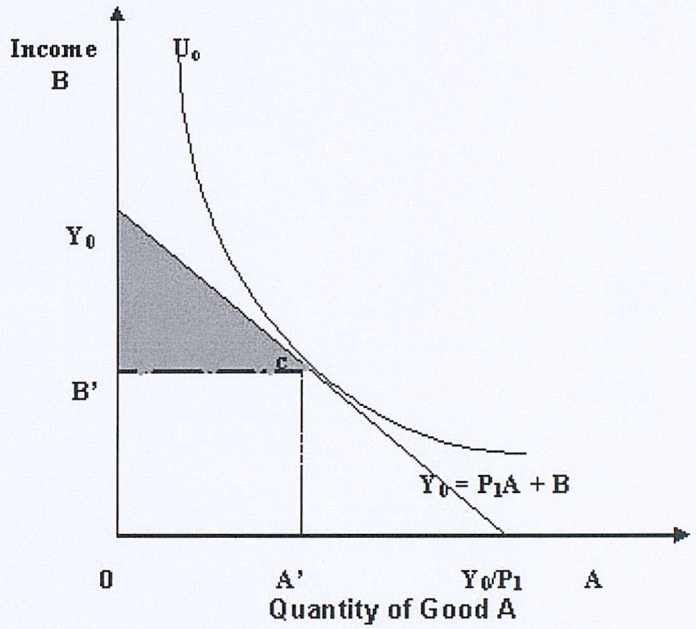

Figure 3.1: Welfare maximisation subject to a budget constraint

The shaded area is referred to as the **Consumer Surplus.** It is the difference between what a consumer would be willing to pay for a bundle of goods and the amount the consumer actually has to pay (Kolstad, 2000). Therefore the consumer surplus is the monetary value of the total welfare gain or utility that an individual derives from the consumption of a good less the price which the individual pays in order to consume that good (Mas-colell et al., 1995). Changes in the consumer surplus therefore imply changes

in the welfare state of the consumer. Therefore, the monetary measure of an individual's welfare change can be obtained by looking at changes in the consumer surplus. To illustrate this changes in the consumer surplus arising from a reduction in the price of **A** from P_1 to P_1" are analysed. The budget constraint line rotates anti-clockwise about the point Y_0 on the vertical axis to the new constraint given by the equation:

$$P_1"A + B = Y_0 \qquad (4)$$

This is shown in Figure 3.2 below.

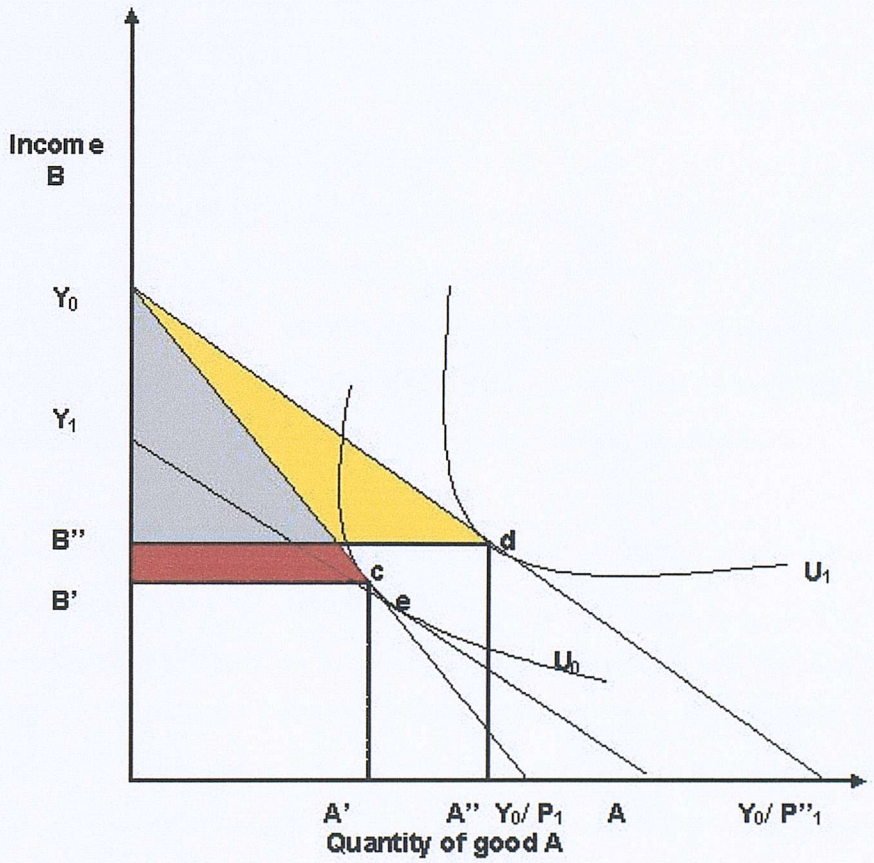

Figure 3.2 Welfare change arising from a price fall

Now welfare is maximised at a higher level (U_1) and by consuming higher levels of **A"** and **B"**. The monetary value of the welfare improvement caused by the fall in the price

of good **A** is shown by the consumer surplus (**Y_0B''d**). Now the concepts of **Compensation Variation** (CV) can be defined. The Compensation Variation is the change in income that would 'compensate' for the price change. That is CV is "the amount of money income which, when taken from the individual together with the price fall, leaves the individual at her initial level of welfare **U_0**" (Perman et al., 1999). It is therefore the maximum **Willingness To Pay (WTP)** of the individual to have the price fall occur. In simple terms CV is the maximum amount an individual would pay for a good in order to improve her welfare. Therefore CV measures, in money income, the welfare change from utility level **U_0** to **U_1**. Figure 3.2 above shows how a change in the price of good **A** affects the consumer surplus of an individual, which is a monetary measure of welfare. This is the basis of indirect methods such as the Revealed Preferences. The Revealed Preferences observe how consumers respond to changes in the price of a good which is related to an environmental service and use this to estimate willingness to pay for that environmental service. For example, coping strategies of households to intermittent water supply (such as buying storage containers or private pumps) can be used to estimate willingness to pay for improved water supply. The price fall in Figure 3.2 may be taken to represent a fall in the price of water storage containers due to an improvement in water supply. Therefore, the Compensation Variation is the maximum amount that an individual would pay for her water supply to improve which, in turn will result in a fall of the price of water storage containers.

This section illustrates graphically the concepts of **Utility** (welfare), **Consumer Surplus**, and **Compensation Variation**. Changes in the price of a good affect the consumer surplus of an individual which is a monetary measure of welfare change. This is the basis of indirect methods of measuring WTP, such as the Revealed Preference (RP) which is discussed in detail later. However, it is important to note that up to now price changes were used to illustrate concepts yet when talking about environmental sanitation it is changes in quality or quantity which are important. In the next section changes in quality are used to illustrate the concept of **Compensation Surplus (CS)** which forms the basis of direct methods of measuring WTP such as the Contingent Valuation.

3.4 Compensation Surplus

In this section the welfare change implications of changes in the quality or quantity of environmental services are considered. Once again a world with two goods only, environmental services (**E**) and a composite good (**C**) representing all other goods is assumed. **E** is assumed to be the cleanliness of the surrounding environment. Also assume that an individual has a well behaved utility function (**U**) which is a function of the two goods **E** and **C**. This can be expressed mathematically as:

$$\mathbf{U = f(E, C)} \qquad \mathbf{(5)}$$

Change in the level of **E** refers to quality change. Since most environmental sanitation services are public goods which are provided by local authorities, individuals cannot adjust their consumption levels as quality of **E** changes. For example, households in most cases are forced to take that quality of environmental sanitation services (such as the cleanliness of the surrounding environment) which are provided by local authorities since they cannot choose to enjoy more or less. This point is very important since it has important economic implications which will become clear when indirect methods of measuring WTP for environmental goods are discussed.

The **Compensating Surplus** (CS), a monetary measure of utility (welfare) change which is associated with a change in the level of **E**, is illustrated in Figure 3.3 below. A shift from **E'** to **E''** represents an improvement in the cleanliness of the surrounding environment. The improvement in the quality of the environment improves the welfare of the residents which is shown by a shift from utility level $\mathbf{U_0}$ to $\mathbf{U_1}$. Note that an improvement in the quality of the environment keeping everything constant is equivalent to a reduction in the price of **E**. The slope of the budget line $\mathbf{Y_0g}$ gives the price ratio implicit in the quality increase, tangential to an indifference curve for a higher level of utility, $\mathbf{U_1}$, at **f**.

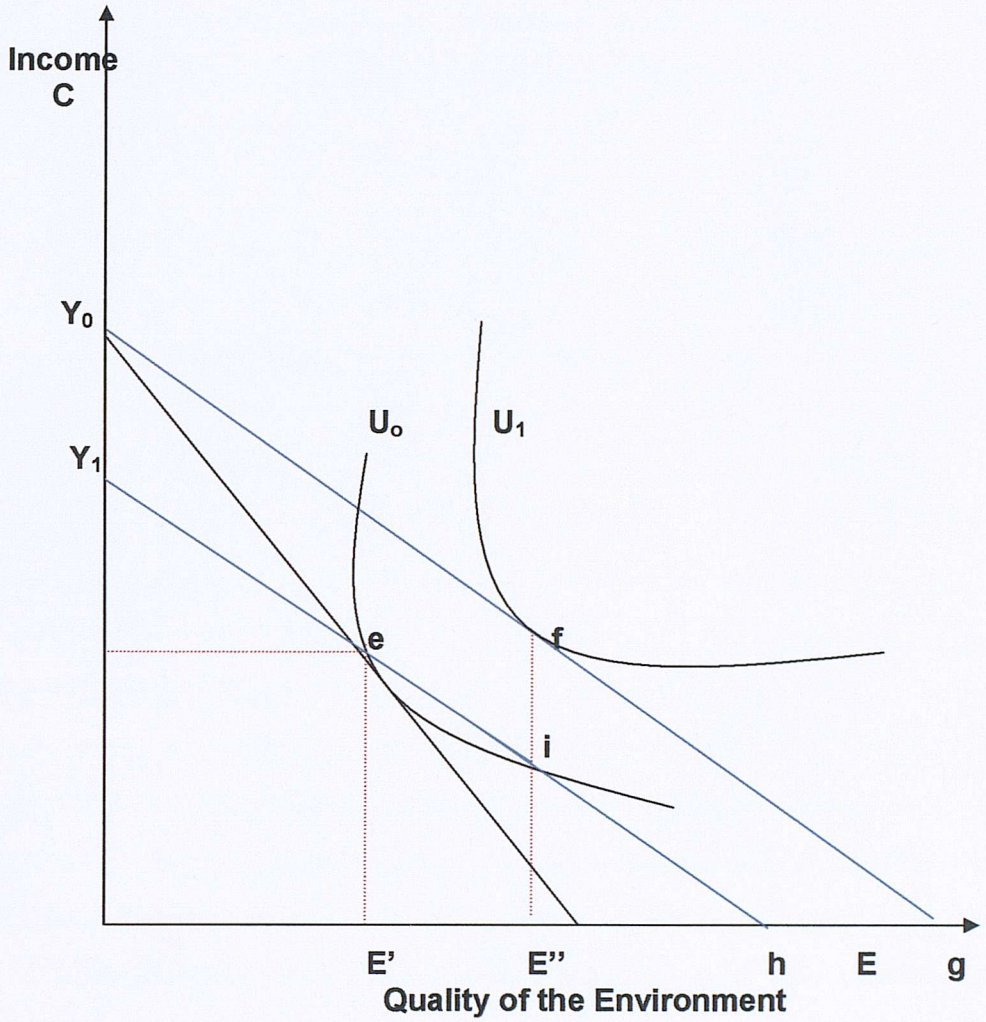

Figure 3.3: Compensation Surplus

Since the individual cannot adjust her consumption of **E** she is forced to consume the given level of environmental quality **E''**. Therefore $\mathbf{Y_1h}$ is drawn parallel to $\mathbf{Y_0g}$ and cutting the Utility curve $\mathbf{U_0}$ at **i** where the level of **E** is **E''**. Note that line $\mathbf{Y_1h}$ is not tangent to the utility curve $\mathbf{U_0}$ but rather cuts it. Therefore point **i** is not a welfare maximising point since it is possible for the individual to improve her welfare with that same level of income. In practice this means that households are forced to take that level of environmental services provided by local authorities which in most cases is below the welfare maximising level.

The **Compensation Surplus** (CS) is **fi** = $\mathbf{Y_0 - Y_1}$, the amount of money that, if foregone by the individual with the improvement in the cleanliness of the surrounding environment, would result in their enjoying the same level of welfare as that before the improvement in the cleanliness of the surrounding environment (Perman et al., 1999). In other words it is the individual's maximum **Willingness To Pay** (WTP) for the improved environmental quality.

This section shows that changes in environmental quality, unlike price changes, result in inefficient consumption bundles since individuals cannot adjust their consumption to efficient levels. This is because once a public good is produced individuals are forced to consume that given level of environmental services. This implies that for environmental quality changes, the **Consumer Surplus** (CS) cannot be used as an approximation for the proper monetary measure of welfare change (Perman et al., 1999). This has substantial implications for indirect methods of measuring willingness to pay for environmental services. Indirect methods use observed market behaviour in response to price changes to estimate the Consumer Surplus which is then taken as an estimate of the willingness of households to pay for improved environmental services (Choe et al., 1996a). But this section shows that price changes cannot be used to estimate willingness to pay for environmental quality or quantity change. This discussion is pursued further when the methods which are used to measure Willingness To Pay are discussed. But first the concept of **Willingness To Pay** (WTP) is defined and illustrated in the section below.

3.5 Willingness To Pay for Environmental Services

As alluded to above, the value an individual places on environmental services is expressed by how much she is willing to pay in order to enjoy that service. To illustrate the concept of WTP graphically, water supply is used as an example. Suppose a thirsty consumer is offered one litre of water and asked how much she would be willing to pay for that first litre of water. Suppose she says Z$300. Then she is asked how much she would be willing to pay for an additional litre. Suppose this time she says Z$200. She is

then asked how much she would be willing to pay for a third, fourth, fifth litre and so on. The results are depicted in Figure 3.4 below.

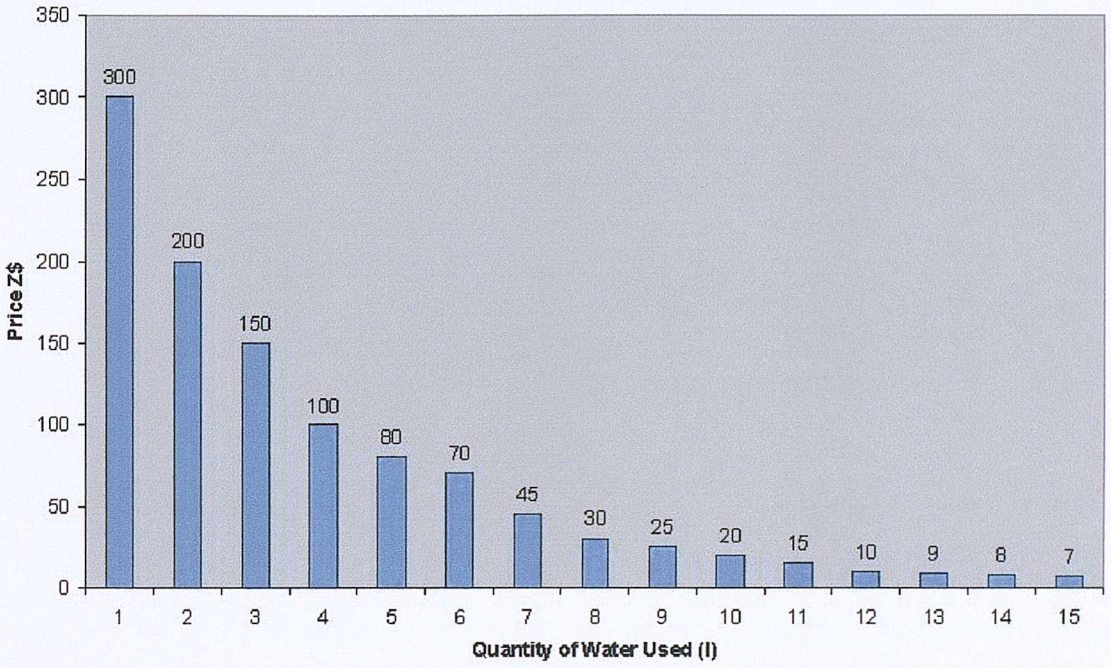

Figure 3.4: Demand for water

The willingness of an individual to pay for an additional unit of a good is referred to as Marginal Willingness To Pay (Field, 1997). The price that an individual pays for a good therefore measures the **marginal value** of that good to the individual, that is how much a consumer would be willing to pay for an additional unit of that good (Varian, 1987). The falling marginal willingness to pay for an additional litre of water shown in Figure 3.4 above depicts a fundamental relationship in economics, the notion of diminishing willingness to pay. The law of diminishing marginal willingness to pay states that as the number of units of a good consumed increases, the WTP for an additional unit of that good falls (Field, 1997). This results in a downward sloping curve which is convex to the origin. Figure 3.4 above shows bars because it was assumed that water is sold in units of litres and not fractions of a litre. If an individual can buy any amount of water such as 1.01, 1.05, or 1.5 litres, then the bars melt into a curve. This is presented in Figure 3.5 below.

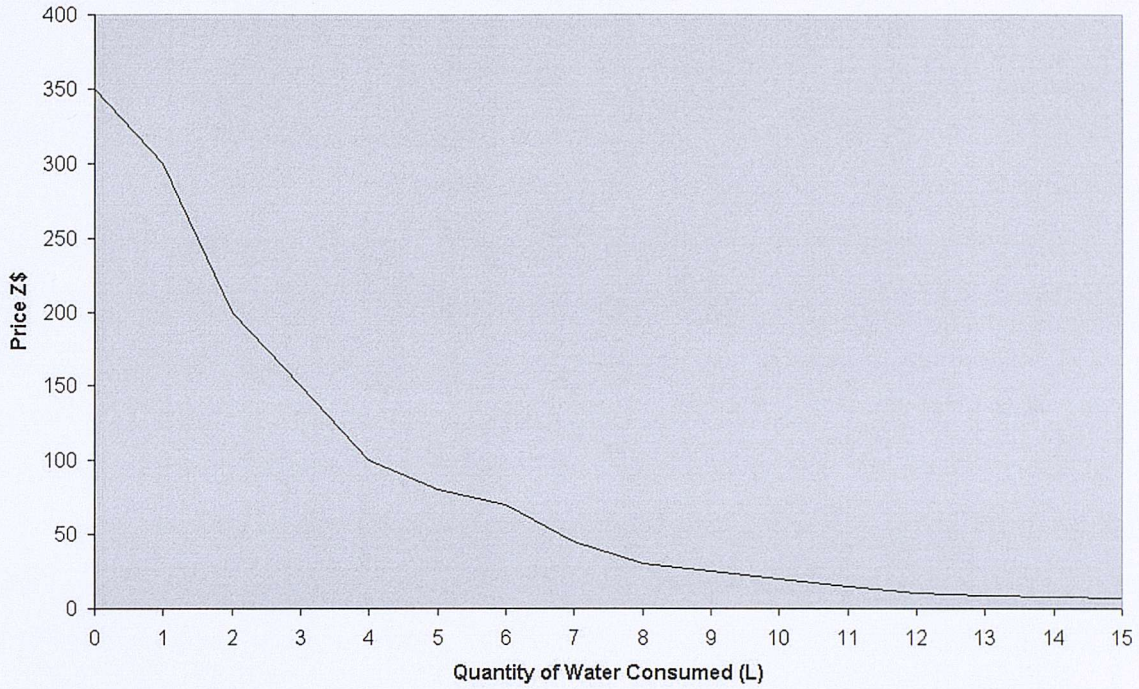

Figure 3.5: The demand curve for water

Marginal willingness to pay curves like the one shown in Figure 3.5 above are usually referred to as **Demand curves**. Therefore Figure 3.5 above is a demand curve for water for a particular individual. The curve shows the quantity of water that the individual in question would demand (purchase and consume) at a given price. The individual's demand curve summarises her tastes and preferences for that particular good and how that good is important to her. The area under the demand curve is the individual's total willingness to pay for any particular consumption level (Gomez-Lobo et al., 2002). But this same area is also the **Consumer's Surplus** which is the monetary value an individual places on welfare improvement that is derived from consuming water. Therefore, willingness to pay surveys can be used to determine the monetary value an individual places on welfare improvement caused by improved water supply. However, in most cases planners want to provide water or sanitation services to a number of households or the whole community. In order to do this they have to know total or aggregate demand for the community. An **Aggregate Demand Curve** is calculated by summing together a number of individual demand curves (Field, 1997).

Now all the concepts that have been defined in this chapter can be linked. Environmental services can be taken as commodities or goods. People derive utility (satisfaction or welfare improvement) from consuming these goods. Therefore, they are prepared to pay for the goods. An individual's demand curve shows the quantity of a good that individual will buy at the given price, in other words it shows the willingness to pay of that individual. The consumer surplus (the area under the demand curve) shows the monetary value an individual places on welfare improvement derived from consuming a good. The goal of environmental valuation therefore is to use the individual's observed demand function (willingness to pay) to estimate the total value (consumer surplus) to the individual of environmental services. The problem is that demand functions of individuals for environmental services are not known and may not be inferred from people's behaviour in the market since most environmental services are not traded in the market. This brings in the crucial question of how to measure willingness to pay for environmental services, such as sanitation, so that this information is used to derive demand curves which can then be used to calculate the monetary value of welfare gains (consumer surplus) from improved sanitation. A number of methods have been used in the water and sanitation sector to estimate demand especially for water supply. The different methods, their strengths and weaknesses are discussed in the following section.

3.6 Demand Assessment Methods

The major methods which are used to estimate demand (Willingness To Pay) for environmental services can be classified into two broad categories, indirect and direct methods. Both indirect and direct methods derive from the fact that markets for the environmental service in question either do not exist or they are not well developed due to externalities, non-excludability and/or non-divisibility (Perman et al., 1999). Indirect methods involve inferring an individual's WTP for non-marketed environmental services from the observed behaviour of the individual in regard to marketed commodities. Direct methods involve asking individuals direct questions relating to their willingness to pay for the affected environmental service. The two popular indirect and direct methods are

the Revealed Preferences (RP) and the Contingent Valuation Methods (CVM), respectively. These are discussed in detail below.

3.6.1 Revealed Preferences

The Revealed Preferences (RP) approach to the assessment of willingness to pay falls in the group of indirect methods. The Revealed Preference (RP) is based on the idea that the monetary value of a change in the level of the environmental good of interest can be inferred from observed data on price change of some ordinary commodity (the concept of compensation variation). The approach involves observing actual household behaviour in response to price changes, modelling this behaviour, and using this information to derive WTP (Griffin et al., 1995). Since this method has been used widely to estimate willingness to pay for water, an example of drinking water will be used to illustrate how this approach works. Demand for improved water supply can be estimated by calculating the financial cost of investment in coping strategies such as household investment in storage tanks and private pumps, and the opportunity cost of time spent collecting water (economic cost). The minimum wage is normally used as the value of time spent fetching water (ibid.). Economic costs also include wage losses due to sickness from poor water quality, time and fuel spent boiling water for safety, and management of the on-site storage subsystems though these are rarely calculated (Choe et al., 1996a). Summing up the financial and economic costs gives an estimate of the resource cost of poor water supply which can be used to estimate the willingness of communities to pay for improved water supply. According to Choe et al., (1996a) Revealed Preference estimates are based on the assumption that coping costs provide an estimate which is close to the consumer's willingness to pay for improved services.

In order to explain the theory behind this approach the difference between the variation (price change) and surplus (quality/quantity) measures of welfare change which were discussed in Section 3.3 above is revisited. In that section Compensation Variation (CV) is associated with price changes while Compensation Surplus (CS) is related to quality or quantity changes. As alluded to earlier, in the case of a price change the individual can

adjust her consumption of a good in response to its price change. But this is not the case with a quality or quantity change. In the case of intermittent water supply for example, households in a city are forced to consume that quantity of water which is supplied to them per day. In this case, changing the quantity of water that is pumped per day is beyond the household's control.

To illustrate this graphically assume a household that is consuming (**N**) ordinary goods. Let **Q** be the quantity of water that is pumped daily in a small city and $\mathbf{C_1}$ be the number of storage containers[15] purchased by households to store water. The demand for $\mathbf{C_1}$ can be expressed as a function of the price (**P**), the quantity of water supplied by the local authority (**Q**), and the welfare function of the household $\mathbf{U_0}$ (Perman et al., 1999). This can be expressed mathematically as:

$$\mathbf{C_1 = H_1(P_1, \ldots P_N, Q, U_0)} \qquad \mathbf{(6)}$$

An improvement in the quantity of water supplied and reliability of supply represented by a shift from $\mathbf{Q^0}$ to $\mathbf{Q^1}$ in Figure 3.6 below reduces demand for storage containers. Therefore, at the same price of a container ($\mathbf{P^*_1}$), the number of containers bought decreases from $\mathbf{C'_1}$ to $\mathbf{C''_1}$. $\mathbf{P^c_1(Q^0)}$ is the price which would drive demand for containers to zero (choke off price) at the initial level of water supply $\mathbf{Q^0}$. $\mathbf{P^c_1(Q^1)}$ is the choke off price after the quantity of water supplied increased to $\mathbf{Q^1}$. This is illustrated in Figure 3.6 below.

Although Figure 3.6 used water as an example it generally shows how demand for an environmental service can be inferred from an ordinary commodity's demand function. The area $\mathbf{a,b,P^c_1(Q^0),P^c_1(Q^1)}$ gives the Compensation Variation (CV) associated with the fall in the price of containers due to decreased demand for containers, which in turn was caused by an improvement in water supply. In other words it is the monetary value of the welfare improvement caused by a fall in the price of containers. Therefore, the Revealed

[15] Storage containers here refer to drums or other small containers that people use to store water in a city where water supply is rationed.

Preference method measures demand for improved water supply indirectly by looking at the welfare effects of price changes of storage containers.

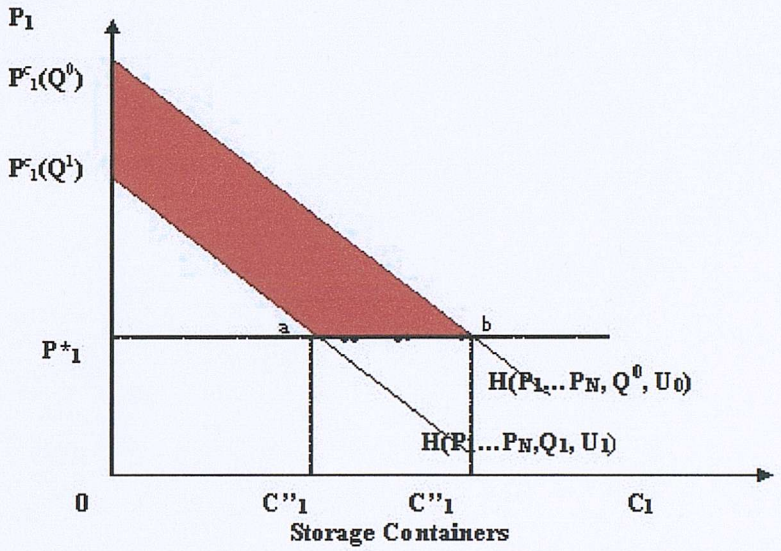

Figure 3.6: Water quality as a commodity demand function parameter

However, what we actually want to measure, in the example above, is the amount of money that the household would be willing to pay for an improvement in the quantity of water supplied. In other words we want to measure the Compensation Surplus (CS) associated with improved water supply which is responsible for the price fall and shift in demand for storage containers. Although CV and CS are close they are different. Therefore, Revealed Preferences measure CV which is not equal to CS. However, there are two conditions under which CV and CS are equal. Compensation Variation and Compensation Surplus are equal if storage containers (C_1) are a non-essential good, and storage containers (C_1) and the quantity of water supplied (Q) are weak complements (Perman et al., 1999).

Storage containers are non-essential to a household if it is possible to compensate the household for the total loss of all its storage containers (ibid.) That is there should be an acceptable level of income which if given to the household after losing all its containers

makes its welfare as good as before they lost the containers. Weak complementarities between storage containers ($\mathbf{C_1}$) and quantity of water supplied ($\mathbf{Q}$) occur only when the welfare (utility) of a household without any storage container is not affected by variation in the quantity of water that is supplied. These strict requirements, combined with the fact that measures of consumer surplus from a price change cannot be carried over to changes in quality/quantity of the environment, casts doubt on the use of indirect methods to estimate willingness to pay for improved environmental services. According to Perman et al. (1997), using price changes as an estimate of willingness to pay for an improvement in the quantity/quality of environmental goods involves errors about which little is known, either about the potential size of errors, or the sign whether they are positive or negative. Direct methods, such as the CVM, avoid this problem by asking people directly their WTP thus deriving a measure of Compensation Surplus directly.

Despite this controversy indirect methods are still used by economists to estimate willingness to pay for environmental services. This is because much of the criticism is theoretical yet in practice these methods have a number of advantages. The merits and demerits of these approaches are discussed below.

Advantages and Weaknesses of the Revealed Preference Approach

The major advantage of the Revealed Preference (RP) method is that it is based on actual observed market behaviour as opposed to hypothetical markets which are used in direct approaches. The method is also cheaper and easier to implement than direct methods (DFID, 1998). However, the major practical limitation is that the RP method cannot be used where there are no services to start with or where there are no alternatives or coping strategies. In these cases there are no observable market behaviours. For example, RP cannot be used to estimate WTP for improved latrines where people defecate in the open. The method cannot be used to predict the responses of households to huge changes in prices or quality of services offered. RP therefore has limited use in future planning. For example, the approach cannot be used to predict the number of people who will connect to a sewer system or join a latrine construction programme.

As noted earlier, environmental services have direct and indirect use value. RP measures WTP for private benefits only and does not estimate WTP for community or environmental benefits such as public health benefits. Related to this is the fact that RP can only estimate WTP for a partially improved service (Choe et al., 1996a). Since RP calculates what people are already paying for partially improved services it can only give a measure of minimum WTP and not the maximum WTP for a fully improved service. This is because coping strategies such as storage tanks, only improve the situation partially but they do not represent full service improvements such as 24 hours of water supply at acceptable pressure. Therefore RP cannot be used to estimate the maximum WTP of consumers for fully improved water supply (DFID, 1998).

According to DFID (1998) RP approaches are not usually suitable for the estimation of demand for improved sanitation services. This is because the usual coping strategies for inadequate sanitation are not tradable. Whereas investment in pit latrines and hiring informal refuse collectors can be used as estimates of WTP for improved excreta and solid waste disposal, the common practices such as open defecation and indiscriminate dumping cannot.

Due to these problems and limitations RP is rarely used to assess demand for sanitation services. Therefore, the decision about which method to use to estimate WTP for improved sanitation seems to have come down pretty firmly on the side of direct methods, rather than indirect ones (Ardila and Williams, 1998). This is evidenced by the recommendation and promotion of direct methods by major sanitation organisations such as the World Bank and DFID (UNDP-World Bank WSP, 1999; DFID, 1998). In the United States of America, the contingent valuation is the acceptable methods of valuing environmental damage for compensation purposes in litigations (Batmen and Willis, 1999).

3.6.2 The Contingent Valuation Method (CVM)

Unlike the Revealed Preferences, Contingent Valuation measures the theoretically correct measure of welfare change (Perman et al., 1999). This may explain why Contingent Valuation (CV) is recommended by economists and major sanitation organisations as the ideal technique for assessing willingness to pay (WTP) for improved sanitation services (Perman et al., 1999; DFID, 1998; UNDP-World Bank WSP, 1999; Arrow et al. 1993). CVM involves presenting the respondent with a hypothetical scenario of an improved service and asking her directly how much she would be willing to pay for this service. The method is called contingent valuation because the respondent's WTP is contingent upon the scenario presented to him/her (Choe et al., 1996a). CVM is based on the fact that in most cases markets for environmental goods or services do not exist or are not well developed, which is the case with environmental sanitation. In such cases, CVM has to be used to estimate how much people would be willing to pay in order to enjoy a clean and disease free environment. CVM is a group of survey-based methods which may be used to value improvements in environmental services in the absence of data on markets or surrogate-market prices. CVM was first used in developed countries to value public goods, such as parks, clean air and water, and endangered species, whose market values were difficult to assess (Dixon et al., 1996). Unlike Revealed Preferences, CVM estimates are not based on observed behaviour but, instead, by inferring what an individual's behaviour would be from the answers he or she expresses in a survey framework. CVM avoids the problem of indirect methods by asking respondents directly how much they would be willing to pay for improved services. These answers are then aggregated to get WTP for the whole affected population. Therefore unlike indirect methods, Contingent Valuation Methods estimate the monetary measure of welfare change (Compensation Surplus) arising from an improvement in environmental quality, directly.

The questionnaire design, implementation and analysis of CVM data are critical in order to achieve credible WTP estimates. Major steps in applying a CVM involve questionnaire

design, conducting household surveys and data analysis (Perman et al., 1999). These are discussed below.

(i) Questionnaire Design

Questionnaire design for a CVM involves four stages (1) designing the hypothetical scenario (sometimes referred to as commodity definition (Carson et al. in Bateman and Mitchell, 1999)), (2) setting the payment vehicle or the means of payment for the improved services, (3) setting the bids and (4) pre-testing and piloting (ibid.). The first stage involves the construction of hypothetical markets for various levels of improved sanitation services. Improved sanitation services can be for example, the construction of a household latrine, solid waste collection and disposal, and construction of drainage facilities. In order to control for hypothetical bias, scenarios of improved sanitation should be as practical as possible (Parry-Jones, 1999). Engineers, planners, communities and other policy makers should be involved in setting the scenarios to ensure that the scenarios are feasible and that the service provider will be able to provide such a service.

The second stage involves setting the payment vehicle or the means through which users will pay for the improved services. For example, improved services can be paid through taxes on all workers or user fees. The third stage involves setting the bids (the amounts which users will be asked if they would be willing to pay or not). Respondents can be asked to state their maximum WTP through an open-ended question or they can be asked whether or not they would be willing to pay given charges. The last stage of questionnaire designing involves pre-testing and piloting the questionnaire to ensure that the scenarios are clear. If the questionnaire is satisfactory it is then administered during surveys.

(ii) Field Surveys

Contingent Valuation questionnaires should be administered through face-to-face interviews (Arrow et al. 1993; UNDP-World Bank WSP, 1999). During the interviews the interviewer gives a detailed description of the scenario to the respondent. Photos have

been used to show cases of reduced pollution (Dixon et al, 1996). There is need to ensure that the respondent understands the scenario. After making sure the respondents have understood the scenario they are then asked how much they would be willing to pay for the improvement.

WTP bids can be elicited using dichotomous choice (referendum format), open-ended questions (single bidding) or iterative bidding games. With the dichotomous choice format respondents are presented with a scenario of an improved service and asked if they would pay a given amount or not. Respondents are asked different amounts which are randomly selected. Therefore the dichotomous choice format is like a referendum in which respondents vote yes or no. The advantage of this approach is that respondents may find it difficult to value services but it will be easier for them to respond to questions about whether or not they would be willing to pay a given amount. The dichotomous choice format is also claimed to dissuade respondents from giving unrealistic bids (Arrow et al., 1993). Although this method was recommended by Arrow et al. (1993), it has a number of drawbacks. The main drawback with the dichotomous format is that it is difficult to determine the maximum amount that respondents would be willing to pay (Marchand, 1998). The method also provides little information on the wide range of consumer WTP (Choe et al., 1996a).

In open-ended questions the interviewer describes the improved scenario to the respondents before asking them to state the maximum price they would be willing to pay in order to enjoy the improved service (Dixon et al., 1996). The respondents are left to decide their maximum bid without additional information on prices from the interviewer. The main advantage of this format is that it is easy to administer and that the respondent's bid is not affected by information given by the interviewer, that is the interviewer does not give the respondent clues on the likely price of the improved service. However, most researchers have been reluctant to use open-ended questions because they fear that such questions, on their own, do not provide sufficient stimuli and information to help people thoroughly consider the values they would place on the improved service (Marchand, 1998). Actually it has been found that willingness to pay bids assessed through open-

ended questions are consistently lower than those assessed through iterative bidding or dichotomous choice format (Bateman et al. 1999). The open-ended format is also prone to strategic bias. Strategic bias occurs when respondents think that they can influence the implementation of a programme or provision of the service in question and state their bids accordingly. This is particularly true when dealing with public goods where each individual cannot be excluded from benefiting once the service is provided but can refrain from paying (free-riders). Nevertheless, open-ended questions can be improved by using them together with other bidding techniques (ibid).

Iterative bidding games involve asking the respondents whether they would be willing to pay a stated amount (known as the starting point) or not (yes/no). The amount is then varied iteratively up or down depending on the answer until the maximum WTP bid is reached. The iterative method has the advantage that it gives more information by capturing the wide range of WTP bids. However, Choe et al. (1996b) and Whittington et al. (1992) found that it is difficult to implement in practice. It requires splitting the sample and asking different groups if they would be willing to pay different bids which may confuse respondents. Whittington (1998) had problems explaining to community leaders why households were asked different prices in Mozambique and Bangladesh. The first bid that is offered to the respondent may affect her maximum willingness to pay bid. For example, respondents who do not have a well-defined valuation for the service in question may use the first bid offered as a clue resulting in starting point bias. Respondents also tend to agree with increasing bids regardless of their true valuation of the service, resulting in overestimation of willingness to pay (Marchand, 1998). Furthermore, respondents may not take the whole process seriously when prices are changed, especially when bids seem obviously too high or too low (Whittington, 1998). All the elicitation techniques discussed above have limitations and environmental economists are split over this topic. At the moment there is no consensus on which is the best elicitation method and debate on refining these techniques is still going on (Bateman and Willis, 1999).

(iii) Data Analysis

A household's willingness to pay for improved sanitation is determined by demographic, socio-economic and institutional factors. Econometric models such as Ordinary Least Squares (OLS) or Logit models use these factors to calculate average WTP (Choe, et al., 1996a; Anand, 1999). Ordinary Least Squares (multiple regression) is normally used to estimate WTP from surveys in which maximum willingness to pay is determined through open-ended questions. Referendum surveys in which respondents are asked whether or not they would pay a stated amount produce yes or no (dichotomous) surveys which cannot be analysed using OLS. Logit or probit models are normally used to analyse data in which the dependent variable is dichotomous (Gujarati, 1995). Both the OLS and Logit models are based on the inverse demand function[16]. Demand for a good is normally defined as the quantity of that good which a consumer will buy and consume at a given price. On the other hand WTP is the price that a consumer will pay in order to consume a given quantity of a good. Therefore willingness to pay is the inverse of the normal demand function. WTP can be expressed as a function of environmental quality or quantity (**E**) demographic (**D**), socio-economic (**Y**) and other factors (**O**). Mathematically the models can be written as:

$$\textbf{WTP bids} = f(\mathbf{E}, \mathbf{D}, \mathbf{Y}, \mathbf{O}) \qquad (7)$$

Equation 7 can be estimated using computer programmes such as SPSS to compute the mean willingness to pay of households. The idea here is to establish the relationship between willingness to pay bids (the dependent variable) and household socio-economic characteristics (explanatory variables) using sample data, with a view to estimate and/or predict the mean willingness to pay of the whole population concerned. The average household WTP is multiplied by the population affected to derive the aggregate WTP for the whole population (Perman et al., 1999). The estimated equation also identifies variables with great influence on WTP and how changes in these variables can affect demand for improved sanitation (Anand, 1999; Whittington et al., 1991). Data on the

important variables can be used to inform policies aimed at increasing sanitation coverage.

The econometrically estimated equation can also be used to validate the whole demand assessment survey by comparing the results with what is postulated by economic theory. For example, demand for a normal good is expected to increase with income therefore the sign on income is expected to be positive (that is as income increases demand for the good also increases). The coefficient of multiple determination (R^2) (also referred to as the squared multiple correlation coefficient) and the F-statistic are used to assess the robustness of the models used to estimate mean willingness to pay. The R^2 shows the percentage of total variation in willingness to pay bids which is explained by the regression plane, that is, by changes in the quality of environmental services, demography, household socio-economic characteristics and other factors. However, R^2 has the major weakness that its value continues to increase as more explanatory variables are added irrespective of the power of these variables to explain variation in willingness to pay bids. To correct for this defect, adjusted R^2 is used. Adjusted R^2 for surveys assessing willingness to pay for water and sanitation is usually low, between 20% and 30% (Whittington et al., 1990; Whittington et al., 1991). That is, only 30% of the variation in willingness to pay bids can be explained by changes in households characteristics, the rest is random or by chance. Generally the results of an econometric model estimating willingness to pay for water or sanitation are acceptable if R^2 is at least 15% (Mitchelll and Carson, 1989).

The F-statistic is used to test the overall significance of the econometric model in explaining variation in willingness to pay bids. In general, high values of the F-statistic suggest that together the quality of environmental services, demography, household socio-economic characteristics and other factors explain a significant part of the variation in willingness to pay bids (Koutsoyiannis, 1979).

[16] The inverse demand function gives the price that a consumer will pay (WTP) in order to consume a given quantity of a good.

(iv) Advantages of the Contingent Valuation Method (CVM)

The theoretical basis of willingness to pay presented in sections 3.3 and 3.4 shows that only two methods, the Revealed Preference (RP) and Contingent Valuation Methods (CVM), can be used to achieve reasonable estimates of consumer surplus. However, the CVM has a number of advantages over Revealed Preferences (RP). As discussed in section 3.3 and 3.4, answers to willingness to pay questions in contingent valuation surveys measure directly the theoretically correct monetary measures of welfare change caused by improved sanitation, unlike the RP which try to infer this from changes in the price of a related good. Therefore, based on the theoretical principles of environmental valuation, CVM is the only technique which can yield statistically representative data on the monetary value of welfare change (Perman, et al., 1999). Where services do not exist and there are no traded alternatives, which is the case with drainage or latrines, CVM may be the only method which can be used to assess the value of environmental goods (Dixon et al., 1996). Given that environmental sanitation has direct and indirect use benefits, CVM is by far the most comprehensive way of calculating the total value of non-marketed sanitation services since it estimates both private and public health benefits (UNDP-World Bank WSP, 1999). Although RP is useful and relatively cost-effective (DFID, 1998), CVM has the major advantage of estimating future demand and policy implications which may not be possible with RP. For example, CVM can be used to estimate the number of people who will connect to a water or sewer system (Choe et al., 1996b; Whittington et al., 1993).

The CVM also estimates WTP for fully improved services as opposed to partial improvements which are measured by RP methods. CVM can give information on household preferences between different levels and standards of improved services. For example, CVM can be used to assess household demand for the Ventilated Improved Pit latrine (VIP), septic tanks or flush toilets which are connected to the sewer. This information can be used to guide technical and financial planning for the improvement of future services. Related to this is the fact that CVM can be used to estimate future demand for improved sanitation options-which may not exist currently-and can thus be

used for technical and financial policy analysis for future service provision (DFID, 1998; UNDP-World Bank WSP, 1999; Parry-Jones, 1999).

Households' WTP bids which are elicited through contingent valuation are estimates of the perceived benefits of the hypothetical scenario, and are not just the cost of what households are currently paying for sanitation or are willing to bear in future. "Being thus based on potential benefits perceived by consumers, these estimates of WTP can be larger than the cost of supply, and hence can either provide for cross-subsidisation of poorer consumers, or can provide a surplus fund to be used for further improvements in services" (UNDP-World Bank, 1999). Detailed CV surveys also provide vital information which is needed to formulate policy on tariff structures, cost recovery levels, and targeting of subsidies to protect the poor. For example, Whittington et al. (1991) calculated the number of people connecting to a water system at different prices and revenue generated at that price. They also illustrated how equity issues can be addressed by choosing the optimal price which allows the highest number of people to connect and still raise enough revenue for operation and maintenance. Where households have to choose from a large number of technologies or service level options, where charges are likely to be high, and where income varies greatly, for example due to presence of industry and commerce who can subsidise the poor, the DFID (1998) recommends detailed CV surveys in order to design projects that meet the needs of the different groups.

Well designed and implemented CV surveys can also provide tangible evidence which is needed to convince politicians and other decision makers that consumers, including the poor, are willing to pay for improved sanitation services (UNDP-World Bank WSP, 1999). However, CVM has limitations which need to be carefully considered when designing demand assessment studies.

(vi) Limitations

The major weakness of the CVM is the hypothetical nature of the scenarios. This results in a number of inherent biases. These are discussed below.

(a) Hypothetical bias

Since CVM estimates are not based on actual behaviour but on hypothetical markets in which money is not actually exchanged, questions have been raised on how accurately they simulate conditions in the real world (Dixon et al., 1997). Hypothetical bias arises from the hypothetical nature of CVM and the fact that people who may not have experience with the improved services may find it difficult to put a value on the services in question. Some authors, whom Bateman and Willis (1999) referred to as "detractors", argue that contingent valuation (CV) results are not valid since asking hypothetical questions will yield hypothetical willingness to pay bids. However, many authors disagree with this view (Bateman et al. 1999; Boyle and Bergstrom, 1999; Arrow et al. 1993). They explain inconsistencies with willingness to pay bids in terms of inadequate design or administration of the surveys. It is therefore important to present respondents with technologies they are familiar with and to make sure that they understand the scenario before asking their willingness to pay.

(b) Starting point bias

This occurs where iterative bidding or double (and multi) bound dichotomous-choice is used. Iterative bidding involves asking respondents if they would pay say $X for the improved service. Depending on whether they say yes or no the amount is then increased or decreased until a maximum WTP is reached. However, respondents who are unfamiliar with the good in question may use the first offered bid (starting point) as indicative of the true value of the good (psychological anchoring) or as a reference point for an acceptable range of bids (Dixon et al., 1997; Bateman et al., 1999). Psychological anchoring implies that respondents are placing a price on the good based on the first bid offered and not on how much they value the good, thus bringing into question the validity

of the CV technique. Hanemann (1995) offers an alternative explanation in which he argues that respondents take the first bid offered as the cost rather than value of the good in question (cost-response). In this case respondents may see no reason to pay more than the cost of the good or they may interpret different bid levels as a reflection of the quality of the good. Although Hanemann's cost-response explanation implies that starting point bias is consistent with utility-maximizing behaviour, it introduces practical problems. According to Bateman et al. (1999), taking bid amounts as reflecting different qualities of the good means that respondents are valuing different goods, in which case aggregating data within a single function will be erroneous. The problem of starting point bias is not yet resolved and Bateman et al. (1999) recommended further research on this issue.

(c) Strategic bias

Strategic bias occurs when respondents give answers which they think will affect the provision of services or implementation of projects (Dixon et al., 1997). If they feel that high bids will lead to the implementation of projects which will improve services without their actually having to pay the bids they state, they may overstate their WTP bids. If, on the other hand, they feel they may have to actually pay the amount they state they may understate their WTP. In Punjab, India for example, AIMS Research (1996) found that households consistently stated low or zero bids even where assets and income proved that the respondents could afford to pay. This was because some respondents felt they could put political pressure on the government and get higher subsidies while others thought water supply and sanitation were the responsibility of the government.

(d) Information bias

Providing respondents with little information about the possible choices of improved services or misleading statements by the interviewer may lead to information bias. This can be avoided by providing clear, complete and unbiased information on the objectives of the survey and the characteristics of improved services. However, in some cases people buy marketed goods without full information. Munro and Hanley (1999) evaluated the effects of information uncertainty on willingness to pay bids and concluded that there

is no reason to dismiss willingness to pay bids elicited through CVM designed purely to value use-value, based on the fact that full information was not provided.

Another form of information bias is referred to variously as the embedding phenomenon, scope sensitivity or part-whole problem. This occurs where respondents commonly state high WTP for the first service and low for last service (Dixon et al, 1997) or give the same willingness to pay bids for services which are unambiguously different to the researcher (Whittington et al. 1997). This occurs where respondents are asked to value more than one scenario in joint evaluations. For example, Whittington et al. (1997) observed that respondents were willing to pay more for a low level service (sewer system plus wastewater treatment plant) than a presumably higher level service (sewer system plus wastewater treatment plant and a regional plan to ensure that all communities treated their wastewater). Kahneman and Knetsch (1992) also observed that respondents stated willingness to pay bids for the conservation of one endangered species which were almost the same as bids for conserving all endangered species.

These results can be interpreted as proving that the CV technique is invalid (Kahneman and Knetsch, 1992). However Green and Tunstall (1999) dismiss this, arguing that embedding in ecological studies is a result of "asking meaningless" questions which make it difficult for respondents to distinguish between one species or all endangered species. In sanitation, a flush toilet is not necessarily better than a Ventilated Improved Pit (VIP) latrine. Depending on the water supply situation respondents may be willing to pay more for a VIP latrine than a flush toilet. Whittington et al. (1997) recommend flexible interpretation of respondents' answers as opposed to the application of simple tests simply to accept or reject CV results. This is also supported by Green and Tunstall (1999) who noted that what is termed bias in economics should actually be investigated further to come up with new theoretical insights instead of being used just to reject CV results.

(e) Payment method bias (payment vehicle)

This occurs where respondents are hostile to the means by which payment would be made. The vehicles chosen for payment such as taxation, payment to the local authority or NGO, or user fees may affect WTP bids. Attitude towards government policy may also affect WTP. For example, where people expect the government to subsidise services or provide them free of charge they may not be willing to pay anything (Whittington et al., 1991). Adding a follow-up question to make sure that any zero bids from the respondent actually reflects zero value to them, rather than a protest against payment, can often eliminate this kind of bias (Dixon et al., 1997).

(f) Psychological Perspective

Although the "biases" discussed above are taken as limitations with the CV method, they may be viewed differently by psychologists. Green and Tunstall (1999) explain bias in terms of weaknesses with economic theory. They argue that neo-classical economics is based on the assumption that economists know what people want and how they make choices. Respondents are then treated as passive objects who react to economic stimuli in a way which is predicted by economic theory. In the cases of CV surveys, any deviation from the theoretical expectations is defined as 'bias' which is ascribed to poor design or execution. According to Green and Tunstall (1999), 'bias' in economic terms implies that either the results, the respondents or survey methods are wrong. On the other hand, psychology is based on the conversion of unexpected results (biases) into theory. Deviations of willingness to pay bids from the theoretical expected result may be due to failure of economic theory to explain beliefs, attitude, and social norms all of which affect preferences. These variables are especially important in sanitation since hygiene behaviour is to a great extent influenced by beliefs, attitudes and social norms. Therefore, efforts to improve the CV method and to explain bias may benefit from an understanding of psychology (ibid.)

In brief, the CVM is not a perfect technique and there is need to improve it, especially the elicitation techniques. However, this does not imply that all CV results are invalid. Careful questionnaire design and administration can minimise or eliminate most of the biases discussed above. Increasing the sample size and using statistically valid sampling techniques can further improve the accuracy of CV estimates.

3.7 Summary

In this chapter the term demand was defined and how demand for environmental services or goods is different from that for normal goods. Although willingness to pay for improved sanitation can be defined as the maximum amount of money which an individual will pay in order to enjoy the service, it is more than just a number. Information on willingness to pay can be used to determine the consumer surplus, which is the monetary value an individual places on welfare benefits derived from improved sanitation. This information has important economic implications on the provision of sanitation services. For example, the monetary value residents place on improved sanitation can be compared with the actual cost of providing the service (cost-benefit analysis) and used to make decisions on the efficient way of using scarce financial resources. Cost-benefit analysis can also be used to make informed decisions on privatisation or commercialisation of sanitation services (public private partnerships) and to justify donor or government subsidies. At the local authority level this information can be used to set tariff structures that improve cost recovery and to design mechanisms to cushion the urban poor.

Given these crucial applications of willingness to pay information in service provision, it is important that it is measured accurately. Although a number of methods (affordability-rule, PRA, RP) have been used to estimate willingness to pay, the theoretical principles discussed in this chapter show that only the contingent valuation method measures the theoretically correct consumer surplus related to improvements in the **quantity/quality** of sanitation services. However, there are some authors who criticise CVM and there is debate on the validity of its estimates, with some critics arguing that hypothetical

scenarios will produce hypothetical WTP bids. It is important though to note that much of this criticism (Kahneman and Knetsch, 1992; Diamond and Hausman, 1994) concerns valuation of non-use values (or what the US courts term passive-use value) for litigation purposes. The rift between economists developed in 1989 when the oil tanker Exxon Valdez spilled 11 million gallons of crude oil in Prince William Sound, Alaska causing a lot of environmental damage. The state of Alaska commissioned eminent economists to use CVM to value the damage caused for litigation purposes. Worried about the size of the damage and the possibility of huge compensation payments, the Exxon Company commissioned an equally high level team of economists to investigate the validity of CVM (Bateman and Willis, 1999). Since then there have been accusations and counter-accusations. Before the Exxon oil spill, debate on CVM seemed to have progressed beyond the validity of CVM estimates, to that on fine-tuning the technique (ibid.). Also, current criticism is academic, focused on theoretical principles such as the difference between willingness to pay and willingness to accept, which may not necessarily limit the application of this technique in the sanitation sector.

Therefore, currently CVM seems to be the only option for valuing sanitation services, especially in situations where there are no services to start with or no coping strategies. This may explain why leading agencies in the water and sanitation sector are promoting this technique (DFID, 1998; UNDP-World Bank 1999). In 1993 a panel of eminent economists commissioned by the American National Oceanic and Atmospheric Administration (NOAA), USA to investigate CVM, recommended use of the method on condition that rigorous guidelines, which the panel laid out, were followed (Bateman and Willis, 1999, Arrow et al., 1993).

The main practical limitation to the application of CVM in developing countries is that it is complex and expensive which makes it difficult to adopt and use as a planning tool by local authorities. There is need therefore for capacity building. Also, as discussed in Chapter 2, sustainability of sanitation services is multifaceted, with political, regulatory and social aspects being of importance in addition to financial issues. Therefore sanitation problems in urban areas cannot be solved completely using one economic tool,

CVM. This calls for an integration or parallel use of different methods in which CVM data is supplemented by information collected using other methods, especially participatory techniques. In this study both the CVM and participatory techniques were used. The methodologies which were used to achieve the objectives of this study are presented in the next chapter.

CHAPTER 4: STUDY CONTEXT AND METHODOLOGY

The World Bank and other major international donors recommend the contingent valuation method as the most appropriate approach to estimate willingness to pay. This is also supported by the economic principles which were discussed in the previous chapter. However, as was discussed in that chapter, the contingent valuation method has a number of potential biases and limitations. This chapter will discuss the methods which were used to achieve the objectives set out in Chapter 1, the steps which were taken to minimise or to avoid bias, and how study sites were selected. However, before presenting the methodology it is important to introduce Zimbabwe, the country in which this study was conducted and to briefly discuss its key physical, economic and demographic characteristics.

4.1 Introduction to Zimbabwe

Zimbabwe is located in Southern Africa and is a member of the Southern Africa Development Community (SADC). The country has a surface area of 391,000km^2. Zimbabwe's economy was booming after independence in 1980 before slowing down in the late 1990s. The Gross Domestic Product[17] (GDP) increased from US$5.4 billion in 1980 to US$8.8 billion in 1990 before declining to US$7.2 billion in 2000. GDP per capita followed a similar pattern. It increased from US$638 in 1980 to US$706 in 1990 before falling to US$703 in 1998 (World Bank, 2000). Agriculture, mining and manufacturing form the three main pillars of the country's economy. In 1991, Zimbabwe embarked on the World Bank and International Monetary Fund supported Economic Structural Adjustment Programme (ESAP). The main objectives of ESAP were to cut government expenditure and to improve cost recovery in all sectors (Government of Zimbabwe, 1994).

[17] GDP is the total output of goods and services for final use produced by an economy by both residents and non-residents. It does not include deduction for depreciation of physical capital or depletion and degradation of natural resources (World Bank, 2000)

For administrative purposes Zimbabwe is divided into ten provinces (two of which are urban) and 57 rural districts. In 2000 the country's population was 11.7 million of which 4.1 million (35%) were urban (WHO and UNICEF, 2000). The map of Zimbabwe showing major towns is presented in Figure 4.1 below.

Figure 4.1: A Map of Zimbabwe showing major towns

Urban areas in Zimbabwe are classified into growth points, towns and cities, based mainly on population size and infrastructure development. Sanitation services in the different urban areas are provided and controlled by a number of ministries and departments. The Ministry of Local Government, Public Works and National Housing (MLGPWNH) and the Ministry of Health and Child Welfare (MHCW) oversee the provision of sanitation services in urban and rural areas. These ministries provide sanitation services through different departments. For example, municipalities and town boards, which all fall under the MLGPWNH, are tasked with the provision of sanitation services in cities and towns, respectively. The responsibility for sanitation in growth points does not fall clearly under any government agency. Sanitation services at growth

points are provided by the Central Rates Fund (CRF), the Department of Public Works and the Rural District Council (RDC). Non-governmental organisations (NGOs) and external support agencies (ESAs) are also active in poor urban areas.

4.2 Research Methods

The objectives of this study were to assess the sanitation situation in poor urban areas, analyse the cost recovery policies of local authorities, and to determine the cost of and willingness of households to pay for sanitation services. Although this study focused on these economic issues it is important to note that it was part of the broader DFID supported research project which looked at institutional, social, regulatory and legal factors. Therefore, methods which were used to achieve the objectives of this study were to a great extent determined by those of the broader project since the same data collection instruments were used. Two main methods, the full cost accounting and the contingent valuation methods were used to collect information for this study although other techniques such as focus group discussions and participatory techniques were also used. These methods are discussed in detail in the following sections.

Selection of Study Sites

The urban areas in Zimbabwe are classified into small urban centres with populations of less than 100,000 (these are commonly referred to as service centres and growth points), and towns and cities (with populations of 100,000 and above). The institutional arrangements, the provision of sanitation services, and the plight of the urban poor vary greatly in the different urban areas. Eight potential study sites were identified through meetings with government officials, NGOs, ESAs and stakeholder workshops. These were visited between October 1998 and April 1999. Meetings were held with local authorities and CBOs in these areas. Based on the field visits the following areas were selected for the study: two growth points, Gutu-Mupandawana and Gokwe; one poor urban area in Harare, (Mbare); and one peri-urban area near Harare, Epworth. The study sites were selected based on the following criteria:

1. There are sanitation problems and sanitation-related disease outbreaks have been reported in poor urban areas in the selected sites,
2. The number of households in these areas is quite large and sufficiently stable to constitute a settlement. Some of the informal settlements in Zimbabwe are very mobile. Groups of households such as those living near Mukuvisi river and those living near rail lines pack their belongings and move every week or month. Although these are informal settlements they were not considered as appropriate study sites for this study.
3. The various study sites are representative of the different ways in which urban areas have developed in Zimbabwe and the different administrative structures that manage them.
4. Responsibility for sanitation service provision, financing and cost recovery policies in these areas is representative of the different situations in urban areas of Zimbabwe.
5. The legal status of the urban poor, and building and housing standards applied in the informal settlements of the selected site varies and is representative of informal settlements in Zimbabwe.
6. The low-income residential areas in the selected sites are representative of the situation in Zimbabwe. Informal settlements in Zimbabwe include slums, hostels, and peri-urban areas. Effort was made to ensure that the selected sites represent all these different situations.
7. The authorities in these areas accepted the project.

Informal settlements in Zimbabwe develop in three distinct ways. First, there are slums which develop from the deterioration of formal low-income areas. This is the case of Mbare. Second, there are areas where people occupied farms, areas near dumpsites or unused swampy areas. This is the case of Epworth which is on the outskirts of Harare. Third, there are rural areas which are engulfed by growing urban centres but keep their rural characteristics. This is the case of Gutu and Gokwe growths points. Growth points are urban areas which are located in the centre of rural areas so that they can act as markets for rural produce and initiate industrialisation, thus acting as "centres of growth". Since these centres are created by the government the institutional framework and

financing of sanitation services is unique in these centres. The distinguishing characteristics of the study sites are discussed in detail below.

4.3 Characteristics of the Study Sites

4.3.1 Gutu-Mupandawana and Gokwe Growth Points

As mentioned above, growth points in Zimbabwe were established as urban centres in the middle of rural areas so that they could act as service centres to the rural areas and, most importantly, act as the nucleus for economic growth in rural areas (thus the term growth points). The two growth points Gutu-Mupandawana and Gokwe that were studied in this project developed in this way.

Gutu-Mupandawana growth point is located on the main road that links the capital city Harare and Masvingo town which is on the way to South Africa (see Figures 4.1 and 4.2). The population of Gutu growth point was 10,000 in 1992 (CSO, 1992) and is now estimated to be about 22,000. Only 20% of this population is gainfully employed, mostly in the public sector. Economic activities are basically agricultural with a few employed in small manufacturing industries.

The growth point has a piped water supply and waterborne sewerage. Most of the residents use flush toilets which connect into two maturation ponds. The low-density areas are not connected to the sewerage system but rely on communal septic tanks. Responsibility for sanitation services at Gutu growth point is split among the Central Rates Fund (CRF), the Rural District Council (RDC) and the Department of Public Works. In order to have a representative sample, three areas which represent the different situations at Gutu were selected. Old Location which is under the CRF, Hwiru which is administered by the RDC, and Farmagrida, a "squatter" settlement, were selected for this study.

Gokwe growth point is located between Harare and Bulawayo, the second largest city in Zimbabwe. The growth point developed in a former tsetse-infested area. When tsetse was eradicated a lot of people of different cultures were resettled in this district. Gokwe growth point developed as an administrative centre for Gokwe South district. The population of Gokwe was only 3,000 in 1980 (CSO, 1982). Currently the population of Gokwe growth point is estimated to be over 60,000 making it the most populated growth point in the country. Gokwe is a major cotton-producing district and incomes in this district are relatively high. Income activities at the growth point include agricultural markets and retailing of a variety of household goods.

Water supply and sanitation services are awfully inadequate. At the moment the centre is supplied with water from two boreholes and less than a quarter of the households in the entire growth point are connected. Most of the households at the growth point use on-site sanitation facilities. Although a few households are connected to the sewer system they are forced to either use the bush or construct on-site facilities due to severe water shortages. Sanitation services are provided by the RDC and the CRF. Three areas- Cheziya, Mafungausti, and Nyaradza- were selected as sites for this study. Cheziya was constructed by the council. Houses have flush toilets which are connected to the sewer. In Mafungausti, people bought stands which they then developed. Although households build houses with inside flush toilets, these are not connected to the sewer. Most of the houses do not even have a water connection. Therefore households in this area use Blair latrines. Like Mafungausti, households in Nyaradza bought stands which they developed. However, Nyaradza has water supply and flush toilets which are connected to the sewer system. Nevertheless, as noted above, severe water shortages give rise to serious sanitation problems.

4.3.2 Epworth

Epworth is located 20 kilometres southeast of Harare city centre. Epworth was a Methodist Mission Church farm before independence in 1980. In the early 1940s Epworth had an estimated population of only 240 people (Clarge, 1999). During the

armed struggle for independence in the late 1970s, a lot of people deserted their rural homes and took refuge at the mission farm. Rapid urbanisation after independence and lack or high cost of accommodation in Harare forced a lot of people to buy and settle on cultivated land in Epworth. As a result the population of Epworth ballooned to 35,000 in 1987 (Hawkins, 1988). The subdivision of cultivated land continued and by 1999 Epworth had a staggering 98,651 people (CSO, 1999). However, this figure includes only the legally recognised settlers and leaves out an estimated 10,000 "squatters".

Initially the government considered Epworth to be an illegal squatter settlement. However, as the population continued to explode and no sanitation services were provided, thereby threatening the lives and health not only of Epworth residents but also of greater Harare, the then Ministry of Local Government and National Housing (MLGNH) was forced to recognise the area. A Local Board was established under the Urban Council Act (1992) to manage the affairs of the settlement. The government upgraded Epworth by servicing part of the settlement (Overspill for example) and relocating some people. However, other areas such as Zinyengere are not serviced and their legal status remains uncertain. Communal water points and household Blair latrines were constructed in Zinyengere extension with assistance from Plan International.

Some households in Epworth, Gada residents for example, still occupy low-lying and unserviced land and they are considered to be illegal squatters even by the Epworth Local Board. No organisation has carried out any sanitation project in this area. Gada residents use pit latrines and fetch water from unprotected sources and shallow wells. In order to cover the different contexts in Epworth, three areas were selected for this study. These are Overspill, which is a legal and serviced area, Zinyengere an unserviced area with uncertain legal status although it is recognised, and Gada an illegal and unserviced "squatter" settlement. Most of Epworth residents are employed in nearby Harare or engage in informal activities in the neighbourhood.

4.3.3 Mbare

The City of Harare is split into a number of semi-autonomous districts of which Mbare is one. Mbare is the oldest high-density residential area in Harare. The houses in Newlines and Shawasha flats, which are the study sites for this study, were built in 1914. Houses in Newlines and Shawasha flats were constructed for single male workers and no females were allowed in these areas before independence. In Newlines, semi-detached blocks of houses were constructed. Each block has four houses and each house has one bedroom and a kitchen which were meant to house one person. A communal flush toilet and water tap are provided for two rows of blocks (each row has about 20 blocks of houses). After independence people brought their families. The sex ratio, as men per 1,000 females in urban areas fell from 1,412 in 1969 to 1,140 in 1982 (Gilbert and Gugler, 1997). Since the rooms are small, wooden shacks are constructed to house children. Some of the shacks are rented out to supplement household income. As a result, the formal block can hardly be seen, as it is engulfed by shacks. There is an average of 24 shacks per block. The population of Newlines which was only 800 before independence has exploded to an estimated 10,000 people. This rapid population growth was not accompanied by an expansion of services. This is putting immense pressure on already inadequate sanitation facilities.

Shawasha blocks of flats were also meant for single male workers and no females were allowed before independence. There are 50 big rooms and one communal toilet in each flat. The four squatting-hole toilets were meant for males only but now they are shared with females. Plastic material is used to separate male from female squatting holes. Each room was meant for four people who divided the room into four quarters using curtains or wooden boards. After independence families moved in and there are now four families sharing one room. In some instances people even rent out part of their space so that there are two families in one quarter.

Residents in Mbare are either employed in the formal or informal sector although a significant proportion is unemployed. A summary of the characteristics of the study sites

is presented in Appendix 3. Figure 4.2 below shows the map of Zimbabwe with administrative provinces and districts, and the location of the study sites.

Figure 4.2: A map of Zimbabwe showing sites selected for this study

4.4 Development of Data Collection Tools

Two data collection tools were developed, the institutional and household questionnaires. The questionnaires were designed with input from engineers, public health specialists, economists, biologists, town planners, social scientists, and administrators. The institutional questionnaire was targeted at sanitation agencies such as local authorities, NGOs and ESAs. The institutional questionnaire was designed to collect information on how sanitation agencies are financed, the cost of providing sanitation services and cost recovery mechanisms. The institutional questionnaire is attached in Appendix 1.

The household questionnaire was designed to collect a wide range of information. In order to ensure that all the issues were adequately addressed, the household questionnaire was divided into six sections: 1) household demographic and social characteristics, 2) household economy, 3) water supply and sanitation services, 4) community organisation and communication, 5) community needs and priorities, and 6) Willingness To Pay (WTP) for improved sanitation. The household questionnaire is attached in Appendix 2. The household questionnaire was pilot tested in Epworth and Gutu and adjusted accordingly. During the pilot testing 75 questionnaires were administered in areas with the same characteristics as those areas included in the main survey. Since questionnaire design is a very important issue in willingness to pay surveys, the questions which were used to elicit WTP bids are discussed in more detail in section 4.8.

4.5 Enumerator Training

Students from the University of Zimbabwe, Department of Agricultural Economics where recruited as enumerators. The enumerators were trained for a week. Training focused on how to approach households, how to introduce themselves to respondents, and how to cross check for consistency. The enumerators were also introduced to key issues in the water and sanitation sector. The study objectives were discussed in detail with the enumerators. Much of the training focused on how to administer willingness to pay

surveys. This involved explaining the scenarios clearly in local language, measuring income and expenditure, cross checking answers for consistency and how to separate zero bids from protest. However, this task was made lighter since the students were familiar with natural resource economics and had experience with social surveys. The selected enumerators were introduced to the communities and also participated in the participatory exercises.

To dissuade enumerators from cheating and rushing through the questionnaires, they were given a fixed allowance per week irrespective of the number of questionnaires they completed. This was thought to be the best way to encourage enumerators to collect as much information from the respondents as they could. The questionnaire was detailed and it took between 40 and 75 minutes to complete in each household.

4.6 Data collection

Written consent was obtained from the relevant authorities before data collection commenced. The project was then introduced to members of local Community Based Organisations (CBOs), local government officials, Members of Parliament (MPs) in the respective study sites, and representatives of NGOs and external support agencies (ESAs) working in these areas.

(i) Institutional Interviews

In order to understand the institutional organisation of the urban sanitation sector and financing and cost recovery policies, government officials and representatives of Rural District Councils (RDCs), community based organisations (CBOs), non-governmental organisations (NGOs), and external support agencies (ESA) were interviewed. The meetings were used to understand the institutional and political factors that affect the financing and cost recovery policies in the study sites. The strategies and approaches of different sanitation agencies in general and their financing and cost recovery mechanisms in particular, were discussed. Different stakeholders also gave useful information on issues affecting the provision of sanitation services which were pursued further during

household interviews. Table 4.1 below gives the names of sanitation agencies which were interviewed.

Table 4.1: Organisations Interviewed

Type of Organisation	Name of Organisation
Government	Ministry of Local Government Public Works and National Housing The Central Rates Fund Rural District Councils Ministry of Finance Department of Water Resources Ministry of Mining Environment and Tourism Ministry of Health and Child Welfare
External support agencies	WHO UNICEF Plan International The World Bank DFID
Non-governmental organisations	IWSD Mvuramanzi Trust Inter-Country People's Aid Save the Children, UK Dutchcare

(ii) Household Surveys

(a) Sampling

Residential areas in the selected towns are classified into high, middle and low-density areas. Only high-density or low-income residential areas were selected. Low-income residential areas were selected based on the organisation responsible for sanitation services (that is whether services are provided by the Rural District Council (RDC), the Central Rates Fund (CRF), the City Council, NGOs or private companies), the type of sanitation facilities used (communal or household flush toilets or communal or household Blair latrines), and the type of residential area (squatter settlement or slum). In those areas where these characteristics were similar in all the low-income residential areas in the selected town, random sampling was used to select residential areas for surveying. Where the institutional arrangements and the nature and degree of sanitation problems

facing the urban poor were different, purposive sampling[18] was used to ensure that all the different poor residential areas were represented. A total of eleven low-income residential areas were included in this study.

Systematic or simple random sampling was then used to pick households in the selected residential areas. The voters' register or the local authority housing list was used as the sampling frame, depending on which was available and up-to-date. Where neither the house list nor the voters' register existed, especially in "illegal" informal settlements, sketch maps were drawn and used to select households. Unfortunately statistical tools were not used to determine sample sizes. This was due to lack of accurate information on numbers of households in informal settlements since these are considered to be illegal. The broader DFID project adopted a simple rule which was to interview 20% or more of all households in the selected areas. Useable interviews were completed with 1,695 respondents. This is far higher than the minimum recommended sample size for a thorough contingent valuation survey. In order to control for the potential biases of contingent valuation surveys a minimum sample size of 500 is recommended (Arrow et al., 1993; UNDP-World Bank WSP, 1999). Table 4.2 below gives the sample sizes for each study site.

Table 4.2: Sample sizes in the study sites

Town (population)	Residential Area	Legal status (and authority)	Number of households in the residential area	Sample size (No. of Households interviewed)
Gutu (22,000)	Old Location	Legal (CRF)	200	50
	Hwiru	Legal (RDC)	500	100
	Farmagrida	Illegal	15	10
Gokwe (60,000)	Cheziya	Legal (RDC)	100	50
	Mafungausti		300	190
	Nyaradza		500	300

[18] Purposive sampling here is used to refer to sampling in which the researcher uses his discretion to choose residential areas which meet the purpose of the study and are representative of the different low-income residential areas in a town.

Epworth (100,000)	Zinyengere	Uncertain Legal	300*	150
	Overspill	(Epworth Local Board)	300	192
	Gada	Illegal	400*	137
Harare (1,100,000)	Newlines	Legal (Harare	500*	234
	Shawasha	City Council)	500*	282

* these are estimates since no official statistics were available

4.7 Costing of Sanitation Services

At the moment major international players in the water and sanitation sector are promoting the adoption of Demand Responsive Approaches (DRA) (DFID, 1998). Key to the DRA is the need to empower a community to initiate a sanitation project and to choose and implement a sanitation system that it is willing and able to sustain. In order to achieve this, the UNDP-World Bank WSP (1999) emphasises the need for sanitation agencies to explain the feasible technologies and their relevant costs so that communities make an informed choice. The following section describes how costs were calculated in this study.

4.7.1 Excreta Disposal Options

In this study the different technological options for on-plot excreta disposal that were considered were flush toilets connected to septic tanks, Blair (VIP) latrines and pit latrines. Capital and recurrent costs of these technologies were calculated based on information which was provided by the Blair Research Institute, Mvuramanzi Trust and local authorities. The MHCW advised on the different sanitation technologies that are acceptable in different areas as stated in the Public Health Act of 1997.

Table 4.3 below shows the costs of the different technologies and those recommended by the Public Health Act. The construction cost of a flush toilet and a septic tank is

Z$6,500[19] (US$160) while that of a Blair and a simple pit latrine is Z$3,000 (US$74) and Z$2,100 (US$52) respectively. The costs which were calculated in this study in 1999 are comparable to those estimated by the WHO and UNICEF a year later. The WHO and UNICEF report (2000) estimate the costs of constructing a Blair and pit latrine in Zimbabwe to be US$140[20], and US$100 respectively. The cost of a Blair latrine is not very different from that of a pit latrine since the technologies are similar except that a Blair latrine has the additional cost of a vent pipe and a fly screen. The operation and maintenance cost of a flush toilet and septic tank are substantial, including water charges (Z$0.65/$m^3$) and blockage clearance (Z$30 per blockage). On the other hand operation and maintenance costs for a Blair or pit latrine are negligible besides sweeping and cleaning. All the three technologies require emptying after about 15 years which costs about Z$5,000.

Table 4.3: Cost of sanitation technologies

Type of Technology	Capital Cost Z$	Recurrent Cost Z$	Comment in relation to Public Health Act 1997
Flush toilet and Septic tank	6,500	Emptying Z$5,000 Water cost Z$0.65/m^3	Allowed in urban areas
Blair Latrine	3,000	Emptying Z$5,000	Not allowed in urban areas except market places
Simple pit latrine	2,100	Emptying Z$5,000	Not allowed at all in urban areas

After fully explaining the different capital and recurrent costs associated with the different technologies and the necessary institutional arrangements to support them, communities were asked to choose the technologies most suited to their environment and which they could afford. Unfortunately, resources and time could not allow individual household visits to assess the choice of viable options, so this was done through community meetings. However, it was explained that communities can choose a technology which could be afforded by the majority and individuals who can afford to do so can upgrade their facilities from this basic level. In all the areas communities chose the Blair latrine based on the following reasons:

[19] In 1999 US$1 was equal to Z$40.73
[20] In 2000 US$1 was equal to Z$55

1. Although the unimproved pit latrine is slightly cheaper than the Blair latrine (Z$2,100 compared with Z$3,000), communities had bad experience with the technology. Most households were using some form of simple pit latrines in the poor urban areas or they had used them in rural areas. Communities were uncomfortable with the smell and flies, and they thought these problems would be worse in an urban environment. They did not see much difference between the proposed simple pit latrine and those which they were already using. According to the Building Standards Act 1996 and the Public Health Act 1997, pit latrines **of any description** are not allowed in urban areas in Zimbabwe.
2. The septic tank was rejected based mainly on erratic water supply. In all the study sites water supply is a problem. In Gokwe and Gutu some residents with flush toilets have actually constructed pit or Blair latrines due to the water crisis. In these areas people can go without water for up to three weeks. Although some community members could afford the construction of septic tanks they also cited water problems and the high maintenance costs and blockages which may increase due to water cuts.

4.7.2 Costing of Solid Waste Management (SWM)

According to the Environmental Protection Agency (EPA, 1997), the cost of Solid Waste Management (SWM) can be split into up-front costs, operation and maintenance costs, and back-end costs. Up-front costs include capital investment while back-end costs comprise the cost of taking proper care of the landfill and other facilities at the end of their useful lives. This study focused on operation and maintenance costs. The standard step-down and bottom-up costing approach (Hansen et al. 1999) and the full cost accounting methods (EPA, 1997) were used to determine the costs of SWM. The two methods are similar although the former give guidance on costing health services in general while the latter focuses specifically on SWM. The costing was done in the following five main steps:

1. description of SWM activities
2. defining the cost centres

3. identifying the cost of each input
4. assigning inputs to cost centres
5. allocating costs to final cost centres, and
6. computing total and unit SWM costs

The first stage was to collect background information on SWM activities and to take an inventory of equipment. Solid waste management services in Old Location (which was selected for the costing exercise) are provided by the Central Rates Fund (CRF). Information on waste collection, transportation, and disposal was gathered. The second stage involved identifying cost centres (core activities) of the Central Rates Fund (CRF) to which direct and/or indirect costs were assigned. Since the CRF is a relatively small department only three major centres were identified: administration, transport and salaries. The third and fourth stages involved identifying all inputs in SWM and assigning them to the relevant cost centres. Then indirect (overhead) costs such as the salary of the Superintendent were allocated to the final cost centres. The standard bottom-up approach was used to estimate the value of time the Superintendent spends dealing with SWM in Old Location. Finally all costs (direct and indirect) were allocated to the final cost centres and used to compute total and unit costs for SWM. Since costing is a key objective of this study it is discussed in more detail in Chapter 6.

4.8 Willingness To Pay for Improved Sanitation Services

The Contingent Valuation Method (CVM) was used to assess the willingness of households to pay for improved sanitation. As discussed in Chapters 2 and 3, Contingent Valuation (CV) is the method which is recommended by several authors for assessing WTP for environmental goods (UNDP-World Bank WSP, 1999; Parry-Jones, 1999; DFID, 1998; Whittington, 1998). Although this method has a number of weaknesses most of these can be avoided or eliminated through good questionnaire design and thorough enumerator training. It is in light of this fact that a lot of effort was expended on

questionnaire design, enumerator training and introduction of the study to the communities.

One of the critical parts of a CV questionnaire is designing the hypothetical scenario. According to Parry-Jones (1999) scenarios should be practical and feasible in order to avoid hypothetical bias. In this study, engineers, urban planners, and communities were consulted to identify the appropriate technologies and their capital and recurrent costs. Hypothetical scenarios were designed for solid waste management, latrines, drainage, and public environmental sanitation. The questionnaire is presented in Appendix 2.

After designing the hypothetical scenarios, the next stage was setting bids. As was discussed in Chapter 3, elicitation methods which are currently used in contingent valuation studies are not perfect (Bateman et al. 1999) and there is no consensus on the best method (Onwujekwe, 2001). More importantly, the referendum format which was recommended by the NOAA Panel and the double- and multi-bound dichotomous elicitation methods do not mimic the way sanitation services in urban areas of Africa are charged for. Whittington (1998) raised practical and ethical questions which are not yet resolved about the use of a dichotomous format or iterative bidding in developing countries. This study used a simple elicitation format which combined take-it-or-leave-it with open-ended questions. Respondents were asked whether or not they would pay a given amount but this amount was not varied among respondents. For example, all respondents were asked whether or not they would pay Z$20 per month for refuse collection, Z$250 per month for household latrine construction, Z$10 per month for drainage, and Z$50 per month for wastewater treatment and dumpsite maintenance. This was then followed up by an open-ended question which asked respondents to state their maximum willingness to pay bid.

This approach was used for a number of reasons. First, the broader project wanted to know the proportion of residents in poor urban areas who could afford to pay Z$20 per month for refuse collection, Z$250 for latrine construction, Z$10 for drainage and Z$50 for general environmental sanitation. The bids were based on the estimated cost of

providing these services and the prevailing charges in Marondera town which was voted twice the cleanest town in Zimbabwe. The Z$250 for latrine construction was based on a proposed latrine programme in which household latrines will be constructed at a cost of Z$3,000 each. Households would then be required to pay the full cost through monthly instalments of Z$250. Second, the common practice in Sub-Saharan Africa is that local authorities charge the same tariff for all residential stands in low-income areas (take-it-or-leave-it). Therefore the take-it-or-leave-it method mimics the situation better than other elicitation methods. For cost recovery purposes it was thought that local authorities would be more interested in knowing the proportion of residents who could afford to pay the charge (which is based on the cost of providing the service) rather than the proportion of households willing to pay randomly assigned bids. Third, the open-ended question was used to determine the exact amount each household was willing to pay for the various sanitation services. This information is intended to classify residents according to the exact amounts they are willing to pay and to design appropriate cost recovery mechanisms for each group. Open-ended questions have been reported to consistently produce low willingness to pay bids compared to other elicitation methods (Bateman et al., 1999). However, studies that have tested the actual validity by comparing willingness to pay bids stated in a contingent valuation with actual purchase when the good is provided have concluded that there were no significant differences between the open-ended and dichotomous choice formats (Loomis et al., 1997; Frykblom, 1997).

Willingness to pay bids were elicited during face-to-face interviews. At the end of each day a sample of questionnaires was checked to see if all questions were filled correctly and whether willingness to pay bids were in line with household income and expenditure. Brief discussions with all enumerators were held at the end of each day, especially in the first two weeks of the survey. This helped to ensure that enumerators were collecting the right information and to discuss any problems encountered. Data was immediately entered and simple analysis was carried out using the Statistical Package for the Social Sciences (SPSS). This helped to check inconsistencies and to identify issues that required

further investigation. Early data analysis also helped to create post codes[21] for some of the open-ended questions.

The results are presented and discussed in Chapter 6. In the following section problems which were encountered and limitations of the methodology are discussed.

4.9 Problems and Limitations

(i) Allegations of corruption

A number of problems were encountered during the study. The project was introduced when local authorities all over the country were facing financial problems mainly due to the harsh economic environment in the country. For example, services in the city of Harare were deteriorating, resulting in the sacking of the mayor. Rural District Councils (RDCs) were also facing financial problems and allegations of corruption. As a result, the study was treated with caution as most government officials were suspicious. Residents may have given low willingness to pay bids in those areas where local authorities were accused of corruption. The presence of NGOs and government officials at community meetings may have resulted in some respondents acting strategically by giving low bids in the hope that NGOs or the government will subsidise services.

(ii) Sampling

Although random sampling was used in this study it is possible that some groups of respondents may be over represented in relation to others, since sampling was not proportional to population size. This may limit extrapolation of the results. However, this problem is expected to be minimal since a large sample (1,695) was drawn and more than 20% of households in each stratum were interviewed (Sections 4.3 and 4.6). Recent research on two-stage sampling procedures in urban areas seems to suggest that drawing a large enough sample at the second stage ensures representativeness (UNDP-World Bank, 1999). Arrow et al. (1993) recommend a sample size of 500. According to Mitchell

[21] Post coding in this thesis refers to the process of grouping a wide range of answers to open-ended questions into a few groups.

and Carson (1989) a sample size of 550 in CV studies roughly indicates that 95% of the time the estimated WTP will be within 25% of the true willingness to pay.

(iii) Information on costs

Although the study aimed at determining the cost of all principle sanitation services, that is excreta disposal, drainage and solid waste management this could not be achieved in all the study sites. In all the study sites, except Gutu, there are no drainage and solid waste management services. Therefore, costing of sanitation services was done at Gutu growth point only. However, cost figures for sewerage services at the growth point could not be obtained since these services are provided by three departments which are not well coordinated. The Central Rates Fund, the Department of Public Works and the Rural District Council operate and maintain sewerage facilities in different parts of the growth point. As a result only the cost of providing solid waste management services was calculated at Gutu growth point. Therefore it was not possible to compare costs and willingness to pay for drainage and general environmental sanitation.

(iv) Elicitation Method

A major weakness of this study is that the elicitation method which was used is predominantly open-ended. As discussed earlier, open-ended questions could result in bids which are underestimates of the actual willingness to pay. However, as was discussed in Chapter 3, all elicitation methods have limitations and research is still going on to improve them (Bateman et al. 1999, Onwujekwe, 2001, Green and Tunstall, 1999). Onwujekwe (2001) compared the theoretical and predictive validity of the elicitation method which was used in this study with iterative bidding and concluded that the two techniques yielded similar results.

(V) The Embedding or Part-whole Problem

This study valued a number of services at once; that is a joint evaluation (JE) as opposed to a separate evaluation (SE) was adopted (Luchini et al. 2002). Kahneman and Knetsch (1992) have used observations in which willingness to pay bids for a particular good varied depending on whether the good was assessed on its own or embedded as part of a more inclusive package to argue that CV results are invalid. As discussed in Chapter 3 some other authors (Green and Tunstall, 1999; Whittington et al. 1997) disagree with this conclusion. To avoid this problem, Green and Tunstall (1999) suggest that respondents should be asked their willingness to pay for all the services first before being asked their willingness to pay for separate services. For example, in this study households could have been asked their willingness to pay for all sanitation services first before asking their willingness to pay for refuse collection, latrine construction etc. Carson et al. (1998) suggest that the sequence of questions should be varied.

These recommendations were not implemented in this study and may have affected willingness to pay bids. However, it is most unlikely that households treated refuse collection and latrine construction as similar programmes or as substitutes. Studies have shown that households prioritise solid waste and excreta disposal differently (Choe et al, 1996b) suggesting that they treat these services as distinct. In Zimbabwe, Zambia and South Africa residents pay separate charges for refuse collection and sewerage (Manase et al. 2001). Furthermore, the questionnaire reminded respondents that although they were asked willingness to pay separately they would pay monthly for all the four services. Therefore, although embedding is possible it is most unlikely that it had a significant impact on the results of this study.

Notwithstanding these problems and limitations, efforts were made to minimise bias and the results of this study are considered to be representative of the situation in many poor urban areas in Zimbabwe and can hopefully be useful in improving sanitation services in poor urban areas of developing countries.

4.10 Summary

This chapter discussed the different methods which were used to achieve the objectives of this study. Information on cost of sanitation services is not readily available due to poor record keeping. Therefore application of the full cost accounting method, which relies heavily on information from records, may be difficult in poor urban areas. The bottom-up approach may be a more appropriate tool to calculate costs. This study used an exploratory elicitation method to determine willingness to pay. Although the method has a number of limitations it mimics the prevailing situation in Zimbabwe better than other methods. Basing willingness to pay bids on the actual cost of services rather than on random numbers may improve the usefulness of contingent valuation studies in informing cost recovery policies. Instead of relying on enumerators to convince respondents to answer truthfully, participatory techniques such as focus group discussions and community meetings where government officials, community leaders, and Members of Parliament introduce the project may be better ways of getting community trust and cooperation.

Although the CVM has a number of limitations, it has great potential to inform cost recovery policies in developing countries where tariffs are not based on any clear economic formula. The cost of implementing a contingent valuation survey is also very little compared to the total cost of sanitation projects and the value of information it generates. It is also important to remember that much of the controversy that surrounds CVM concerns valuation of passive or non-use values. Government officials who participated in the surveys and data analysis gained insights which changed their perceptions about poor urban communities, service standards and tariffs. Given the potential benefits of CVM, especially when complemented by participatory techniques and costing, efforts should be made to enhance the capacity of local authorities to implement such surveys

It is very important to ensure that relevant stakeholders are consulted and to ensure that contingent valuation surveys are in line with central government or local authority policy visions and priorities. For example, this study received considerable government support

since it was implemented in line with an on-going government review of tariff structures and cost recovery policies at growth points. The results of this study are presented and discussed in the remainder of this thesis.

CHAPTER 5: THE SANITATION SITUATION IN POOR URBAN AREAS

One of the objectives of this study is to assess the level of sanitation services in poor urban areas. As was discussed in the theoretical framework (equation 7), household willingness to pay for improved sanitation is to a great extent determined by the prevailing sanitation situation and household socio-economic characteristics. This chapter will present the household characteristics and assess the sanitation situation in the selected sites, which are representative of the various institutional and regulatory frameworks. An attempt will then be made to link household characteristics, the institutional framework, finance mechanisms and the quality of sanitation services. This analysis will be used to suggest ways through which willingness to pay and cost information could be used to improve financing of sanitation services and thus the quality of these services in poor urban areas, which is the overarching objective of this study. The data presented in this chapter result from the household surveys carried out as a major component of this study, and are supplemented, where noted, with data from secondary sources.

5.1 Socio-Economic and Housing Profile of the Respondents

As discussed in the preceding chapter, a total of 1,695 households were interviewed in this study. Most of the respondents are women; 65% of those interviewed are women and 35% are men. Female-headed households constitute 22 percent of the total sample. The average family size for all the surveyed households is 4.29 but it ranges from 1 to 15.

Education levels in the selected sites are relatively high. The average household-head has nine years of formal education. The national adult literacy[22] level was 88% in 1999 (UNDP, 2001). However, education levels are low in informal settlements of Epworth. Most household-heads in Gada and Zinyengere only attended school as far as Grade 7

[22] Adult literacy refers to the percentage of people aged 15 years and above who can read and write.

(primary school). Illiteracy is also prevalent among female-headed households. Almost 20% of the female household-heads do not have formal education while an additional one third only attended school as far as grade 7. The differences between male and female literacy rates are also found at the national level. In 1999 the adult literacy rate for males was 92% while that of females was 84% (ibid.)

Urban migration patterns are different in the various study sites. In growth points, which are located in the middle of rural areas, most of the people migrated straight from surrounding rural areas to the high-density residential areas. Actually, growth points expand by absorbing the surrounding rural populations. However, the migration pattern in Mbare and Epworth is slightly different. Most of the respondents in these areas migrated from formal residential areas mainly in Harare or other smaller towns. Three quarters of the respondents in all survey areas migrated to their current homes more than 5 years ago.

Respondents who migrated from rural to urban areas cited access to better education and health services, and high employment opportunities as the major pull factors. However, migration to urban areas or informal settlements does not always improve the welfare of the migrants. Less than half (46%) of the respondents said their welfare improved when they moved to their current homes. For the majority there is no difference or they perceive that things are actually worse. Table 6.1 below shows a summary of the socio-economic profile of the respondents.

Table 5.1: Socio-economic Profile of Sample Respondents

Variable (Average)	Gutu	Gokwe	Epworth	Mbare
Family Size	5	4	5	4
Age of Respondent	31	30	33	33
Female Respondents (%)	77	65	74	56
Education of Respondent (number of years)	10	10	7	9
Age of Household Head	39	34	38	37
Female Household Head (%)	24	20	24	20
Education of Household Head (years)	11	11	7	9
Formal Employment (%)	60	58	71	81
Income (Z$/month)	2,413	4,575	3,032	3,197
Expenditure on water and sanitation (% of Income)	2	1	1	16
Hold Bank account (%)	76	83	75	88
Lodgers (%)	62	66	20	98
Poor quality house (%)	21	10	57	80

5.1.1 Household Income

More than half of the household-heads that were interviewed are employed in the formal sector while almost 40% engage in informal activities such as radio repairs and agri-business. Five percent are pensioners while about 3% are unemployed and rely on handouts and remittances. One third of the households have more than one employed adult. Of the other employed household members more than half work in the informal sector to supplement household income. The national unemployment rate was 6.9% in 1997 (CSO, 1997). The Central Statistical Office (CSO) considered persons in the categories of paid employees, employers, unpaid family workers and own account workers as employed. In this study people who engage in informal activities (own account workers) are also considered as being employed. However, unpaid family workers and those who get most of their income from handouts or remittances are classified as unemployed. The fact that the unemployment rate reported in this study is lower than the national rate may confirm the perception that job opportunities are higher in urban compared to rural areas.

It is difficult to calculate total household income, especially earnings from informal activities and from other household members besides the household-head. As mentioned in Chapter 4, income from some informal activities, though significant, is erratic and varies greatly from month to month. Therefore, figures which are reported in this study are based on income of the household-heads who are employed either in the formal or informal sector. However, given that a significant proportion of the households (30%) have at least one other family member involved in informal activities, the income figures which are presented in this thesis are underestimates of total household income. The UNDP uses household expenditure as a more accurate measure of income (UNDP, 2001). Although effort was made to determine household expenditure, respondents had problems recalling expenditure especially on food items.

The average reported income is Z$3,622[23] per month. Given that average reported household size in the study sites is 4.29, then the average income translates to US$0.7 per person per day which is below the World Bank one-dollar-a-day poverty line. Seventy per cent of the urban dwellers in Zimbabwe are classified as low-income (that is they earn less than Z$5,000 per month) (ZBC, 2000). However, income distribution in the study sites is skewed. Figure 5.1 below shows the frequency distribution of household income as reported in the survey areas. Twenty percent of the respondents earn less than Z$1,000 per month while 14% earn Z$5,000 or more. Average household incomes ranged from as low as Z$640 per month in Farmagrida, Gutu to Z$5,000 in Nyaradza, Gokwe.

[23] The exchange rate in 1999 was US$1 = Z$40.73

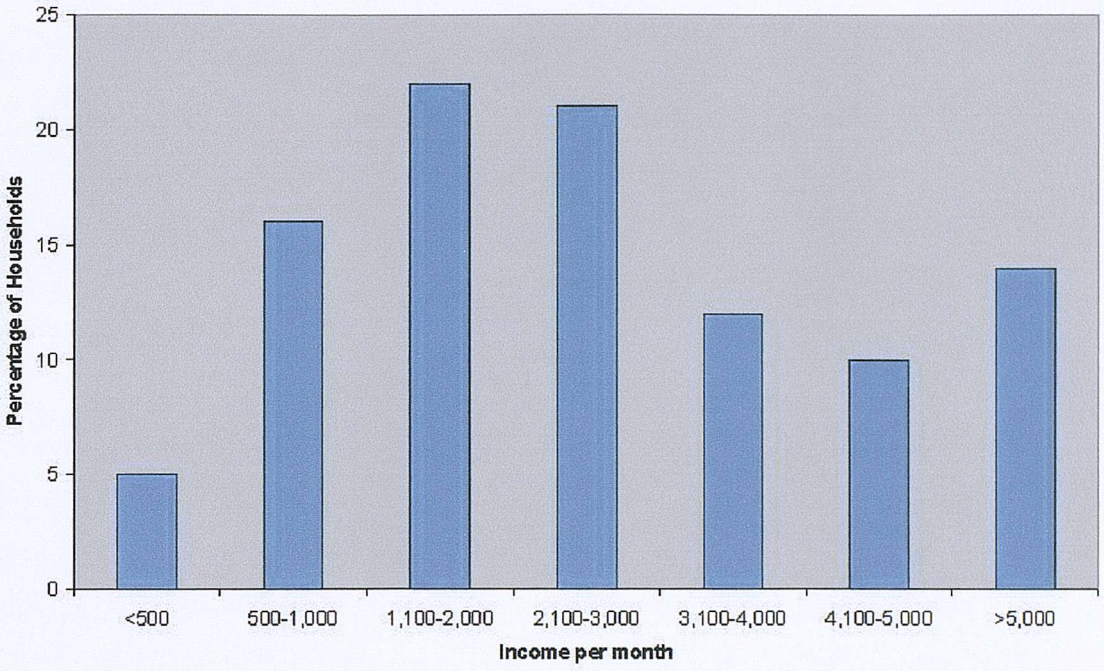

Figure 5.1: Frequency Distribution of Household Income

Most of the respondents have some sort of savings despite low incomes. Sixty per cent of the respondents have bank accounts. Although holding a bank account cannot be used as a good reflection of savings, it shows that most of the respondents have some sort of saving, especially given that the lowest required minimum balance is Z$3,000. There are also a number of informal micro-finance and savings activities in almost all the study sites. Most of the respondents (65%) are members of housing cooperatives, lending groups, or women's clubs. Members of these organisations contribute a monthly premium of between Z$450 and Z$1,000. In return they get loans for school fees or hospital fees in cases of emergency. Women vegetable vendors in Mbare raise Z$5,000 per month which is given to one member. This money is mainly used to buy household assets mainly used by women such as electric stoves, refrigerators, plates etc. Such initiatives could be used to promote latrine construction. The level of micro-finance activities, the organisation and commitment of the urban poor is surprising. The Mbare and Epworth housing cooperatives for example, have a membership of more than 1,000 each and have raised over Z$10 million and Z$50 million, respectively. Members of the cooperatives hold regular meetings. The major problem that members of these cooperatives face is that the local authorities cannot give them subsidised stands on

which they can construct their own houses. Business people such as beer hall and shop owners also provide credit to households.

These results are contrary to the fears of the private sector that poor urban households have negative savings and inconsistent incomes and are therefore not credit worthy. In fact, a quarter of the respondents bought either a cassette player, refrigerator, or colour television through hire purchase. The main problem which the urban poor face is a difficulty with cash flow. However, appropriate credit and savings facilities can ease these cash flow problems.

Expenditure patterns reported in the survey show that the urban poor spent on average 15% of their income on basic commodities like food, water, sanitation and housing. But this could be an underestimate especially when the food price inflation is over 50% (CSO, 1999). Respondents had problems remembering expenditure, especially on food items. This overall figure also masks differences among different income groups. An analysis of household expenditure on basic commodities for different income groups, shows that the poorest group (income less than or equal to Z$500 per month) spent half of their income on food, water and rent compared with only 4% for those earning Z$10,000 per month or above.

On average, households reported an expenditure of Z$124 per month (or 6.5% of income) on water and sanitation services only. However, the poorest group spends Z$100 per month (or 20% of income) on water and sanitation compared with only 2% for the richest group. Like many other studies these results disagree with the affordability approach to financing sanitation services which assumes that the poor can only afford to spend 3-5% of their income on water and sanitation. Cases have been reported where poor urban households spend up to 40% of their income on water alone (DFID, 1998). These results also show that the poor are already paying significant amounts for poor water supply and sanitation services. However, the urban poor's expenditure pattern shows that most households may not be able to pay for the construction of a Blair latrine in one month.

However, since they have some savings and some form of income, access to credit may improve their willingness to pay for the construction of a Blair latrine.

5.1.2 Housing Profile

The housing situation and the number of people sharing a sanitation facility affects willingness to pay, which has a direct effect on cost recovery. The type and quality of houses in the study sites range from very good brick-and-tile houses to very poor shacks constructed using scrap material. Once again this shows that poor urban areas are not homogeneous. Mbare has the worst housing situation among the study sites. Mbare is characterised by formal brick-and-iron sheet houses which are completely engulfed by shacks. The shacks are constructed using wooden boards, plastic and scrap metal. These shacks are either rented out to supplement household income or they house children, since the formal houses cannot accommodate all members of the extended family. Figure 5.2 below shows a typical housing situation in informal settlements.

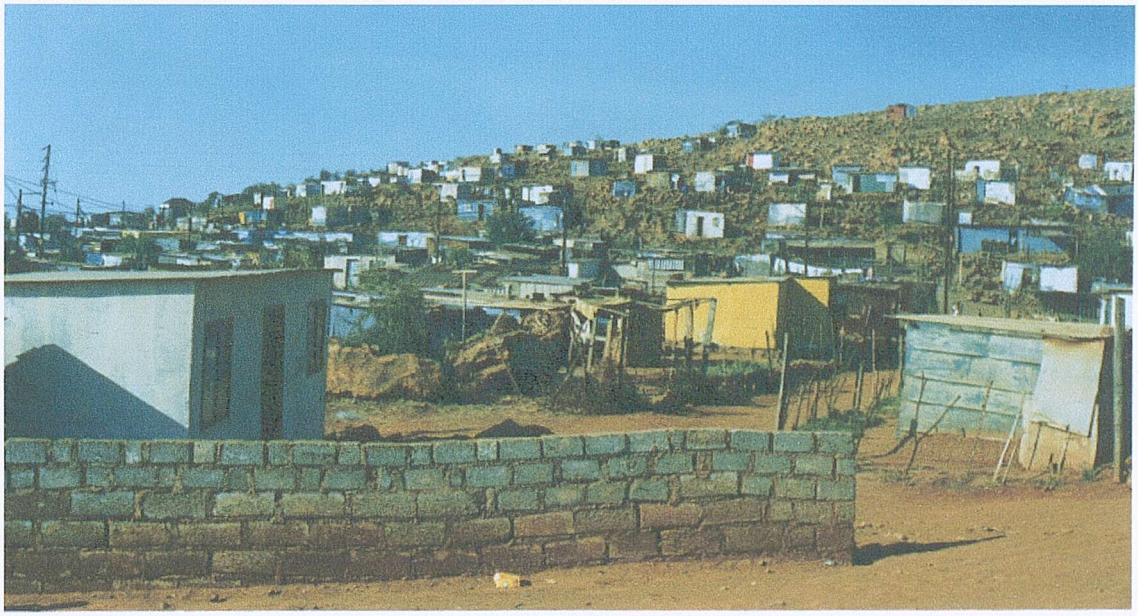

Figure 5.2: Typical housing situation in informal settlements

Household socio-economic characteristics and housing profiles, which are summarised in Table 5.1 affect the provision and maintenance of sanitation facilities. For example,

households construct shacks which they rent out to supplement household income. However, this increases the number of people per stand, thus putting pressure on basic social services including sanitation facilities. These characteristics also affect willingness to pay for improved sanitation which in turn determines the success or failure of cost recovery policies. Policy makers and planners should therefore consider these factors and plan accordingly. For example, those setting tariff levels and when they are due should consider household income and when households get paid. Renting out results in a situation where lodgers use facilities, especially communal ones, yet only legal households pay. Cost recovery mechanisms may have to consider ways of ensuring that all users pay. The impact of these household socio-economic characteristics on water supply and sanitation are discussed in the next section.

5.2 Water Supply and Sanitation Coverage

Eighty five per cent of Zimbabwe's population is reported to have access to safe drinking water while 68% has access to adequate sanitation (UNDP, 2001). In urban areas it is claimed that 100% of the urban population has access to safe drinking water and only 1% has no adequate sanitation (UNICEF, 2000). However, these statistics are biased since peri-urban areas are usually left out when such surveys are being conducted or they are classified as rural areas. Surveys on sanitation coverage in most cases just look at whether facilities are available or not, without stating their condition, whether they are used or not, and the number of people sharing a facility. Official statistics overstate coverage since people with communal facilities are often considered as adequately served yet there could be hundreds of families sharing. Worse still, the maintenance and the cleaning of communal sanitation facilities is so poor that they are a major health hazard and many people avoid them.

This study shows that, contrary to the claims stated above, the sanitation situation in poor urban areas in Zimbabwe is generally bleak, with most of the respondents using rudimentary sanitation facilities. In this section the different sanitation facilities which are

used and the causes of poor sanitation in the study sites are identified. Although this study focuses on sanitation it is also important to understand the water supply situation given the complementarities of water and sanitation. The section below therefore starts by briefly discussing water supply in the study sites before presenting the sanitation situation.

5.2.1 Water Supply

Although it is claimed that all the urban population in Zimbabwe has access to safe water (UNICEF, 2000), the urban poor use different sources of water for different purposes. Whereas the majority of the urban poor may fetch water for drinking and cooking from improved sources, they fetch water for laundry and bathing from unprotected sources such as streams and shallow wells. Table 5.2 below shows the percentage of respondents using the different sources of water in the study sites.

Table 5.2: The Percentage of Households using Various Water Sources in the Study Sites

	Water Source	Tap within household %	Communal tap %	Borehole %	Private Vendor %	*Others %
Gutu	Old Location	100	0	0	0	50
	Hwiru	100	0	0	0	60
	Farmagrida	0	0	50	0	80
Gokwe	Cheziya	100	0	0	0	0
	Mafungautsi	39	0	0	61	0
	Nyaradza	92	0	0	8	3
Epworth	Zinyengere	0	83	6	0	33
	Overspill	90	0	0	7	5
	Gada	0	0	0	3	98
Mbare	Newlines	0	100	0	0	0
	Shawasha	0	100	0	0	0

* these include shallow wells and all unprotected sources, streams, rivers etc.

Note: Most rows total more than 100% as households use more than one source of water; an improved source may be used for drinking and cooking whereas a less hygienic source is used for bathing and laundry.

All the households in the study sites face water supply problems irrespective of the fact that some have household taps. In Gutu for example, all the households have piped water

within the household. However, the growth point faces critical water shortages and at times water has to be rationed. During the period of rationing households rely on an unprotected well which is near the business centre. Figure 5.3 shows the unprotected well which is used by Gutu residents during periods of water rationing. In Farmagrida, which is just outside Gutu growth point, half of the households fetch drinking water from an unreliable borehole. Most of the households (80%) use unprotected sources for other domestic purposes such as laundry and bathing.

Figure 5.3: An unprotected well used by Gutu residents

5.2.2 Latrine Coverage

Facilities which are used for human excreta disposal range from unimproved simple pit latrines to flush toilets which are connected to the sewer system. Figure 5.4 shows the distribution of the different facilities which are used in poor urban areas. According to UNICEF (2000) 99% of the urban population in Zimbabwe has access to adequate sanitation. This study also found that the urban poor use some sort of sanitation facilities although their quality and effectiveness in blocking disease transmission routes varies. Of

the 1,695 households that were interviewed more than half have access to flush toilets, 12% use Blair latrines while almost a third use simple pit latrines. One third of the latrines were constructed through household initiatives without assistance from local authorities or NGOs. On average, households invested Z$900 in the construction of latrines. In addition, households also contributed labour to dig the pit or mould bricks. Only five per cent of the respondents do not have any form of latrine and practise open defecation. Figure 5.4 below shows the proportion of the respondents using the different latrines.

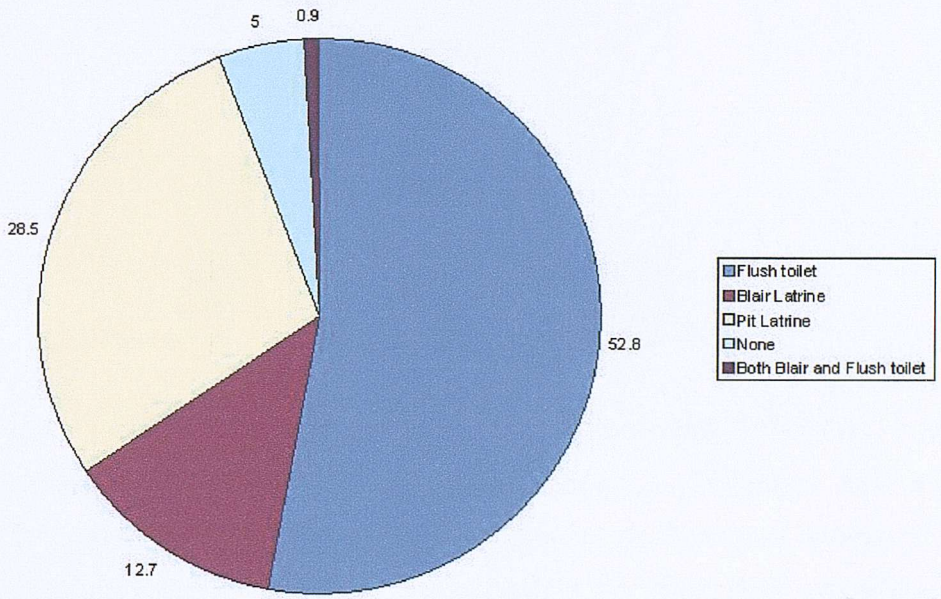

Figure 5.4: Frequency distribution of the various types of latrines

However, it is important to note that the coverage statistics shown in Figure 5.4 above include unsanitary pit latrines and communal toilets which are rarely used. Most of the unimproved pit latrines have shallow pits and no roofs. The superstructures are constructed using plastic sheets or thatch. The unimproved pit latrines are not effective in blocking disease transmission routes; in fact they provide good breeding sites for flies and rodents. Figure 5.5 below shows a typical unimproved pit latrine. The MHCW does not consider unimproved pit latrines of any description to be adequate (Mudege and Taylor, 1997). A standard Blair latrine, which includes a solid superstructure and roof, a vent pipe and a fly-screen, is considered as the basic minimum technology. If the

MHCW's definition of adequate latrines is used, then all households using unimproved pit latrines are not covered. This increases the percentage of households without access to adequate sanitation in the study sites to 33 percent.

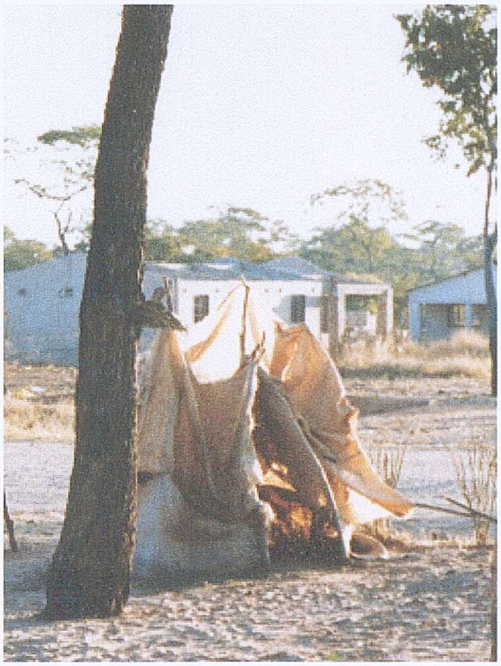

Figure 5.5 An unimproved pit latrine in Gokwe

Although Figure 5.4 shows that most of the respondents have flush toilets not all towns have water borne sewerage systems. As shown in Figure 5.6 below, most of the households with access to flush toilets are in Mbare and Gutu. The sewer system in Gutu was constructed by the MLGPWNH with assistance from the World Bank. Simple pit and Blair latrines are more common in Gokwe and Epworth. Over 60% of the respondents in Gokwe and Epworth use on-site facilities while the majority in Gutu and Mbare have flush toilets. The construction of on-site facilities is strictly controlled in Mbare and Gutu. Only a few pit latrines were observed in Gutu. As shown in Figure 5.6, most of the households without any form of latrine are in Gokwe.

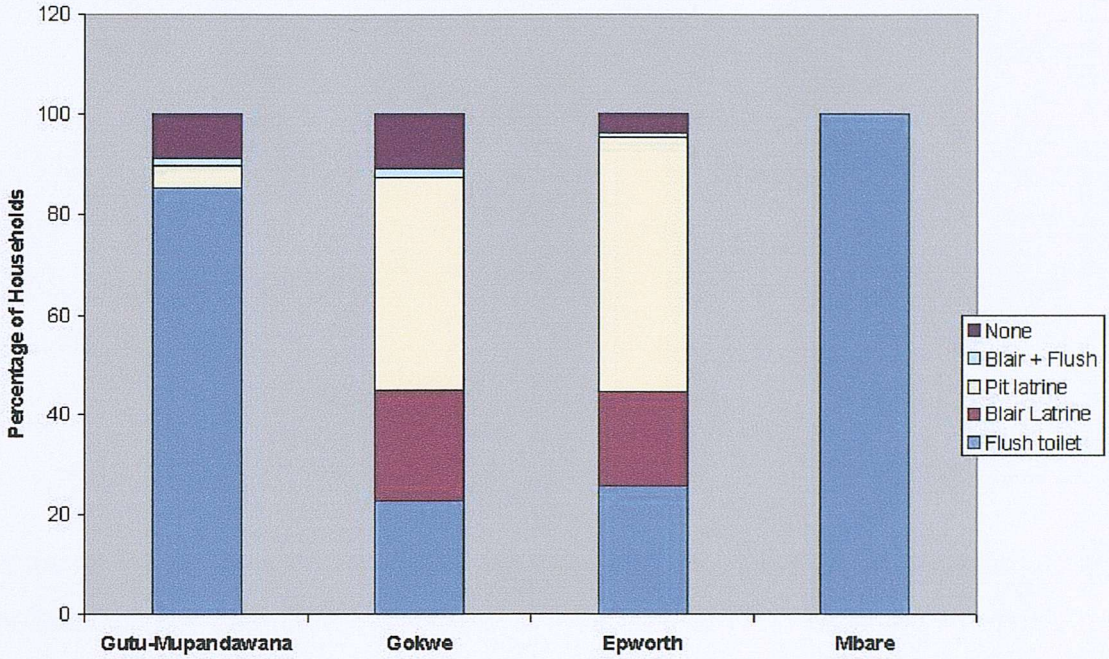

Figure 5.6: Distribution of households using various types of latrines

However, these overall latrine coverage statistics have two major shortcomings. Firstly, they do not reflect the differences in latrine conditions in the various residential areas within the same town. Secondly, the statistics do not describe the state of the facilities, whether the facilities are used or not, and the number of people sharing. The term coverage or access simply means whether or not a household has a facility within walking distance without explaining why such a situation exists (Komives et al., 2001). For example the overall urban latrine coverage statistic of 99% (UNICEF, 2000) gives the impression that safe human excreta disposal is not a problem in urban areas in Zimbabwe, which is not correct.

In order to avoid the weaknesses of overall coverage statistics the types of latrines which are used in the different study sites are presented in Table 5.3 below. The table shows that most of the households in Farmagrida, Gutu do not have any fixed place to defecate. The proportion of households without latrines is also substantial in Mafungautsi, Gokwe.

Table 5.3: The Percentage of Households using Various Types of Latrines

	Latrine Coverage %	Flush toilet	Pour Flush	Blair Latrine	Pit Latrine	Both Flush + Blair	None
	Old Location	100	0	0	0	0	0
Gutu	Hwiru	100	0	0	0	0	0
	Farmagrida	0	0	0	30	0	70
	Cheziya	100	0	0	0	0	0
Gokwe	Mafungautsi	6	1	26	48	1	18
	Nyaradza	24	0	22	43	3	8
	Zinyengere	0	3	53	37	0	7
Epworth	Overspill	36	0	6	54	1	3
	Gada	0	35	2	61	0	2
Mbare	Newlines	100	0	0	0	0	0
	Shawasha	100	0	0	0	0	0

Turning to the second weakness raised earlier about coverage statistics it is observed that although 100% of the households in Gutu (except Farmagrida) and Mbare are reported to have access to flush latrines, they face critical problems. In Gutu, water cuts which can continue for two weeks or more force households to use the bush. In Gokwe, where water cuts are more frequent and prolonged, open defecation is common, while some households with flush toilets have also constructed Blair latrines. The bushes in Gokwe and Gutu are littered with faeces showing the extent of open defecation.

In Mbare, there are communal flush toilets but these are awfully inadequate. On average 1,300 people share one communal toilet with six squat holes and two showers. Worse still, the communal toilets do not flush and there is no electricity for lighting. Solid waste is also dumped in the toilets causing blockages. Toilets block as many as 20 times per month. Since there are no drainage facilities, raw sewage flows in the streets. The communal toilets are also located far from most households which inconveniences women in this high crime area.

Latrine coverage statistics have been calculated based on whether or not facilities are "adequate". However, there has been confusion over what constitutes an adequate latrine. The WHO and UNICEF report (2000) now defines latrine coverage based on the type of technology used and has changed from using the word "adequate" to "improved" latrines.

Types of facilities that are considered to be improved latrines include flush toilets that are connected to the sewer or septic system, pour-flush latrines, and Ventilated Improved Pit (VIP) latrines. Service or bucket latrines, public latrines and open latrines are classified as un-improved technologies. If this definition is used, then latrine coverage in Mbare is zero since people use public latrines. This makes sense since the toilets are rarely used. Householders relieve themselves in plastic bags or buckets. Some of the plastic bags with human excreta are dumped in the communal skips or thrown anywhere, the "wrap and throw" method. If the WHO and UNICEF definition of improved latrine coverage is used, together with that of the MHCW, then 67% of all the respondents are not covered since they use communal latrines and unimproved pit latrines which are considered to be inadequate facilities.

Even where latrines are available, generally they do not meet the needs and expectations of the urban poor. In order to assess how much households are willing to pay for improved latrines it is necessary to understand how households perceive the advantages and disadvantages of their existing latrines. In all the areas, less than a fifth of the households are satisfied with their latrines.

Respondents cited a number of reasons why they are not satisfied with their toilets. These reasons are listed below.

a. erratic water supply and frequent blockages
b. smell and filth,
c. presence of rodents and insects,
d. poor latrine construction materials,
e. no lighting at night,
f. inappropriateness and unsafe for children,
g. overcrowding,
h. latrine also used as bathroom,
i. shallow pits which force people to see the contents inside,
j. lack of affordable pit emptying facilities,
k. inconvenient location, and

1. lack of privacy (especially for adolescent girls during menstruation).

Figure 5.7 below shows a typical communal toilet in Mbare.

Figure 5.7: A communal flush toilet in Mbare

5.2.3 Reasons why Households do not have Latrines

Respondents who practise open defecation gave a wide range of reasons to explain their situation. The reasons include economic, cultural and institutional factors, which shows the complexity of human excreta disposal problems. The following list summarises the reasons which were given for not having a latrine.

1. uncertain or illegal land tenure (institutional),
2. households are waiting for the local authority to provide them with flush toilets,
3. the latrine either filled up or collapsed (physical or technological),
4. high water table or loose sandy soils which make it difficult to dig pits (physical or technological),
5. poverty and the high cost of a standard Blair latrine (economic), and
6. lodgers are not willing to pay for the construction of latrines.

These factors are discussed below.

(i) Socio-economic factors

Socio-economic factors are said to have a bearing on a household decision to invest in sanitation and the choice of facility (Hogrewe, 1993). In this study the effects of household socio-economic characteristics on the decision to construct a latrine were analysed by assessing whether latrine coverage was different between households with different characteristics. For example, an analysis of latrine coverage by sex of household-head shows that there is no significant difference between male and female-headed households. Six percent of female-headed households do not have latrines, compared to 5% for male-headed households. However, where households constructed their own facilities without assistance from the local authority or NGOs, there are differences in the types of facilities which are used by female- and male-headed households. Of the 86 flush toilets that were constructed using household resources only a third belong to female-headed households. The same applies with Blair latrines. Ninety per cent of the Blair latrines which were constructed by households themselves belong to male-headed households. The situation is reversed when looking at simple pit latrines, with more female-headed households using such pit latrines than their male counterparts.

Education seems not to have a significant effect on latrine construction. The proportion of households without latrines is not significantly different among groups with different education levels. This is despite the fact that health and hygiene education is part of the primary education curriculum. This may imply that education does not automatically affect people's hygiene behaviour. UNICEF (2000) also found in other countries that high literacy rates do not always correlate with better human excreta disposal and hygienic behaviour. For example, they found that human excreta disposal was better in Nicaragua than Paraguay despite the fact that literacy levels were higher in Paraguay.

Income has a significant effect on the household decision to build a latrine. The poorest households are the ones without latrines. The proportion of households without latrines

falls sharply as income increases. Twelve per cent of households reporting income of Z$500 per month have no latrines compared to only 3% for those with income of Z$2,000 or more. Income also has a bearing on the type of facility which is used by the household. The proportion of households using flush toilets increases with income. These results seem to confirm the observation that inadequate sanitation is both a symptom and cause of poverty (DFID, 1998). Therefore, sanitation should be tackled in the whole context of poverty alleviation.

However, these results seem to suggest that income is not related to education. This may be true since most of the households in the study sites supplement household income through farming and informal activities. Income from these activities is not directly related to education. However, this analysis is simplistic since poor excreta disposal is not affected by household socio-economic characteristics alone but also by other factors such as institutional arrangements. A more rigorous multivariate analysis of the determinants of willingness to pay is presented in Chapter 7.

(ii) Institutional factors

The effects of land tenure on investment in sanitation depend on the attitude of the local authorities towards the "squatters". Illegal or uncertain land tenure and daily threats of eviction were given as the main reasons for not having a latrine in Farmagrida where 70% of the households use the bush. This settlement was eventually destroyed at the beginning of 2001. On the other hand, in Gada, Epworth which is also considered to be illegal but is tolerated by the authorities, most of the households invested in human excreta disposal facilities. Less than 2% of the respondents in Gada have no latrine.

The effects of local authority promises for water borne sewerage were observed in Mafungausti and Nyaradza in Gokwe and Overspill in Epworth. All these areas are formal and partially serviced. In these areas people bought stands which they have developed. Most of the houses were constructed with indoor flush toilets and bathrooms. Local authorities in Gokwe and Epworth embarked on large-scale sewer line construction

but the projects were abandoned before completion when funds ran out. Since the main sewer lines are there, although they are not complete, most of the households who do not have latrines are waiting for the local authorities to connect them to the sewer system. Meanwhile they use the bush or temporary pit latrines which are unsanitary.

According to the Urban Councils Act of 1996, unimproved pit latrines of any description are not allowed in urban areas. Therefore, although almost a third of the respondents use pit latrines these are constructed as temporary structures and most of them are unsanitary. Uncertain land tenure and promises for a water-borne system reduce willingness to pay for latrines.

At the town level, institutional and regulatory arrangements affect the financing of local authorities, the charges for different services, and how the money raised is used. Tariffs which are charged in Gutu, Gokwe and Epworth are controlled by statutory instruments and are uniform throughout the country. Tariffs in these areas are low and rarely revised. Consequently local authorities raise little revenue for operation and maintenance resulting in dilapidated facilities. Local authorities claim that extending services to the urban poor is too expensive, but this claim is based on installation of piped household water and conventional sewerage systems. In Zimbabwe, the Urban Councils Act (1996) compels the local authorities to provide water borne systems. In most cases the government provides local authorities with loans or grants to construct the sewer system. However, this technology is expensive to construct and neither the local authorities nor the households can afford the full costs of constructing, operating and maintaining the system. Yet use of low cost technologies which meet the local physical conditions, social preferences and economic resources can cut the cost of conventional systems by 50 to 90% (Hardoy et al., 1997). There is a common belief among government officials in Zimbabwe that modifying standards to allow the use of on-plot technologies in urban areas will lead to poor quality and performance. However, the Orangi Pilot Project in Pakistan and the PRONEAR project in Brazil have proved that modifications to official standards can cut costs with little or no reduction in quality and performance (ibid.). In order to extend coverage with limited resources, local authorities in Zimbabwe have

resorted to providing communal flush toilets. However, the communal facilities are awfully inadequate, poorly maintained and therefore rarely used. Financial issues are discussed in more detail in Chapter 6.

5.3 Solid Waste Management (SWM)

As is the case in most developing country cities, solid waste management (SWM) is given low priority in poor and peri-urban settlements in Zimbabwe. It is estimated that half of the solid waste that is generated in urban areas of developing countries remains uncollected (Hardoy et al., 1997). As shown in Figure 5.8 below, local authorities collect solid waste from less than 40% of the respondents. As is the case with latrines, most of the households make their own arrangements. The majority dig refuse pits while less than ten per cent practise indiscriminate dumping.

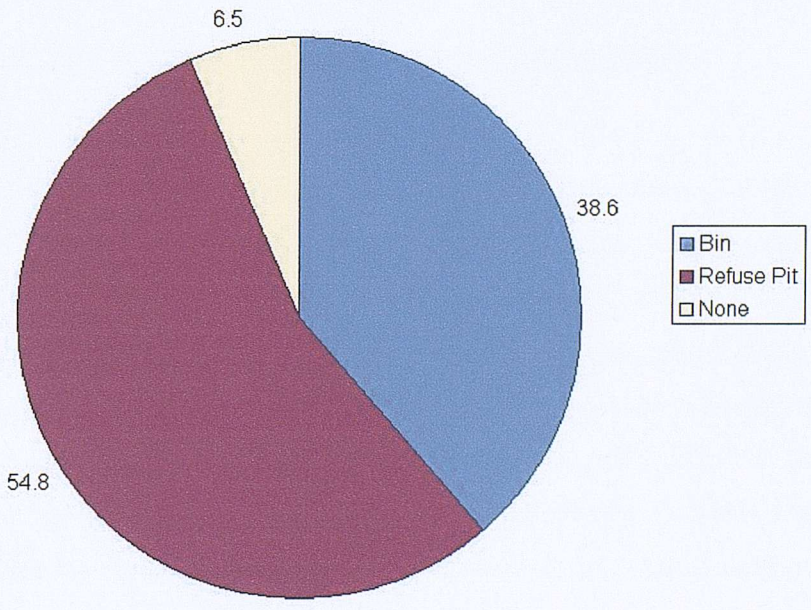

Figure 5.8: Frequency distribution of various solid waste disposal methods

However, the degree of solid waste management problems varies from town to town and these overall statistics overshadow these disparities. Figure 5.9 shows the different refuse disposal methods which are used by households in the four sites. Whereas the majority of

the households in Gutu and Mbare have access to refuse bins which are supplied by the local authorities, less than two per cent have access to bins in Gokwe and Epworth.

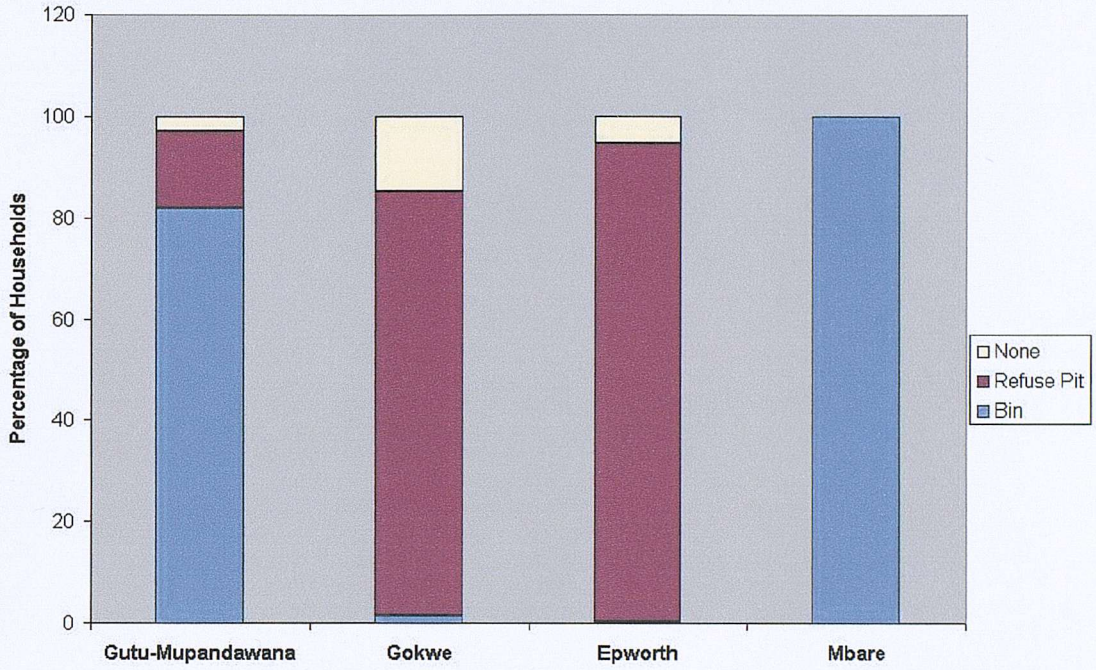

Figure 5.9: Frequency distribution of solid waste disposal methods in the various study sites

The availability of household refuse collection services is strongly related to the institutional arrangements. As Figure 5.9 above shows, there are some sort of SWM services in Gutu, Gokwe, and Mbare where houses were constructed by the government or local authority. This reflects the standard government planning where all houses in urban areas are supposed to have flush toilets and refuse bins. For example, Hwiru was constructed by the Gutu Rural District Council (GRDC) with assistance from the World Bank. Therefore, solid waste management services in this area are provided by the GRDC. The same applies with Old Location which was constructed by the CRF, Cheziya which was constructed by the Gokwe Rural District Council and Mbare which was constructed by the Harare City Council (see Table 5.4 below).

Table 5.4: The percentage of households using various types of solid waste disposal

Town	Solid waste disposal %	Bin	Refuse pit	None
Gutu	Old Location	97	3	0
	Hwiru	96	4	0
	Farmagrida	0	80	20
Gokwe	Cheziya	4	79	17
	Mafungautsi	0	81	19
	Nyaradza	0	86	14
Epworth	Zinyengere	0	93	7
	Overspill	1	93	6
	Gada	0	97	3
Mbare	Newlines	100	0	0
	Shawasha	100	0	0

However, although most of the households in formal urban areas have refuse bins, at times refuse is not collected for three or more weeks forcing people to dump solid waste indiscriminately. Local authorities give lack of financial resources as the main reason for poor SWM services in the study sites. Solid waste management is very expensive, consuming up to 60% of local authority budgets in India (Taylor, 1997). In Zimbabwe, SWM services are heavily subsidised. Tariffs which are charged for SWM in all the study sites are insignificant. As a result, local authorities do not generate enough revenue to provide adequate SWM services. All the local authorities in the study sites except Mbare, depend mainly on government grants for SWM. However, government allocation for refuse collection is always inadequate, resulting in refuse collection problems.

5.3.1 Solid Waste Management at Gutu Growth Point

Solid waste management services at Gutu growth point are provided by the CRF and the Gutu Rural District Council (GRDC). However, the CRF tractor broke down in 1998 and had not been repaired in the following three years. A combination of high tractor hire charges and inadequate government allocation has resulted in the CRF failing to collect waste for three or more weeks, forcing residents to dump waste in nearby bushes. Figure 5.10 shows heaps of rubbish in Gutu. In 1999 the situation was further aggravated by fuel shortages. Confusion about the roles and responsibilities of the different departments has

also left some areas without services. For example, there is no solid waste collection in government residential areas which are supposed to be served by the Department of Public Works. No services are also provided in areas where private companies constructed houses for their employees. As a result, more than 60% of the respondents at Gutu growth point are dumping waste indiscriminately.

Figure 5.10: Heaps of uncollected refuse in Gutu

Refuse collection from the market place at Gutu growth point is the responsibility of the CRF. However, the market place is filthy and heaps of decomposed rubbish can be seen everywhere. The situation at the market place is made worse by the presence of livestock, which introduce new waste and disperse waste by emptying bins. The market place is very busy, handling on average 6,000 people per day and there are a lot of vegetable markets.

The way in which solid waste is disposed of in Gutu is of major concern to the residents and health officials. Solid waste is dumped on an open space less than 100metres from the central market place. The dumpsite is not protected and is easily accessible to

livestock and children. Waste that is dumped at this open place ranges from household waste to chemical containers from local industry.

5.3.2 Solid Waste Management at Gokwe Growth Point

Compared to Gutu, solid waste management (SWM) problems are worse at Gokwe growth point. The growth point is characterised by flying papers and heaps of decomposed rubbish. This is not surprising since the growth point, with an estimated population of over 60,000 people, has no refuse collection services. The RDC only collects refuse from the central market place. However, the services are inadequate since the market is crowded with informal business people dealing in vegetables, hair saloons, poultry, food etc. The situation is made worse by vendors who sell their merchandise on un-tarred pavements.

Although Table 5.5 shows that 4% of the respondents have refuse bins, these are not collected, forcing households to empty them in nearby bushes. Most of the households at Gokwe growth point use refuse pits. Fifteen per cent of the households practise indiscriminate dumping. However, even those households with refuse pits also dump waste indiscriminately since some of the waste cannot be disposed of in refuse pits. Solid waste is dumped in bushes, alongside roads or on undeveloped stands. Over 80% of the respondents admitted dumping waste indiscriminately. The high concentration of refuse pits in Gokwe also causes problems of mosquitoes and flies. The situation is aggravated by the fact that children also use refuse pits as latrines. Most of the households burn refuse in the pits creating dense smoke. Since the waste ranges from papers to batteries and other chemical containers, burning poses a serious threat to the health of Gokwe residents. Private companies, the Hospital and the RDC also dump waste on open space just outside the growth point. The dumpsite is not protected and animals and people have unlimited access to the site. This further puts the health of Gokwe residents at risk. Figure 5.11 below shows heaps of uncollected waste in Gokwe.

Figure 5.11: Uncollected refuse at Gokwe Growth Point

5.3.3 Solid Waste Management in Epworth

In Epworth the Local Board does not provide any solid waste management services. Households use refuse pits or just dump solid waste indiscriminately. In Epworth a combination of refuse pits, shallow unprotected wells, shallow pit latrines, high water table and flooding during the rainy season mean that chances of drinking water contamination are very high. The average depths of wells and latrines in Epworth are 7m and 4m respectively. Although there are chances of faecal contamination from latrines, research on underground water pollution found that refuse pits were the major cause of water contamination in Epworth (Blair Research Institute, 1998). This is because people dig wells closer to refuse pits than to latrines since they do not suspect any contamination.

5.3.4 Solid Waste Management in Mbare

Solid waste management is a problem in Mbare despite the fact that all households have access to refuse bins and communal skips. Heaps of decomposed rubbish which are

dotted all over Mbare pose a serious health threat not only to the residents of Mbare, but to all Harare residents. The situation can be explained in part by the high number of lodgers. There are on average 6 lodgers per legal house yet only one plastic refuse bin is allocated per legal household. As a result a refuse bin which is meant for one household is shared by six. Consequently the bin fills up within a day. Worse still, there is no house-to-house refuse collection in Mbare. Households are supposed to empty plastic bins into the communal skips which are emptied once per week. But these skips are far from the households and are rarely used. Figure 5.12 below shows a rarely used skip. The few which are located near households fill up in two days forcing people to dump around them. To make matters worse, some residents dump human excreta in the communal skips. This creates a health-threatening environment especially to children who live or play near the skips.

Figure 5.12: A rarely used skip on the outskirts of Newlines, Mbare

Poor solid waste management in Mbare is also affecting the use of toilets. Households are forced to flush domestic waste in the toilets thereby causing blockages. There is also a

well-developed home industry in Mbare. Informal activities include carpentry, vegetable markets, food outlets, hair dressing salons etc. All these generate extra waste making it necessary to empty bins on a daily basis. However, local authorities do not have financial resources to collect waste daily. Households in Mbare and other areas try to clean up their neighbourhoods. For example, households sweep their yards and in Mbare households use extra plastic bags as refuse bins. Unfortunately these household initiatives are not complemented by local authority efforts. Actually in Mbare household efforts are thwarted since the private companies which collect waste in Harare do not collect the other plastic bags which are used by households. The problem is that the private companies are paid by the Harare city council according to the number of bins they collect. Now, of the 10,000 people in New Lines, Mbare only 800 households are registered and actually pay for services. The rest live in shacks and they do not pay any rates to the local authority. Therefore, the local authority does not generate enough revenue to service the extra households. Poor revenue collection therefore means that those who do not pay for services are subsidised while those who pay and those who have no access to services are penalised.

5.4 Drainage

Unlike latrine construction and to some extent solid waste management (SWM), drainage is mainly a community and not a household problem. Therefore, local authorities and not households play a leading role in the construction of drainage facilities. This is evidenced by the fact that drainage facilities are only present in serviced areas. At Gutu there are drainage facilities and drainage is not a serious problem in serviced areas. However, the drains are rarely cleaned and when refuse is not collected on time they are used as dumping sites resulting in blockages and flooding, especially during the rainy season. Figure 5.13 shows a poorly maintained drain which is also used for solid waste dumping.

In Gokwe, neither the RDC nor the CRF has the human and financial resources needed to construct and maintain drainage facilities. Therefore there are no drainage facilities in

most of the residential areas. Gokwe has fragile sandy soils. Although sandy soils drain easily they are also very susceptible to erosion. Large gullies threaten the business centre at Gokwe. A sewerage pipe that carries sewage to the stabilisation ponds was broken after heavy rain created huge gullies (about 5m deep) that left the pipe suspended. As a result, raw sewage flows into gullies which discharge into nearby streams.

Figure 5.13: A poorly maintained drain filled with solid waste

The contamination of streams near the growth point has been linked to the chronic outbreak of cholera in rural areas just outside Gokwe growth point. Absence of storm drainage facilities results in storm water entering the sewerage system. Consequently stabilisation ponds flood and untreated sewage spills into local streams.

There are no drainage facilities in Epworth and Mbare. Most of the areas in Epworth are swampy due to a high water table. Absence of drainage in swampy areas results in damp

walls and damp living environments which are conducive to the spread of diseases. Parts of Epworth are flooded during the rainy season causing houses and latrines to collapse. The situation is made worse by the fact that most of the people (98% in Gada) fetch water from unprotected shallow wells or streams. It is also unfortunate that the "squatters" who are more prone to water and sanitation related diseases are charged higher fees at the local clinic.

In Mbare, water supply without drainage has worsened sanitation conditions. There are no drainage facilities in this crowded area. There is one drainage pipe at the water point. Therefore, people are forced to carry wastewater back to the water point since it is the only place with a drainage pipe. It is also unfortunate that the drainage pipe is directly below the water tap and chances of contamination are very high. Some of the residents mix urine with water which they also pour down the drain at the water point. Most of the households just pour wastewater from washing and bathing behind shacks or on roads, thereby attracting flies.

Drainage problems in Mbare are worse when the flush toilets block, which they do frequently. According to the respondents toilets block on average 8 times per month but some experience as many as 20 blockages per month. When the toilets block, raw sewage flows to the water point, in the streets and at times into shacks that are close to the communal toilets. Since all the five communal toilets in Newlines are connected together, when one blocks the others follow and the whole area is flooded with raw sewage. Inadequate facilities and poor hygiene lead to outbreaks of water and sanitation related diseases.

5.5 Sanitation Related Diseases

It is estimated that at any given time half of all the people in developing countries are suffering from one or more of the six main water and sanitation related diseases (diarrhoea, ascaris, dracunculiasis, hookwork, schistosomiasis, and trachoma)(DFID,

1998). A combination of inadequate sanitation facilities and poor hygiene practices makes poor urban areas susceptible to water and sanitation diseases. Cases of diarrhoea, dysentery and even cholera outbreaks are common in all the study sites. Figure 5.14 below shows that Gutu recorded over 7,000 cases of diarrhoea and 1,364 cases of dysentery in 1999. In Gokwe 187 cases of cholera and 2,087 cases of malaria were reported in the same year. Most of the respondents linked poor sanitation to water and sanitation related diseases.

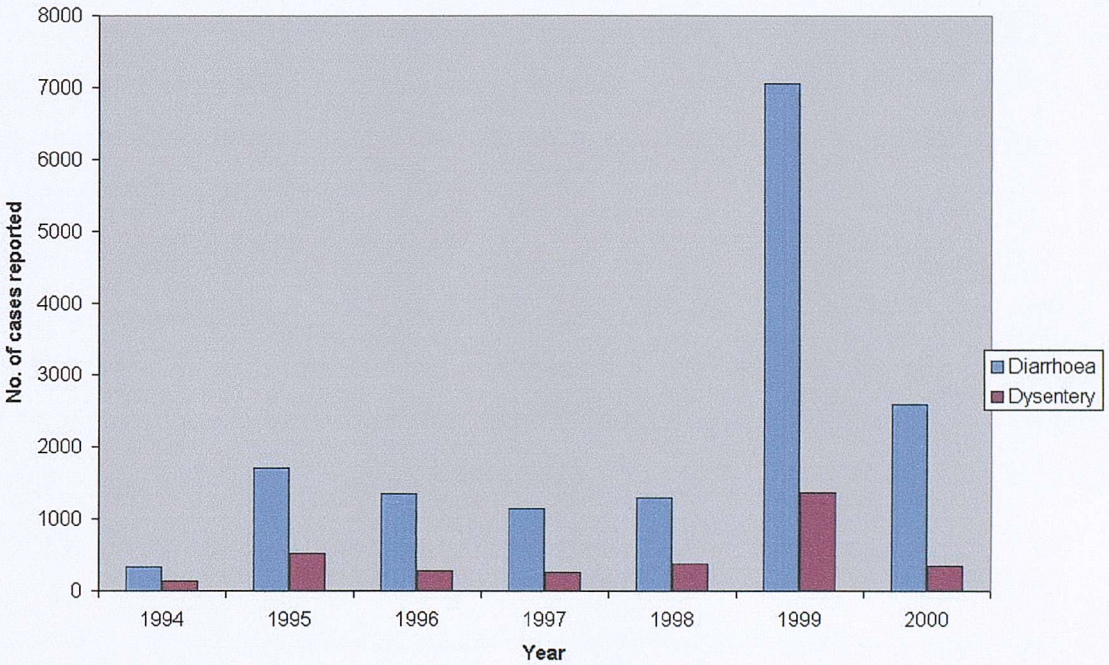

Figure 5.14: Reported cases of diarrhoea and dysentery at Gutu

Respondents listed diarrhoea, cholera, malaria, eye and skin diseases as some of the diseases which are caused by poor sanitation. Seventy percent of the households had one or more household members who suffered from water and sanitation related diseases in the past six months prior to the interview. The implicit and explicit costs of these diseases in terms of lost productivity due to illness, lost wages, medical fees, and even human life are enormous. It is estimated that Africa loses over 24 billion work hours each year due to people suffering from diarrhoea or caring for those with diarrhoea (IWSD, 2000b). An additional 40 billion work hours are spent in water collection. Collectively these losses in productivity cost the African economy US$3.2 billion every year. Treating diseases

caused by poor sanitation, unhygienic practices and unsafe water supply costs US$20 billion every year (ibid.). This money could be used more effectively by investing it in preventive measures such as constructing latrines.

5.6 Summary

Assessing the level of sanitation services in poor urban areas was one of the objectives of this study. Although other reports claim that only 1% of Zimbabwe's urban population has no access to improved sanitation, this study shows that the sanitation situation in poor urban areas is generally bleak, with 67% of the respondents using rudimentary latrines. Drainage and solid waste management is also poor in most of the informal settlements. Although causes of poor sanitation are many, local authorities gave lack of financial resources as the major cause. Local authorities do not raise enough revenue due to low tariffs, and poor billing and revenue collection systems. This is not surprising since a number of studies have also identified economic issues as central to sustainable improvement of sanitation services (Evans, 1992; Wright, 1997). This is why the Strategic Sanitation Approach emphasises cost recovery in sanitation projects. There is an urgent need, therefore, for local authorities to improve cost recovery for sanitation services.

However, cost recovery policies should take into account households' socio-economic characteristics. Poverty on the part of households is one of the causes of poor sanitation in the study sites, as shown by the fact that most of those with incomes less than Z$500 per month practise open air defecation. On average, poor urban households live on less than US$3 per day but female-headed households live on much less than this. This may mean that households may not be able to pay the full cost of sanitation services without credit, loans or subsidies. However, households still manage to save part of their little income as shown by the high proportion of households with bank accounts. Organisations such as housing cooperatives and women's clubs also raise substantial resources. These could be used to raise funds for investment in sanitation services.

The success of a cost recovery policy depends on the willingness of users to pay, which in turn, depends on households' socio-economic characteristics, such as family size, education, expenditure pattern, housing situation, etc. Household practices such as renting out and subdivision have a bearing on the quality of sanitation services and the effectiveness of cost recovery policies. Therefore, cost recovery policies should understand these variables fully. The effect of the socio-economic characteristics which were presented in this chapter on willingness to pay is analysed in Chapter 7.

Although financial issues are a major constraint to investment in sanitation they cannot be solved in isolation. The institutional and regulatory frameworks also have a bearing on the level and quality of sanitation services in poor urban areas. For example, the institutional, legal and regulatory frameworks in Zimbabwe dictate the type of sanitation services which a local authority should provide, how sanitation services are financed, and the tariffs which local authorities charge. These frameworks also define land tenure, which in turn affects the decision of households to invest in sanitation and their willingness to pay for sanitation services. Therefore economic issues such as cost recovery may have to be addressed as part of a strategic plan that includes institutional reform. Once again this suggests that assessing willingness to pay can only be effective as a planning tool if a conducive institutional environment to implement the recommendations prevails. Sanitation is a multi-dimensional problem with economic, social and institutional facets which cannot be solved by a single tool. Therefore, in the next chapter willingness to pay is analysed in relation to the institutional framework.

CHAPTER 6: COSTS OF AND WILLINGNESS TO PAY FOR IMPROVED SANITATION

The preceding chapter presented the sanitation situation in the study sites and identified lack of financial resources as one of the major causes of poor sanitation in poor urban areas. Low tariffs, coupled with poor billing and revenue collection systems mean that local authorities raise inadequate resources for operation and maintenance of sanitation services. Poverty on the part of households, especially female-headed households, means that these households may not be able to pay the full cost of sanitation services. On average, respondents to this study live on less than US$3 per day. The purpose of this study is to determine the cost of sanitation services and the willingness of households to pay for these services, to analyse the current cost recovery policies, and to find ways through which this information can be used to improve the quality of sanitation services without hurting the poor.

In this chapter, the results of the costing exercise and the contingent valuation surveys will be presented. Respondents will be classified into various categories depending on their willingness to pay. Appropriate cost recovery mechanisms are then suggested for the various categories of consumers. But the way the selected study sites developed and the institutional framework within which services in them are managed should be understood first. This is important because, as mentioned in the preceding chapter, the way an urban centre develops affects the institutional arrangements within which it is governed. This in turn affects the way in which services are financed and the cost recovery policies which are pursued. These interrelationships are clearly demonstrated by the cases of Gutu and Gokwe growth points which are discussed below.

6.1 Financing Sanitation Services at Growth Points

In this section growth points will be used to illustrate how institutional arrangements affect financing of sanitation services and cost recovery policies. As discussed in Chapter

4, growth points in Zimbabwe were created as urban centres in the middle of rural areas to stimulate development. During the transition to independence in 1978, the government established two important funds, the African Areas Building Fund (AABF) and the African Township Central Rates Fund (ATCRF). The two main objectives of the AABF were to construct houses in African townships located in growth points and to give loans to the African Townships Central Rates Fund for the construction of infrastructure at growth points. The main objectives of the African Township Central Rates Fund (now known as the Central Rates Fund) was to get loans from the AABF specifically to finance sewerage, water supplies, electricity, roads and solid waste management in African townships at growth points. These loans were also supposed to be paid back with interest.

The two funds were centralised, that is they were administered in Harare and no separate funds were set up for each growth point. This was due to a number of assumptions on the part of the government. First, the government anticipated that services in growth points were not going to immediately become financially self-sustaining. Second, the government planned to devolve power to decentralised Rural District Councils (RDCs) once a growth point's revenue potential had increased. Lastly, it was realised that for some time subsidies from the treasury to growth points could not be avoided. These assumptions meant that central government involvement in the financing and administration of growth points was going to be necessary for some time.

When Zimbabwe achieved independence in 1980, the AABF was incorporated into the National Housing Fund, while the ATCRF became the Central Rates Fund (CRF). The CRF became responsible for infrastructure development at growth points. Infrastructure was developed under the Public Sector Investment Programme (PSIP). The PSIP had three phases. Phase one (fiscal years 1982/3 to 1984/5) focused on the construction of water reticulation systems, roads, bus stops and shelter, markets and public toilets. Phase two (1985/6 to 1988/9) focused on sewerage, extension of water reticulation, roads and provision of electricity. Phase three was supposed to further extend sewerage systems, to augment and extend water reticulation systems, and to provide electricity.

However, it was realised that infrastructure investment at growth points was not going to be self-sustaining for the foreseeable future. Records obtained from the MLGPWNH show that on average the CRF was raising only Z$100,000 per year from market rental and slightly over Z$100,000 per year from household stand owners. Yet the CRF was expected to pay back Z$1.2 million per annum for the capital cost alone, without interest. The CRF was also operating at a budget deficit of over Z$1million per year. Consequently the CRF failed to pay its workers and the Rural District Councils for refuse collection services. The treasury was forced to give grants to bail out the CRF. According to Lenneiye (1989), poor financial performance of the CRF was due to low tariffs which were not based on cost or willingness to pay, and a cumbersome and inefficient revenue collection system. In addition, there was no political will to enforce payment and to service loans borrowed from the treasury. Poor loan service during phase one led to major financial constraints for phases two and three of the PSIP. This shows how poor cost recovery can lead to the collapse of good initiatives such as the government of Zimbabwe's PSIP.

6.2 Sources of Revenue for the Central Rates Fund (CRF)

The CRF relies heavily on government funding. However, government allocation to growth points is usually insufficient. The Economic Structural Adjustment Programme (ESAP) and the current economic problems have forced the government to cut expenditure. For example, the budget allocation to the MLGPWNH fell from Z$1.9 billion in 2000 to Z$1.7 billion in 2001. Government grants and loans to all growth points and service centres fell from about Z$560 million to Z$360 million during the same period. Government subsidies to all the 57 growth points also fell from Z$17 million in 1998 to Z$6 million in 1999 (The Herald, 2000). These cuts have put both the RDC and the CRF in the financial doldrums. They have to find new ways of financing services. However, the RDC and the CRF are in a difficult situation because, apart from reduced government allocations, legislative constraints limit their revenue raising powers. For example, they are prohibited from borrowing money from the open market and the

central government tends to take for itself the more lucrative and easily collected taxes, from minerals for example. Tariffs charged by the RDC and the CRF are also controlled by statutory instruments, which makes charging realistic tariffs difficult. Table 6.1 below shows government allocations to the CRF for sewerage and solid waste management at Gutu-Mupandawana growth point between 1992/3 and 2000.

Table 6.1: Allocation for Sewerage and Solid Waste Management at Gutu Growth Point (Z$)

Year	92/93	93/94	94/95	95/96	96/97	97/98	1999	2000
Sewerage system	10,000	15,000	20,000	21,000	15,000	15,800	14,800	-
Refuse	20,000	5,000	2,500	2,625	10,000	10,500	9,000	120,000

Discussions with the Superintendent at Gutu proved that government allocations for refuse collection, which are shown in Table 6.1 above, were inadequate. In all the years allocations were spent before the end of the year. When the allocated amount for a particular service runs out the CRF makes a request for additional funds (which takes time to be approved) or it just stops providing that service. For example, in 1999 the CRF was allocated only Z$9,000 for solid waste management. By then the CRF tractor had broken down and they were hiring a tractor at Z$240 per hour. This meant that they could only hire a tractor for 36 hours for the year or just four and half days. The effects were seen through heaps of decomposed rubbish which accumulated on road sides and in bushes near residential areas. This, combined with erratic water supply led to an outbreak of water and sanitation related diseases. As illustrated in Figure 5.14, over 7,000 cases of diarrhoea and 1,364 cases of dysentery were reported at the growth point in 1999. The central government, the RDC and the MHCW had to intervene.

This section shows how poor cost recovery forces local authorities to rely on the central government allocations, thus perpetuating the need for subsidies. In addition to inadequate government allocations, the CRF cannot charge realistic tariffs since these are controlled by restrictive statutory instruments. The charging system and determination of tariffs at growth points is discussed in the following section.

6.3 Charging for Sanitation Services at Growth Points

Services at Gutu and Gokwe growth points and Epworth are not run on a commercial basis. Tariffs which are charged by the RDC, the CRF and the Epworth Local Board are controlled by the government's implicit policy of subsidising services at growth points. Actually, between 1980 and 1981 residents at growth points did not pay any tariffs. Between 1982 and 1989 nominal charges of Z$2 per stand per month were introduced. However, slow economic growth in the late 1980s and the subsequent adoption of the World Bank-IMF sponsored Economic Structural Adjustment Programme (ESAP) in 1991 forced the government to introduce charges. Total government debt was 5.4% of Gross Domestic Product (GDP) in 1990 (World Bank, 2001). In 1988 the government also made its grant and loan support to the MLGPWNH clear. Although government allocations for growth points were in the form of loans and grants between 1980 and 1987, the local authorities and residents assumed it to be entirely grants due to the political climate at that time, resulting in poor loan repayment. In order to service the government loan the MLGPWNH more than trebled rates charged at growth points from Z$2 per month in 1989 to Z$7 per stand per month in 1990. (Tariffs which were charged by the CRF and the RDC at Gutu are presented in Table 6.4)

However, the CRF and the Epworth Local Board do not have separate charges for sanitation services. Service charges are combined and charged as monthly rates. Rates cover the following charges: 1) road and sewer maintenance, 2) domestic waste collection, transportation and disposal, 3) industrial and market waste collection, transportation and disposal, and 4) water pipe maintenance and housing rent. The rates are too low to raise any significant amount to operate and maintain the facilities let alone to service the loans. Rates also remain constant for a long time despite cost increases due to inflation. For example, CRF rates were only Z$7 per stand per month between 1990 and 1995. Even these low rates were not paid due to poor billing and revenue collection. Households went for three to five months without receiving bills. After 1995, CRF rates were increased to Z$10 per month but the increase was not based on capital or recurrent costs. Besides the problems of low and static rates, there was also no statutory instrument

to enforce payment. The first statutory instrument was only announced in 1998. At the moment residents and industries are paying rates of Z$80 and Z$100 per month, respectively. However, given the number of services that are covered under these rates this amount is totally inadequate to cover the costs of providing these services.

Unlike the CRF, the RDC has separate charges for sanitation services. The RDC charges are normally higher than those charged by the CRF. This has resulted in residents of the same centre paying different tariffs for the same service. For example, at Gutu growth point, Hwiru residents pay Z$175 per month to the RDC while Old Location residents pay only Z$80 to the CRF. Consequently disputes have erupted between the Gutu Rural District Council and Hwiru residents concerning these disparities.

Revenue which is collected by the CRF in all the 57 growth points goes into one central government account as part of the required loan repayment. This creates problems since revenue from all growth points is pooled together and is not used to improve services at source.

6.3.1 Determination of Charges

According to the Director of the CRF, between 1980 and 1995 rates were set politically and were divorced from any economic parameter. In 1996 the CRF looked at the tariffs which were charged in small towns and used these as a guide in setting more realistic rates for growth points which were supposed to be reviewed annually. The Superintendent in the CRF and the Chief Executive Officer (CEO) in the RDC, are supposed to review the tariffs annually. The RDC and the CRF use a different process in reviewing rates. In theory, rates charged by both the RDC and CRF are supposed to be based on the percentage of capital cost which needs to be recovered, the interest repayment on government or World Bank loans, and operation and maintenance costs. However, the Superintendents and CEOs who were interviewed are not aware of the percentage of capital costs which need to be recovered nor of the interest rates. They are also not aware of the actual operation and maintenance costs of specific services such as

solid waste management. In practice therefore the Superintendent estimates new tariffs based mainly on previous charges. But the proposed increase is also divorced from inflation figures and depends on what the Superintendent believes to be a reasonable and affordable increase. The suggested new tariffs are sent to the administrators in the MLGPWNH. The administrators review the proposed rates from the 57 districts, and come up with a single rate which they recommend to the Minister. If the Minister agrees with the recommended rate it is gazetted through a statutory instrument and applied in all the 57 districts.

Tariffs which are charged by the RDC are reviewed by the CEO and the Finance Officer. As is the case with the CRF, tariffs are not based on the actual cost of providing services. Tariffs are rather based mainly on previous charges. However, the RDC also looks at interest on loans borrowed, especially from the World Bank, and money which is needed to expand services. The tariffs also reflect the extra amount of money that needs to be raised in the next financial budget. This is the major cause of clashes between local authorities and residents. Local authorities set a budget target. In order to meet the target they increase tariffs irrespective of the actual cost or quality of services. Since most of the money goes to cover salaries and economic inefficiencies, residents end up paying more for deteriorating services. For example, the City of Mutare had an overdraft of Z$100[24] million which was accruing interest at Z$6.2 million per month in 2001 (The Daily News, 28 March, 2001). In order to finance this, the council increased solid waste charges by 200% but residents demonstrated against the increases and took the council to court. According to the Residents' Association the main reason for the protest was not against the tariff itself but that the council was providing a shoddy service. There was no running water at many public toilets, buildings were crumbling, refuse remained uncollected for a month and there was no street lighting yet the council wanted to more than double charges for these services (ibid.). Similarly, residents in Red Cliff also protested when the council increased tariffs and supplementary charges by up to 130%. Again the main reason for the increase was to raise money to offset the council's ballooning budget

[24] In 2001 US$1 was equal to Z$55

deficit and bank overdraft of Z$27 million and Z$10 million, respectively (The Daily News, 13 March, 2001).

RDCs are supposed to hold a consultative meeting with residents to discuss the proposed budget and new rates before they are submitted to the Minister for approval. In addition, the RDC is also required to advertise the budget and proposed rates in the local press and give residents time to respond. The proposed budget and new rates, together with minutes of the community consultative meeting and the advertisement, are then sent to the Minister for approval. Before approving, the politicians compare the proposals from RDCs all over the country and come up with one uniform tariff. The Minister's decision is not based on any clear economic formula and therefore appears to be subjective. According to the Minister of Local Government National Housing and Public Works tariffs are based on the need to encourage development in growth points and to arrest migration to large towns. However, the final decision is political, thus undermining the technical efforts of the Chief Executive Officers (CEOs) and Finance Officers. In the end the approved tariff, which is the same for all RDCs, bears little resemblance to that proposed by the local Finance Officers and it does not reflect differences in costs of providing sanitation services in the 57 districts. The approved tariff is gazetted through a statutory instrument. There is potential for cost and willingness to pay information to inform the tariff determination process. The community consultation process offers an opportunity to present cost and willingness to pay information to communities and politicians and to justify tariff increases.

Between 1999 and 2001 all the rates which were charged by the CRF were fixed by statutory instrument 31 of 1999: Housing and Building (Central Rates Fund) (Rents and charges) (Amendment) Regulation, 1999 (No.1). According to Schedule (section 3) Part ii of the Amendment, charges payable to the CRF for essential services between 1999 and 2001 are as shown in Table 6.2 below.

Table 6.2 Charges Payable to Central Rates Fund for Essential Services (1999-2001)

Service	Charge (Z$)
For bulk sewerage maintenance, refuse collection, rent and upkeep of adjacent roads, etc.	
1. High density residential stands	80per stand per month
2. Low density residential stands	110 per stand per month
3. Industrial stands	110 per stand per month
4. Commercial stands other than hotels	100 per stand per month
5. Hotels	600 per stand per month
Bus entry and parking fee at market place	15 per entry
Water charges	6 per cubic metre per month
Water connection fee	800 per stand
Plumbing repairs (labour only, materials chargeable at cost)	150 per repair (that is if blockage is caused by household, not main sewer problem)
Hire of Tractor to remove rubble	100 for first 10km and 20 per km thereafter
Hire of open space for public use	200 per week

Rates which are charged by the Gutu Rural District Council are shown in Table 7.3 below.

Table 6.3 Charges Payable to the Rural District Council for Essential Services (Z$ per stand per month)

Item	1982 to 1997	1998 to 1999	2000
Sewerage		10	20
Refuse		10	30
Rent		35	50
Supplementary and service charges		30	75
All rates combined	**52.97**	**85**	**175**

A comparison of total rates (sewerage maintenance, refuse collection, housing, roads, etc.) charged by the RDC and CRF presented in Table 6.4 below, shows that CRF charges are consistently less than those charged by the RDC. Generally tariffs charged at growth points are low both in absolute terms and relative to other urban areas. For example, in 2001 Mbare residents were paying Z$585 and Z$145 per month for sewerage and refuse collection respectively yet the CRF at growth points was still charging Z$80

for solid waste management, sewer and water system maintenance, roads, and housing rent.

Table 6.4 A comparison of total rates charged by the RDC and the CRF at Gutu-Mupandawana between 1980 and 2000

Year	Combined Charges (Z$ per month)	
	Central Rates Fund	Rural District Council
1980 to 1981	0	0
1982 to 1989	2	52.97
1990 to 1995	7	52.97
1996 to 1997	10	52.97
1998 to 1999	80	85
2000	80	175

6.3.2 Financing of Sanitation Services in Epworth and Mbare

Epworth is classified as an urban centre and falls under the Urban State Land unlike Gokwe and Gutu growth points which fall under the Rural State Land. This classification affects the mode of government support. Government support to rural growth points is in the form of both grants and loans, yet urban centres like Epworth receive full government grants. The rationale for this is not clear. Epworth is just outside Harare and household income is relatively higher than in rural growth points. The Epworth Local Board is also allowed to charge higher tariffs than those charged in rural growth points yet it receives full government grants. In 1999 the Epworth Local Board was charging Overspill residents a tariff of Z$140 per month yet the CRF was charging Z$80 per month in growth points. Besides government support there is also considerable NGO investment in Epworth. For example, Plan International (an NGO) constructed communal taps and assisted households with cement and other materials for the construction of household Blair latrines. On the other hand there are no NGO sanitation projects in rural growth points.

Mbare is one of the city of Harare's decentralised and semi-autonomous districts. Although the district receives financial support from Harare City Council, it has to raise most of its revenue by charging for services it provides. Tariffs in Mbare are based on

depreciation, operation and maintenance costs, re-investment, profit margins and property value. Therefore tariffs are more realistic. For example, in 2001 Mbare residents were paying Z$585 per month for sewerage and Z$145 for refuse collection yet the CRF and the RDCs were charging Z$80 and Z$175 for all services, except water. This is despite the fact that reported incomes in these areas are comparable.

6.3.3 Summary of Cost Recovery Policies

Sections 6.1 to 6.3.2 analysed the financing of sanitation services and cost recovery policies in the study sites. Discussion in this section shows that although part of government support to growth points is in the form of loans there are no clear cost recovery policies aimed at servicing the loans. Lack of clear cost recovery policies together with reluctance on the part of politicians to set realistic tariffs in growth points has led to heavy subsidisation of sanitation services. Poor cost recovery has led to the collapse of the government's Public Sector Investment Programmes which was supposed to upgrade and extend sanitation facilities at growth point. Discussion in the preceding sections also shows that targeting subsidies based on geographical location may not benefit the intended poor. For example, the government's implicit policy of subsidising rural growth points has resulted in Gokwe residents, who have the highest income compared with other sites studied, paying only Z$80 per month for all services yet poor residents in Mbare are paying Z$585 for sewerage alone while those in Epworth pay Z$140.

Cost and willingness to pay information could contribute towards achieving cost recovery and targeting of subsidies. In the following section the actual cost of refuse collection and construction of a Blair latrine are estimated and compared with current charges (for refuse collection) and willingness of households to pay for these services. This information is then used to recommend more efficient cost recovery policies.

6.4 Cost of Sanitation Services

One of the objectives of this study is to determine the cost of providing sanitation services (supply) as well as willingness to pay (WTP) (demand) and to use the information to set tariffs that improve cost recovery without hurting the urban poor. The preceding sections have shown that tariffs are low and are not based on any clear economic formula that factors in cost or willingness to pay. In this and following sections the cost of sanitation services and the willingness of households to pay for these services are determined.

6.4.1 Cost of Household Refuse Collection at Gutu Growth Point

Gutu-Mupandawana growth point was selected for costing refuse collection since it is the only study site where household refuse collection is provided. The standard bottom-up approach and the full cost accounting methods (EPA, 1997) were used to determine the costs of refuse collection.

The aim here is to calculate the cost of refuse collection per household per month and compare this with the willingness of households to pay for improved refuse collection and the current charge. This information can then be used to calculate the Consumer Surplus (illustrated in Chapter 3), which in turn could be used to set appropriate tariffs and to design equitable and effective cost recovery mechanisms. The Gutu Rural District Council (GRDC) and the CRF provide solid waste management (SWM) services at Gutu-Mupandawana growth point. Costing of refuse collection focuses on Old Location residential area which is administered by the CRF. Old Location has 200 residential stands. The main sanitation responsibilities of the CRF are operation and maintenance of the sewer system and solid waste management. The CRF also collects solid waste from the central business area, the bus terminus and the markets around the bus terminus. There are 250 commercial stands, 300 vendors and 70 market stalls which are serviced by the CRF. Although the CRF collects refuse from Old Location and the market place

during the same days it was possible to calculate the amount of time spent collecting refuse in Old Location separately. Participation in refuse collection activities for two weeks and observations were used to record the time workers spent on each activity. A typical refuse collection day schedule is shown in Table 6.5 below. On average the workers spent 1.6 hours per day (20% of the time) collecting refuse in Old Location although time ranged from 1 to 2 hours. Therefore, workers generally spent 12% of their time per week collecting refuse in Old Location (that is 4.8 out of 40 hours).

Table 6.5: Time spent on solid waste management activities

Time	Activity
8-10am	Refuse collection in Old Location
10-10:30am	Change to another site and tea break
10:30-12	Refuse collection in low-density areas
12-1pm	Refuse collection in the central business area
2-5pm	Cleaning the market place

Refuse in Old Location is collected three times a week. During the collection days residents carry refuse bins and place them on the edge of the road just outside their yards. A team of CRF workers, which comprises one tractor driver (who is also the foreman) and four general hands, collects the refuse. The general hands empty the bins into the trailer. When the trailer is full it is taken to the dumpsite where general hands use shovels to empty it. The major cost centres for refuse collection are therefore, capital costs, tractor hire and labour. The cost of refuse collection per household in 1999 is calculated below.

(i) Capital costs

The CRF tractor broke down in 1996. In 1999 the CRF was hiring a tractor from a private businessman for refuse collection. Therefore the capital costs of a tractor are not included in this calculation. In 1998, the CRF bought 200 refuse bins for Old Location residents at a total cost of Z$1,600. Bins are expected to last for three years. If we assume straight-line depreciation this give a monthly cost of Z$44. In 1999, the CRF spent Z$2,000 on tools such as shovels which are used to move refuse. The CRF expenditure is presented in Table A5.1 in Appendix 5. Since these tools are used in Old Location 12% of the time,

this gives a cost of Z$240 per year. If straight line depreciation is assumed and that tools last 3 years, this gives a monthly cost of Z$7 per month. Adding up these costs gives a total capital cost of Z$51 per month.

(ii) Tractor hire costs

In 1999 the CRF was hiring a tractor at a rate of Z$250 per hour. This is a flat charge which covers consumables, depreciation and insurance. The tractor is hired for 8 hours a day but time observations, which are presented in Table 6.5, show that it only spends 1.6 hours on average working in Old Location. Since refuse is collected three times a week the tractor spends about 4.8 hours per week in Old Location. This gives a total cost of Z$1,200 per week or Z$4,800 per month. Table 6.6 shows the cost of household refuse collection in Old Location.

Table 6.6: Cost of household refuse collection in Old Location

Line Item	Cost Z$ per month
Household bins	44
Tools	7
Tractor hire	4,800
Labour	316
Uniform	60
Overheads	379
Total Cost	**5,606**
Number of Households	200
Cost per household	**28**

(iii) Labour costs

In addition to tractor costs the CRF also incurs labour costs. Refuse collection is done by the tractor driver and four general hands. All are permanent employees of the CRF who are assigned other duties when they are not collecting refuse. As mentioned earlier, time observations show that workers allocate about 20% of their time collecting refuse in Old Location during refuse collection days. Since refuse is collected three times a week this translated to 4.8 hours a week or 12% of their time per month. The salaries of the tractor driver and the general hands are Z$592 and Z$510 per month respectively. Therefore the

total labour costs per months are Z$316 (that is Z$592*0.12 + Z$510*0.12*4). In 1999 the CRF also spent Z$6,000 on clothing and uniforms. Once again if 12% of this is allocated to refuse collection in Old Location, the cost is Z$60 per month. This gives a total labour and uniform cost of Z$376 per month.

(iv) Overheads

Overhead costs are the management and support costs of providing refuse collection services in Old Location. These include management, support labour costs, clerical support and office costs such as rent and office equipment. CRF support staff at Gutu growth point consists of the Superintendent, his assistant, and the executive clerk. Two methods, the Personnel Shared Method and the Standard bottom-up method were used to allocate overheads. The Personnel Shared Method uses the number of personnel in solid waste management compared to total CRF staff to allocate shared costs (EPA, 1997). The multiplier which is used to allocate costs is calculated using the equation below.

$$\frac{SWM\ Staff}{All\ Personnel\ -\ Centralised\ Service\ Staff} = Allocation\ Multiplier \qquad (8)$$

The CRF at Gutu has 28 employees of which three (the Superintendent and his assistant and the executive clerk) are centralised service staff. The post of the sanitation foreman is vacant. Therefore if the equation above is used then the allocation multiplier is 20% (5/(28-3)). This means that 20% of all the overhead costs can be allocated to solid waste management. However, solid waste management at Gutu comprises four main activities; refuse collection in Old Location, low-density areas, the central business district, and cleaning the market place. Time observations show that refuse collection in Old Location only takes up 12% of the time, that is 4.8 out of 40 hours per week. Therefore only 2.4% (12% of 20%) of the overheads can be allocated to refuse collection in Old Location.

Based on the calculations above, 2.4% of the salary of the Superintendent and his assistant, and the executive clerk were allocated to refuse collection in Old Location. The

Superintendent, his assistant and the clerk earn Z$5,426, Z$4,500, and Z$2,150 per month respectively. This gives overhead labour costs of Z$290 per month. The same procedure was used to allocate telephone, electricity, transport, stationary, and incidental costs. In 1999 these costs amounted to Z$44,300 (the disaggregated costs are presented in Table A5.1 in Appendix 5). This translates to Z$89 per month. Unfortunately no reasonable estimates for other overhead costs such as the cost of buildings and water, and dumpsite maintenance could be obtained. Therefore overhead costs of Z$379 per month were allocated to refuse collection in Old Location, but it is recognised that this is an underestimate.

The figures computed above were used to calculate the total cost of refuse collection in Old Location which was then divided by the number of households to derive the cost of refuse collection per household per month. Table 6.6 shows that the cost of refuse collection per household per month is Z$28. Compared to the actual cost which the CRF incurs, this figure is a slight underestimate since it does not include costs such as office rent and water, although these are small amounts. Although actual dumpsite maintenance costs at Gutu are insignificant, these are also not included in the calculations above. According to Halback (1999) solid waste collection is 70% of total solid waste management. This means that the total cost of SWM in Old Location, including dumpsite maintenance, could be Z$40 per household per month.

However, although this cost figure is an underestimate, due to reasons noted above, costs could be further reduced through improved efficiency and community participation in refuse collection (Anand, 1999). The cost figure of Z$40, including dumpsite maintenance, is comparable to Z$46.00 per month which the Mbare District Council was charging in 1999. Given that services are more expensive in the capital city, the cost calculated at Gutu, a much smaller area surrounded by rural areas, are relatively high. Refuse collection time could be reduced from three to two times per week thus reducing the costs. Surveys were carried out when refuse had not been collected for weeks resulting in indiscriminate dumping. There was also an outbreak of diarrhoea and dysentery at the growth point. Reported cases of diarrhoea and dysentery shot from 1,301

and 375 in 1998 to 7,042 and 1,364 in 1999. This may have forced the CRF to collect refuse three times per week. However, since its budget allocation was inadequate other ministries had to intervene.

The CRF was hiring a tractor at Z$6,000 per week (Z$288,000 per year) in 1999, yet a 90 horse power tractor at that time was costing Z$1.5 million. In 2000 tractor hire charges went up to Z$400 per hour. Therefore, it would have been cheaper for the CRF to buy rather than to hire a tractor.

6.4.2 Cost of a Blair Latrine

The cost of a Blair latrine was calculated based on information which was provided by the Blair Research Institute (the inventor of the Blair latrine). The cost of the different components and labour required to construct a single-pit Blair latrine were determined. A schedule of quantities was prepared and a unit price was put against each item in the schedule. The total cost of a Blair latrine (including materials and hired labour for digging the pit, fetching water and construction) in 1999 was estimated to be Z$3,000.00 (US$73). The cost of each line item is shown in Table 6.7 below. This cost is comparable to estimates reported by other authors. The WHO and UNICEF (2000) estimates the average cost of constructing a Ventilated Improved Pit latrine (VIP) in Zimbabwe in 2000 to be US$140. The difference could be partly explained by depreciation which saw the value of the Zimbabwe Dollar against the United States Dollar fall from Z$40 in 1999 to Z$55 in 2000. The average cost of constructing a Ventilated Improved Pit (VIP) latrine, which is similar to a Blair latrine, in Africa is reported to be US$160 (Shordt, 2000).

Table 6.7: The Construction Cost of a Blair Latrine

Item	Unit Cost (Z$)	Quantity	Total Cost (Z$)
Bricks	500 per 1,000 bricks	1000	500
Cement	200 per bag	5	1,000
Iron sheets	200	2	400
Mesh wire			200
Reinforcement steel bars			200
Fly screen	50	1	50
Labour			650
Grand Total			**3,000**

In the following section the estimated costs of refuse collection and construction of a Blair latrine are compared with household's willingness to pay for these services.

6.5 Willingness To Pay (WTP) for Improved Sanitation

After determining the cost of providing sanitation services the next step in meeting the objectives of this study was to determine the willingness of households to pay for these services. As discussed in Chapter 4, the Contingent Valuation (CV) method was used to elicit willingness to pay bids. Since some authors allege that CV results are invalid, this issue is addressed in detail in the next chapter. In this section the results of these willingness to pay surveys are presented. Information on cost and willingness to pay is then used to classify residents. Appropriate cost recovery mechanisms are then suggested for the various classes. The UNDP-World Bank WSP (1999) recommends that median WTP bids, which are normally lower than mean WTP bids, should be reported together with mean estimates. Mean WTP has the disadvantage that it can be influenced by a few outliers. In this study both the mean and median WTP bids are presented although the mean is used in much of the discussion.

6.5.1 Willingness To Pay (WTP) for Refuse Collection

In order to determine the willingness of households to pay for improved refuse collection, households were asked how much they would be willing to pay for a household refuse

bin which would be collected three times per week. Households were first asked whether or not they would pay Z$20 per month for refuse collection before being asked to state their maximum willingness to pay. The analysis which is presented below is based on answers to the open-ended question in which households stated their maximum willingness to pay bids. Since bids which are elicited through open-ended questions are said to be consistently lower than those elicited using other elicitation formats (Bateman and Willis, 1999), mean willingness to pay bids which are reported in this and following sections could be underestimates. However, this is not to say that the open-ended elicitation method produces invalid or biased results (Onwujekwe, 2001; Loomis et al, 1997; Frykblom, 1997).

Of the 1,695 households that were interviewed 93 did not give any bids. Some of these respondents (20%) did not find refuse collection a priority issue while the majority (75%) did not trust the local authority or felt that they were already paying enough through taxes and that the government or NGOs should improve services at no extra cost to the household. These are classified as protests and they are not included in the analysis below.

Generally, willingness to pay for household refuse collection[25] in all the study sites is substantial in absolute terms, although it is a small percentage of household income. Table 6.8 below shows mean and median willingness to pay bids in the study sites. Mean willingness to pay for refuse collection varies from Z$16 per month in Mbare to Z$ 47 in Gutu.

[25] Refuse collection refers to collection and transportation to the dumpsite

Table 6.8: Mean and Median Willingness To Pay for Improved Refuse Collection

	Gutu	Gokwe	Epworth	Mbare	Overall
Mean (Z$ per month)	47	39	18	16	25
Standard Deviation	70.11	73.09	18.77	19.06	47.71
Median (Z$ per month)	30	20	20	20	20
N (Valid Sample)	142	503	475	482	1,602

The overall mean and median willingness to pay bids for refuse collection are Z$25[26] (US$0.61) and Z$20 (US$0.49) per month, respectively. The mean WTP represents less than one per cent of average household income. However, this is substantially higher than results of other studies. Arimah (1996) for example, found that households in Lagos, Nigeria were willing to pay an extra rent of only US$0.23 per month for improved SWM. In Bangladesh, households were reported to be willing to pay US$0.18 for community based SWM in which they also carry refuse to a central point (Salequzzaman et al., 2000). However, in Chennai, India Anand (1999) also reported high mean willingness to pay bids. Households were willing to pay US$1.3 for refuse collection and transportation. The mean willingness to pay for refuse collection calculated in this study is also consistent with the international affordability-to-pay rule which states that households can afford to pay 0.7% to 2.5% of their income for solid waste management (Marchand, 1998). Although this is not reliable, application of this rule suggests that the urban poor in Zimbabwe should be able to pay between Z$25 and Z$90 per month for solid waste management. The positive WTP bids show that households in poor urban areas of Zimbabwe are aware of the negative amenity effects of poor refuse collection.

However, willingness to pay for refuse collection varies greatly among households ranging from zero to a maximum of Z$1,000 per month. The frequency distribution charts are attached in Appendix 6. Figure 6.1 below shows the cumulative distribution of

[26] The average exchange rate for 1999 was USD1 = Z$40.73

willingness to pay bids based on data from the open-ended question in which households were asked to state their maximum willingness to pay.

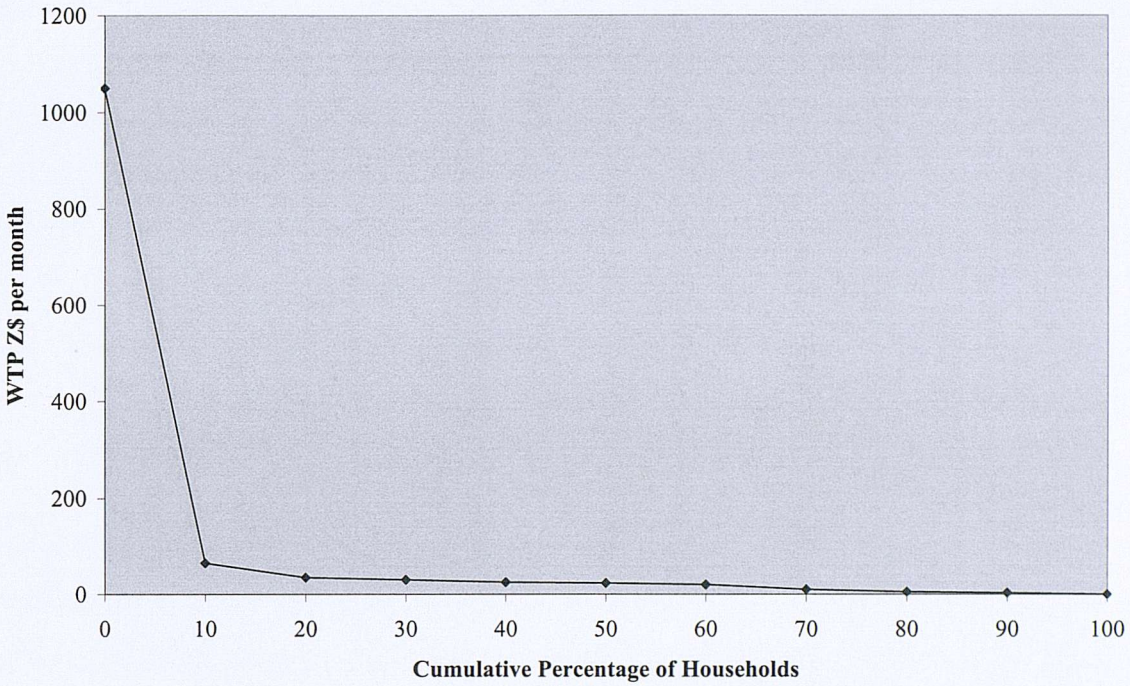

Figure 6.1: Willingness to Pay for Improved Refuse Collection

Figure 6.1 shows a high percentage of zero bids. Almost 15% of the respondents gave zero bids. This may be interpreted as a sign of strategic bias in which respondents were stating low bids irrespective of their income so that they could get subsidies from the government. However, this interpretation is unlikely since 85 percent of those who gave zero bids earn less than the average reported income of Z$3622. The majority (60%) of those who stated zero bids are female respondents. For the sake of continuity, detailed analysis of zero bids and tests for bias are deferred to Chapter 7.

As discussed in Chapter 2, most willingness to pay studies (Arimah, 1996; Whittington et al., 1991; Choe et al., 1996a) recommend tariffs which are based on mean willingness to pay without clearly outlining mechanisms which should be put in place to ensure that those who cannot afford to pay these tariffs are not denied access to basic sanitation services. Results of this study show that if the tariff for refuse collection is based on the mean willingness to pay of Z$25, then about 40% of all the respondents may be denied

services. Other studies (World Bank Demand Research Team, 1993; Choe et al., 1996b) have suggested that in such situation where willingness to pay is low and cost recovery is not feasible projects should wait until income and thus willingness to pay has increased. However, given the level of poverty and slow economic growth in Africa this does not appear to be the best solution. In the following section Gutu is used to illustrate how cost and willingness to pay information may be used to design cost recovery mechanisms that improve cost recovery without hurting the urban poor. Gutu is used because costing of refuse collection was carried out in this area. However, it is important to note that Gutu has the highest mean willingness to pay of all four study sites and most of the residents are willing to pay the full cost of refuse collection.

(i) Willingness To Pay Compared to Current Charge for Refuse Collection

The mean willingness to pay bid for refuse collection is substantially higher than what Gutu residents are currently paying and the estimated cost of household refuse collection. Residents in Gutu are paying Z$10 for refuse collection. Therefore, the mean WTP bid of Z$47 is almost five times more than the current charge. The mean WTP bid is also higher than the actual cost of refuse collection (Z$28 per month) which was calculated in section 6.4.1. Figure 6.2 below compares what Gutu residents are currently paying for household refuse collection with what they are willing to pay and the actual cost.

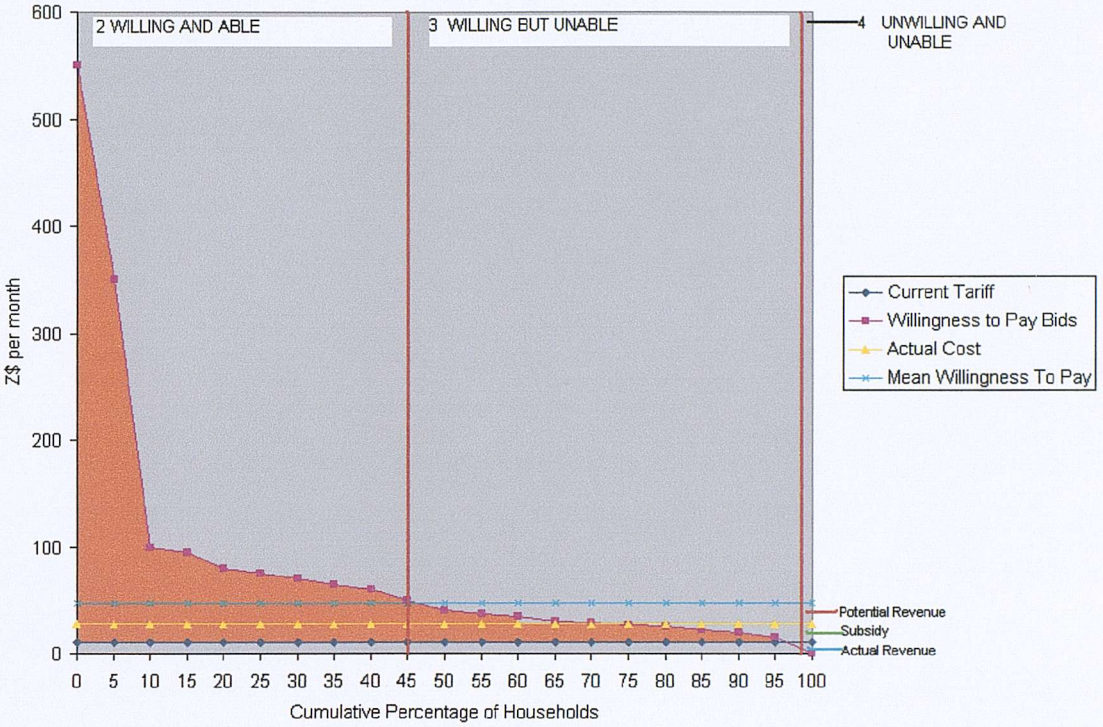

Figure 6.2: Various categories of Gutu Residents

As shown in Figure 6.2 above, 90% of the respondents in Gutu are willing to pay double the current charge. The shaded area represents the **Consumer Surplus** or the monetary value which Gutu residents put on welfare improvement resulting from improved refuse collection less the price which they are paying for the service. If these results are extrapolated to all the 5,000 households at Gutu, then the consumer surplus is worth Z$546,500 per month, which translates to Z$6,558,000 (US$161,011) per year. This is potential revenue for the local authority which is not tapped. Yet the local authority is actually subsidising refuse collection services. The difference between the estimated cost (Z$28) and the current charge (Z$10) is the subsidy which the local authority is paying to Gutu residents. If this is extrapolated to all the 5,000 Gutu households then the local authority is paying a subsidy of Z$90,000 per month which is over Z$1 million (US$24,552) per year! On the other hand, if the Gutu local authority was charging a tariff based on the mean WTP of Z$47 per month, then it would raise Z$2.82 million (US$70,500) per year, thereby making a profit. Figure 6.2 shows the potential and actual revenue and the subsidy which the local authority is paying to residents.

Information on stated bids and the set tariff (which is based on mean willingness to pay of Z$47 per months) can be used to classify residents into four groups; (1) those who are unwilling-but-able to pay the Z$47 per month, (2) those who are willing-and-able[27] to pay Z$47 per month, (3) those who are willing to pay something but are unable to pay the full tariff of Z$47 per month, and (4) those who are unwilling and unable to pay the tariff. All the groups, except group 1, are shown in Figure 6.2 above. Group one represents protesters who are not included in the analysis.

The information which is presented in Figure 6.2 shows that if the Gutu local authority sets a tariff of Z$47 (based on mean willingness to pay) only 45% of the residents may be able to pay. Therefore there is a real danger that more than half of the residents may be denied services and may resort to indiscriminate dumping if dumping regulations are absent or not enforced. Residents in group 3 (that is those who are willing to contribute something towards the cost of refuse collection but are unable to pay the full charge) and group 4 may be assisted through subsidies. The local authority can design screening mechanisms based on income and other proxy variables of poverty such as widows, female headed households etc. In order to benefit from the subsidy, residents may be asked to apply as is the case in Chile (Altaf, 1997a), Panama (Foster, et al., 2000) and for exemption from paying health and education fees in Zimbabwe. Those who qualify can be given cards which they produce when paying bills in order to pay the subsidised amount. The subsidy should cover only part of the bill and households should pay their share. The subsidy should be the difference between the household's willingness to pay and actual total cost of the service. In Chile, residents are required to pay 85% of their water bills and subsidies are only disbursed upon proof that the household has paid its share (ibid.).

Although similar approaches are used to provide subsidies for basic services like health in Africa the main practical problem is targeting (Watkins, 1997). Two ways to improve targeting of subsidies are suggested here. First, transparency about the selection process

[27] Although this term is similar to that used by Whittington (1998) in this thesis it is used to refer to households who are willing and able to pay the set tariff or actual cost of services.

can be improved by involving local community leaders such as church leaders, councillors, members of parliament, school heads and teachers, community based organisations, non-governmental organisations etc. Ideally local community leaders should identify those who deserve subsidies. For example, local chiefs or councillors are used in Zambia, Zimbabwe, Mozambique and South Africa to identify beneficiaries for basic services (UNICEF, 2000). Second, subsidies can be delivered through self-targeting programmes such as food-for-work, which have been reported to be effective in Africa (SADC, 2002).

These results generally show that local authorities charge low tariffs which do not cover even the operation and maintenance costs, as illustrated by the case of household refuse collection in Gutu. The local authority is charging Z$10 per month yet the cost is estimated to be Z$28 resulting in a 60% subsidy yet households are willing to pay the full cost. There is potential therefore for local authorities to improve cost recovery by charging tariffs which are based on mean willingness to pay. However, not all residents may be able to pay for services therefore mechanisms should be put in place to protect the poor. Although policies which are suggested above may have practical limitations the point is that the urban poor cannot be treated as a homogeneous group and appropriate cost recovery mechanisms need to be identified for the various groups. Therefore instead of doing nothing in situations where willingness to pay is low, alternative financing mechanisms should be investigated.

6.5.2 Willingness To Pay for a Household Blair Latrine

Willingness to pay for a Blair latrine was determined for those households who were using unsanitary latrines or those who were practising open defecation. In order to determine the willingness of these households to pay for a Blair latrine, they were told that suppose the local authority or NGOs in the area embark on a programme to construct a Blair latrine on each stand. The respondents were also shown a picture of a standard Blair latrine and told that the latrine costs Z$3,000 (US$74) to construct. All households using the latrine would be required to cover the construction costs through monthly

contributions. They were then asked how much they would be willing to contribute in cash and kind towards the construction of a household Blair latrine (the questionnaire is presented in Appendix A2). In Newlines, Mbare respondents were told that some shacks may have to be destroyed to create space for household Blair latrines. Thirty percent of the 1,695 households who were interviewed were not included in this exercise since they already had sanitary facilities or construction of a Blair latrine was not feasible in that area. The latter was the case in Shawasha block of flats. An additional four percent of the responses were protests. The majority (60%) of the respondents who protested think that on-site facilities are not suitable for overcrowded urban areas while others (10%) believe the provision of latrines to be the sole responsibility of the local authority. Some of the people in urban areas still think that the flush toilet is the only proper technology. Lodgers comprise a significant proportion of the respondents, most of whom are not willing to pay for the construction of a household Blair latrine. Households with sanitary latrines and those who protested are not included in the analysis below.

Generally willingness to pay for a household Blair latrine is very high. Table 6.9 shows the mean and median willingness to pay bids in the study sites. Mean willingness to pay bids vary from Z$100 per month in Gutu to Z$516 in Mbare.

Table 6.9: Mean and Median Willingness To Pay Bids for a Blair Latrine

	Gutu	Gokwe	Epworth	Mbare	Overall
Mean (Z$ per month)	102	113	310	516	388
Standard Deviation	147.92	534.74	463.69	513.55	511.50
Median (Z$ per month)	50	0	150	300	150
N (Valid Sample)	104	181	436	483	1204

The overall mean and median willingness to pay are Z$388 (US$10) and Z$150 (US$4) per month, respectively. The mean and median WTP bids represent 10 and 4 percent of average household monthly income, respectively. This is comparable to US$11 per month which households in Punjab, India were reported to be willing to pay for a

household latrine (AIMS Research, 1996). However, this is generally higher than other reported WTP bids for improved latrines. For example, in 1989 Whittington et al. (1993) found that households in Kumasi, Ghana were willing to pay only US$1.60 per month or 2% of household income for a Kumasi Ventilated Improved Pit (VIP) latrine which is similar to a Blair latrine. Unfortunately there are not many studies to which results of this study can be compared directly.

The high WTP bids which are stated in this study are supported by actual investment in latrines. Households who already have a latrine were asked how much they contributed in cash and kind towards the construction of the latrine. On average households invested Z$900[28] in the construction of latrines. Those who constructed pour-flush latrines spent Z$1,026. In Gokwe and Gutu households with flush toilets are forced to construct Blair latrines due to severe water shortages. These households invested an average of Z$1,433 in Blair latrines. In addition, most households also contributed time and labour towards the construction of the facilities which they are using. This shows that households are not only willing to pay for latrine construction but some have actually paid for it.

However, not all households are able to pay the full cost of latrine construction in one payment. Bids in this study range from zero to Z$5,000 per month reflecting the different socio-economic status of the respondents. Therefore setting charges or contributions based on the mean willingness to pay of Z$388 may exclude some households. Figure 6.6 shows the cumulative frequency distribution of households' willingness to pay bids based on answers to the open-ended question. The information illustrated in that figure can be used to classify residents into four classes; 1) protesters who are unwilling-but-able to pay the full cost of constructing a Blair latrine within a month (these are not shown in the graph), 2) those who are willing- and-able to pay the full cost, 3) those who are willing-but-unable to pay the full cost, and 4) those who are unwilling-and-unable to pay.

[28] This figure is lower than the cost of a Blair latrine of Z$3,000 which is reported in this study in part because facilities were constructed 2 to 5 years before the survey.

As mentioned above, protests constitute 4% of the respondents. Possible policy mechanisms may include marketing strategies which are aimed at convincing this group to accept Blair latrines in urban areas since local authorities have no financial resources to construct sewer systems. Some of those who protested to the latrine construction programme do not trust local authorities. Extensive stakeholder consultation, community participation in local authority programmes, and regular meetings between local authorities and communities may help to improve trust between local authorities and the communities they serve. In addition, sending bills together with brochures with information on local authority income and expenditure figures and project updates may further improve relations between local authorities and communities.

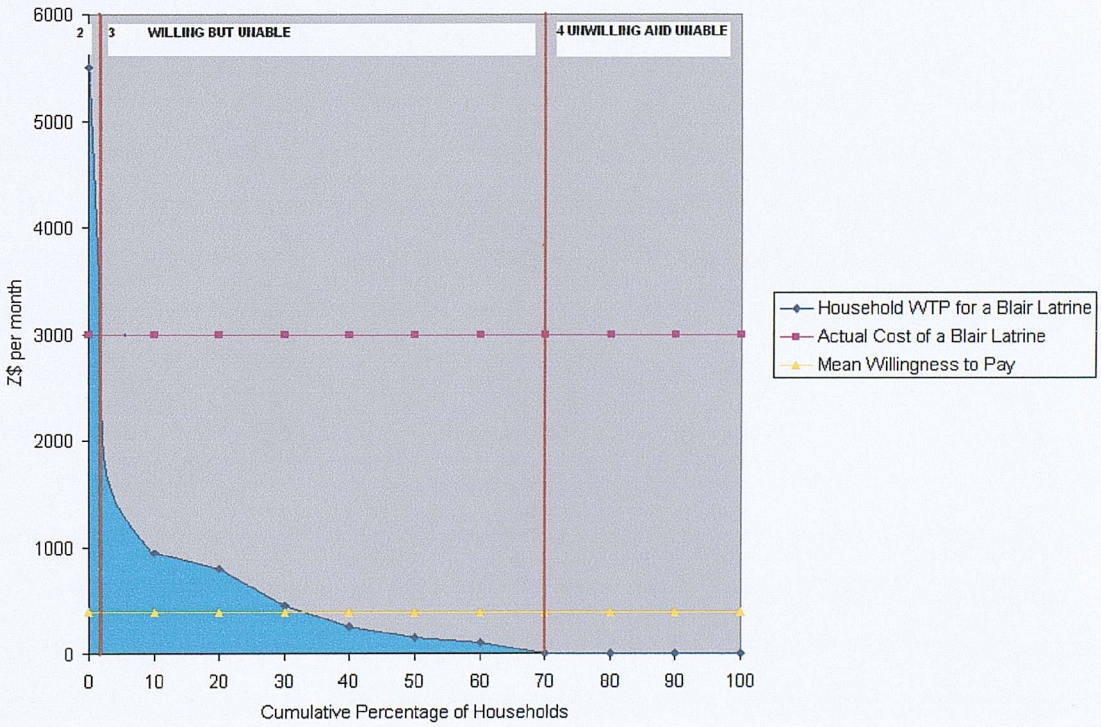

Figure 6.3. Willingness to pay for the construction of a Blair latrine

Only one percent of the respondents are willing-and-able to pay for the full cost of a Blair latrine in one month (group 2 in Figure 6.3). These do not require financial assistance from the government or NGOs. However, although the majority of the respondents are willing to pay something for the construction of a Blair latrine, they cannot afford to pay the full cost in one month (group 3 in Figure 6.3). Loans or credit facilities may be

required to assist this group. Half of the respondents are willing to pay Z$150 per month so they can pay the full cost in less than two years. In Lesotho loans were used successfully to increase urban sanitation coverage (Varley, 1995). However, loan and credit conditions should note the different situations of households. Local community leaders should be involved in identifying beneficiaries and designing repayment terms. Local informal resource mobilisation strategies such as contributions to housing cooperatives or women's clubs (Section 5.1.1) could also be utilised to raise funds for latrine construction. Since most of the respondents have bank accounts, private banks together with NGOs and donors could establish a revolving fund in which households would be required to raise a certain amount in their account before they get assistance to construct a household latrine. This approach is used extensively by building societies in Zimbabwe to construct houses for low-income households and has been applied to water supply and sanitation in India and Bangladesh (UNDP-World Bank WSP, 2002)

About a third of the respondents gave zero bids (group 4 in Figure 6.3). These could not afford to pay anything due to very low income. Some of these households cannot afford to pay even for basic necessities such as food, clothes and health care. Therefore, subsidies are inevitable for this group, especially female-headed households. Health and hygiene promotion is also required to stimulate demand in this group. As discussed above, involvement of community leaders in the identification of beneficiaries and food-for-work programmes may help to target subsidies.

These results generally show that households cannot pay the full cost of a Blair latrine in one month. Therefore assistance in the form of loans, credit or subsidies may be required in order to improve latrine coverage in poor urban areas. Alternatively building bylaws may have to be revised in order to allow the construction of cheaper on-site facilities in urban areas.

6.5.3 Willingness To Pay for Improved Drainage

In order to assess willingness to pay for drainage, households were presented with a scenario of improved wastewater and storm water drainage. They were presented with a situation in which communal drainage facilities for storm and wastewater would be constructed and cleaned regularly by local authority workers to avoid flooding. They were then asked how much they would be willing to pay for the cleaning and maintenance of the drainage facilities. One quarter protested while a further one third gave zero bids. Protests are respondents who refused to give bids either because they did not agree with the scenario or they did not trust the local authority to carry out the work or use the funds effectively. In the case of drainage some (about 20%) of the respondents who protested wanted the facilities to be constructed first before being asked to pay. The majority (about 75%) thought drainage was the sole responsibility of the local or central government and expected such facilities to be constructed and maintained by the government at no extra cost to the household. The high number of zero bids may imply that households do not consider drainage as a high priority issue. Other studies have also reported a high proportion of zero bids for drainage, for example up to 85% in Punjab, India (AIMS Research, 1996). However, low WTP bids in this study could be due to seasonal bias. The study was conducted in the dry season when drainage is not a serious problem in most of the study sites. A detailed analysis of zero bids is presented in the next chapter. Protests are excluded from the analysis presented below but zero bids are included. The mean and median willingness to pay figures are presented in Table 6.10 below.

Table 6.10: Mean and Median Willingness To Pay for Improved Drainage

	Gutu	Gokwe	Epworth	Mbare	Overall
Mean (Z$ per month)	7	24	10	10	13
Standard Deviation	10.32	44.44	15.39	19.27	26.02
Median (Z$ per month)	0	10	10	10	10
N (Valid Sample)	96	284	465	482	1327

On average all the households are willing to pay a mean of Z$13 (US$0.32) or a median of Z$10 (US$0.25) per month for improved drainage. This is less than 0.5% of average household income. However, this is comparable to bids reported in other studies for drainage. In Baroda, India for example, Vaidya (1995) found that households were willing to pay a monthly drainage tax of US$0.28. In Punjab, households were willing to pay US$0.60 for household and community drainage (AIMS Research, 1996).

Low WTP (as percentage of income) for drainage may imply that households are willing to pay less for communal sanitation facilities. Anand (1999) also found that households were willing to pay substantial amounts for refuse to be collected from the household, but not for final disposal. Since drainage is a community, as opposed to a household facility respondents expect all households to contribute. Therefore, although contributions per household are low, significant amounts can be raised at the community or neighbourhood level. For example, Gokwe has an estimated 15,000 formal households. If each household paid Z$13 per month the RDC could raise Z$234,000 (US$5,745) per year which is a considerable amount.

Although the mean willingness to pay bid is Z$13 per month, bids range from zero to Z$300. In Figure 6.4 below respondents are classified into groups based on willingness and cost information.

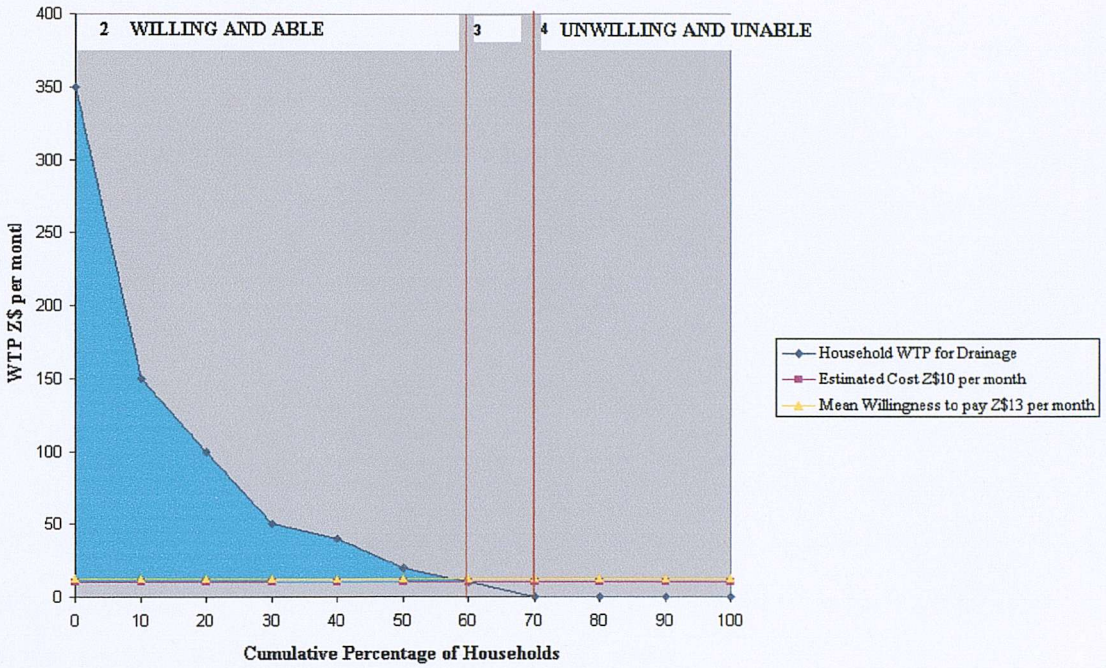

Figure 6.4: Willingness to pay for improved drainage

The mean willingness to pay for drainage (Z$13) is slightly higher than the estimated cost[29] of Z$10 per household. About 60% of all the respondents are willing to pay the estimated cost of Z$10 per household per month. However, a third of all the respondents are not willing to pay anything for drainage. But the situation is different from that for latrine construction and subsidies may not be necessary in this case. Unlike latrine construction low willingness to pay for drainage is not due to low income. Most of the residents (75%) who are not willing to pay for drainage regard it as a communal facility which should be financed through local or national taxes. In this case cost recovery policy should put more emphasis on ensuring that all residents pay. This could be achieved through taxes or combining drainage charges with water bills or rent. Given the poor revenue collection systems in most developing countries (IRC, 2000) the latter might be an appropriate method.

[29] Estimated costs for drainage and public environmental sanitation are based on prevailing charges in Marondera which has been voted twice the cleanest town in Zimbabwe.

6.5.4 Willingness To Pay for Public Environmental Sanitation

The Contingent Valuation Method (CVM) was also used to elicit willingness to pay (WTP) bids for improved environmental sanitation[30]. Households were asked how much they would be willing to pay for the maintenance of the dumpsites, cleaning of streets, bus termini and market places, and treatment and safe disposal of human excreta (the questionnaire is presented in Appendix A2). About 10 percent of the respondents protested. Almost all of the protesters (over 95%) felt that such services should be provided by the local or central government at no extra cost to the household, while some did not mind the poor environmental sanitation. As is the case with drainage, a significant proportion of the respondents (46%) also gave zero bids. Almost all of those respondents (97%) who gave zero bids thought that environmental sanitation was not a high priority issue. However, the high proportion of zero bids could also be due to the effect of question sequence which is addressed in the next chapter.

The mean and median willingness to pay bids for improved environmental sanitation are presented in Table 6.11 below. Mean willingness to pay bids range from Z$19 per month in Epworth to Z$76 in Gokwe.

Table 6.11: Mean and Median Willingness To Pay for Improved Environmental Sanitation

	Gutu	Gokwe	Epworth	Mbare	Overall
Mean (Z$ per month)	42	76	19	41	46
Standard Deviation	54.12	187.27	81.95	81.50	127.75
Median (Z$ per month)	20	25	0	0	5
N (Valid Sample)	130	474	430	474	1,508

[30] In this thesis environmental sanitation refers to the treatment and safe disposal of human excreta, solid waste and wastewater and the general cleaning of the surrounding environment.

The overall mean WTP for improved environmental sanitation is Z$46 (US$1.10) per month. Although the mean willingness to pay bid is Z$46, bids range from zero to Z$3,000. Figure 6.5 shows the effects of basing environmental charges on estimated costs or mean willingness to pay on various groups of residents.

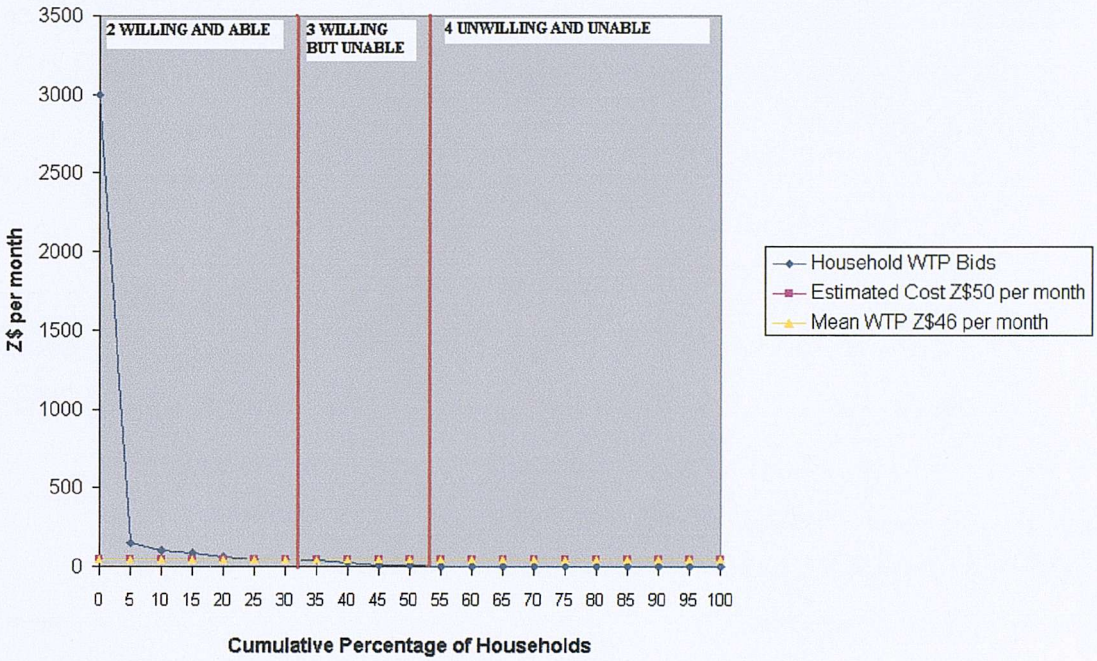

Figure 6.5: Willingness to pay for improved environmental sanitation

Figure 6.5 above shows that the overall mean willingness to pay (Z$46) is close to the estimated cost (Z$50) of providing environmental sanitation services. However, if the local authorities charge a tariff of Z$50, less than 35% of the residents would pay. Forty six percent of the residents are not willing to pay anything for improved environmental sanitation. As was the case with drainage, the majority of respondents (97%) who are not willing to pay either consider environmental sanitation as a low priority issue or feel that environmental sanitation services should be provided by the local or central government at no extra cost to the household. Therefore, once again, the policy thrust should be on raising environmental awareness through health and hygiene promotion or sending messages about the importance of environmental sanitation services together with bills.

6.6 Summary

This chapter set out to identify ways through which cost and willingness to pay information can be used to set tariff structures that improve cost recovery and therefore service delivery without hurting the urban poor. The results show that residents are generally willing to pay amounts which are substantially higher than prevailing charges for sanitation services. Therefore local authorities can improve revenue by charging tariffs which are based on mean willingness to pay. These could then be adjusted yearly for inflation. After about 5 years the local authorities may have to conduct another contingent valuation survey, since willingness to pay and costs may have changed considerably.

However, some residents may have problems paying, especially for expensive investments such as construction of a Blair latrine. Therefore basing project design solely on willingness to pay may deny the very poor access to basic sanitation services. This chapter has demonstrated how willingness to pay and cost information could be used to design alternative financing mechanisms such as subsidies, credit, loans, and food-for work programmes which meet the needs of the urban poor. The important point is that all residents should pay their share for sanitation services. The subsidy can be made contingent on the residents contributing a certain proportion of their bills. The need for clear and transparent eligibility criteria and the involvement of community leaders and all other stakeholders in identifying beneficiaries for subsidies and designing credit or loan terms cannot be overemphasised. To avoid duplication of effort the selection process for sanitation subsidies could be linked with exemption schemes for other basic social services such as health and education.

The important policy implication of these results is that the need for subsidies should be assessed and not assumed. The government of Zimbabwe, like many other developing country governments (Wegelin-Shuringa, 1997a) assumes that the poor are too poor to pay and base tariffs on that presumption. For example, residents at rural growth points are assumed to be poor, therefore they are charged nominal tariffs for sanitation services. Consequently residents at Gutu and Gokwe growth point pay charges which are far less

than those paid by households in Mbare and Epworth despite the fact that income levels in all these areas are almost the same. Moreover, these subsidies are benefiting middle- and high-income residents who already have refuse bins and drainage facilities, and not the intended poor who have no access to such services. Willingness to pay and cost information can be used to assess whether subsidies are necessary and to calculate the magnitude of the subsidy.

Although some authors allege that contingent valuation results are invalid (Kehneman and Knetsch, 1992) while others recommend complex econometric analyses (Arrow et al., 1993; Carson et al., 1995), the process of implementing a contingent valuation may be the most important lesson for sanitation policy makers in developing countries, not the accuracy of the results it produces. Simple qualitative analysis of the reasons for protests and zero bids gave government officials who participated in this study policy insights which they started using in Gokwe even before the study was completed. Therefore, the research suggests that policy makers should use contingent valuation surveys, together with costing and participatory techniques, to collect information which they can use to design appropriate and effective cost recovery policies. The major determinants of willingness to pay are discussed in the next chapter.

CHAPTER 7 DETERMINANTS OF WILLINGNESS-TO-PAY FOR IMPROVED SANITATION

The previous chapter presented results of the contingent valuation survey. Simple descriptive statistics (which can be used by local authorities) were used to calculate mean willingness to pay bids in that chapter. However, simple descriptive statistics may not identify the important determinants of willingness to pay (WTP) which should be targeted by policies aimed at improving cost recovery for sanitation services. In this chapter, more rigorous econometric models are used to analyse willingness to pay bids. The main purpose of this chapter is to use econometric models to determine the most important determinants of WTP which can be targeted by policy makers. But first, the plausibility of the contingent valuation results is discussed.

7.1 The Plausibility of Contingent Valuation Results

As was discussed in Chapter 3, the contingent valuation method is susceptible to a number of biases due to its hypothetical nature. These biases included strategic bias, starting point bias and question sequence effect. The next sections assess the effects of these potential biases on the results of this study.

7.1.1 Strategic Bias

The high proportion of zero bids which were reported in this study may be interpreted as strategic bias in which respondents reported low willingness to pay bids irrespective of their income so that they could receive subsidies from the government or donors who attended the community meetings. However, this interpretation does not appear to be valid since the majority (above 70%) of those who gave zero bids for refuse collection, Blair latrine construction, drainage or environmental sanitation earn less than the average reported income of Z$3,622. Less than 10 percent (121 respondents) of all the respondents gave zero bids for all the four scenarios. Of these, 77 percent earn less than Z$2,000 per month. The highest number of zero bids was recorded for environmental

sanitation (46%). Table 7.1 below shows that 79% of those who gave zero bids for environmental sanitation earn less than Z$3,000 per month. The majority (67%) of those who gave zero bids are female.

Table 7.1: Number of households who gave zero bids for Environmental Sanitation

Sex of Respondent	Income		Row Percentage
	Income equal to or less than Z$3,000	Income above Z$3,000	
Female	248	116	67.9
Male	124	48	32.1
Percentage	**79.4**	**30.6**	**100**

Since most of the zero bids were reported for communal services such as drainage and environmental sanitation a more plausible explanation is that households are not prepared to pay substantial amounts for such services. Furthermore, if respondents acted strategically they would be more likely to overstate their willingness to pay so that the proposed programmes would go ahead and then bargain for subsidies later. But even this form of strategic bias is unlikely since less than 0.3% of the respondents gave bids which can be considered as outliers. Therefore it can be concluded that strategic bias did not have a significant impact in this study.

7.1.2 Starting Point Bias

Starting point bias occurs when respondents peg their maximum willingness to pay bid on the first bid offered. Frequency distribution tables which are presented in Appendix 6 show that respondents gave maximum willingness to pay bids which are close to the first offered bids, especially for refuse collection and drainage thus showing signs of starting point bias. Respondents were asked whether or not they would pay Z$20 for refuse collection and Z$10 for drainage, and maximum willingness to pay bids for these services are clustered around these amounts. This may be interpreted as "psychological anchoring" in which the validity of the contingent valuation technique is questionable (Hoevenagel, 1992, Kahneman, 1986). However, as was discussed in Chapter 3, the "cost-response" is a more plausible explanation in this study (Farmer and Randal, 1995;

Hanemann, 1995). Since respondents were told that the bid offered was the actual cost of the service it is more likely that they took the bid as that, in which case they saw no need to pay more than necessary, especially given the mistrust between the urban poor and local authorities (Hanemann, 1996). Starting point bias is common in contingent valuation surveys that use double- or multi-bound dichotomous elicitation formats (Whittington et al., 1992; Choe et al. 1996). Unfortunately there is not much published work on how to correct for starting point bias. Bateman et al. (1999) recommended further research on this topic.

7.1.3 Question Sequence Effect

In joint evaluations, the order in which scenarios are presented may affect willingness to pay bids with respondents stating high bids for the first scenario and low bids for the good whose value is elicited last (Kahneman and Knetsch, 1992; Carson et al., 1998). In this joint evaluation the question sequence was not altered. Values were elicited in the following order:

1. Refuse Collection
2. Construction of a household Blair latrine
3. Improved drainage
4. Improved environmental sanitation

Table 7.2 below presents an analysis of respondents who gave zero bids. Figures in the first row show that 235 respondents gave zero bids for the first question (willingness to pay for improved refuse collection). Of these, 109 went on to give zero bids for the construction of a household Blair latrines (second question), 125 for drainage (third question) and 161 for improved environmental sanitation (last question). The diagonal figures in that table show that the number of respondents who gave zero bids increased from 235 for the first question (willingness to pay for refuse collection) to 536 for the last question (willingness to pay for environmental sanitation). This may be interpreted as implying question order effect. However, this is not supported by figures in the first row.

Figures in that row show that of the 235 respondents who gave zero bids for the first scenario (refuse collection) some went on to give positive bids for subsequent scenarios.

Table 7.2: Distribution of Zero Bids

	Refuse Collection	Blair Latrine	Drainage	Environment
Refuse Collection	235	109	125	161
Blair Latrine	109	306	215	234
Drainage	125	215	312	265
Environment	161	234	265	536

The mean willingness to pay bids for the four scenarios also do not seem to show question sequence effect. The mean willingness to pay bids are Z$25 for refuse collection, Z$388 for a Blair latrine, Z$10 for drainage and Z$50 for environmental sanitation. The mean willingness to pay for environmental sanitation which was presented last is higher than that for refuse collection (which was presented first) and drainage (which was third). The high number of zero bids could be due to the fact that households give low priority to community services such as environmental sanitation and it just happened that is was also presented last in the questionnaire. Therefore, although question sequence effect cannot be completely ruled out, results of this study show that its influence on willingness to pay bids was limited.

In brief, results of this study do not show strong signs of strategic bias or question order effect. Although willingness to pay bids for refuse collection and drainage show strong signs of starting point bias, this is most likely a result of cost-response rather than psychological anchoring. Although bias cannot be ruled out completely there is no strong evidence to suggest that the results of this study are totally invalid. Results of this study are therefore considered to be of acceptable credibility and in the rest of this chapter multivariate analysis is used to identify key determinants of willingness to pay, which should be targeted by policies aimed at improving cost recovery for sanitation services.

7.2 Determinants of Willingness To Pay

The willingness of households to pay for improved sanitation is generally determined by the characteristics of the proposed improved service, perceived benefits of the new system, cost of the new system, demography, size and composition of households, income expenditure patterns and assets, and household attitudes towards local authorities and government policy (Vaidya, 1995). Multivariate techniques are commonly used to determine the effects of household socio-economic characteristics and other variables on WTP bids (Whittington et al., 1991; Whittington et al., 1992; Lauria et al., 1999; Choe et al., 1996b). It is recommended that WTP bids should be estimated econometrically (Parry-Jones, 1999; Arrow et al., 1993). In this section multivariate analysis is used to compute mean willingness to pay bids and to determine the magnitude of the effects of household socio-economic characteristics and other variables on willingness to pay for improved sanitation.

In order to better understand the determinants of the households' willingness to pay for improved sanitation, WTP bids are regressed on independent variables using Ordinary Least Squares (OLS). The computer programme SPSS was used to analyse the data. Only the answers to the open-ended questions in which households were asked to state their maximum WTP bids are used in the regression analysis.

As discussed in the theoretical framework, demand for improved sanitation services can be represented as an inverse demand function by relating WTP bids to environmental quality or quantity (**E**) demographic characteristics (**D**), socio-economic characteristics (**Y**) and other factors (**O**) in the following form:

$$\textbf{WTP Bid} = b + b_1\mathbf{E} + b_2\mathbf{D} + b_3\mathbf{Y} + b_4\mathbf{O} \qquad (9)$$

The maximum monthly amount stated by the households is treated as a continuous variable (Anand, 1999). Various explanatory variables are then used to attempt to explain the variation in WTP bids for improved sanitation. The nature of the relationship between

the WTP bids and independent variables and the magnitude of the effect of the explanatory variables on WTP is shown by the signs and sizes of the coefficients ($\mathbf{b_1}$ to $\mathbf{b_4}$). The explanatory variables can be classified into five main groups. First, tenure and mode of payment are used to assess the effects of land tenure and institutional arrangements on willingness to pay for sanitation services. The second group of variables describe the respondent's characteristics (for example, sex and years of education). The third group describe the household's characteristics (that is housing conditions, income, expenditure and savings). Variables in the fourth group describe the water and sanitation situation in the study site (for example, water sources, refuse collection, type of toilet used by the household, and presence or absence of drainage facilities). The last set of variables concerns diseases and the respondent's knowledge and attitudes about environmental sanitation (for example, incidences of water and sanitation related diseases, household priority, and whether or not the respondent is satisfied with existing sanitation services and conditions).

Table 7.3 lists the names and definitions of both the dependent and explanatory variables which are used in the multivariate analyses. In this case the WTP bid is the dependent variable because its value depends on household socio-economic characteristics and the sanitation situation. Household socio-economic characteristics, the sanitation situation and other factors are referred to as independent or explanatory variables. The expected nature of the relationship between the independent variables and WTP bids, that is positive or negative, based on economic theory and other studies (Lauria et al, 1999; Whittington et al., 1991; Choe et al., 1996a), is also given in Table 7.3. For example, *a priori* income and education are expected to have a positive effect on WTP bids, while the number of households sharing a facility is expected to have a negative effect. However, the effects of sex and mode of payment cannot be determined *a priori*. There is no solid evidence to suggest that female respondents are willing to pay more for sanitation services than males and vice versa. Similarly we do not know whether respondents who choose to pay to the local authorities are willing to pay more or less than others.

Table 7.3: Description of variables used to explain variation in willingness to pay bids for improved sanitation

Dependent Variable	Mean (S.D)	Description	Expected sign
WTP bids for refuse collection	24.88 (47.71)	Maximum monthly amount households would pay for improved refuse collection	
WTP bids for a Blair latrine	388.16 (511.50)	Maximum monthly amount households would pay for a Blair latrine	
WTP bids for drainage	13.22 (26.03)	Maximum monthly amount households would pay for improved drainage	
WTP bids for environmental sanitation	46.49 (127.76)	Maximum monthly amount households would pay for improved environmental sanitation	
EXPLANATORY (INDEPENDENT) VARIABLES			
Policy and financial arrangements			
TENURE	0.83 (0.38)	1 = settlement is legal 0 = otherwise	+
MODE OF PAYMENT	0.294 (0.456)	1 = household prefers paying to the local authority 0 = otherwise	?
Households Socio-economic Characteristics			
SEX	0.35 (0.48)	1 = male 0 = female	?
EDUCATION	8.86 (3.79)	Years of education for the respondent	+
HOUSE OWNERSHIP	0.36 (0.48)	1 = house owner 0 = otherwise	+
HOUSE QUALITY	0.53 (0.50)	1 = good 0 = poor	+
INCOME	0.14 (0.35)	1= household earns more than Z$1,000 per month 0= otherwise	+
EXPENDITURE	6.5 (16.05)	Expenditure on sanitation services as a percentage of income	-
BANK ACCOUNT	0.83 (0.38)	1 = holds bank account 0 = no bank account	+
PRIORITY	0.245 (0.43)	1 = stated sanitation as the top priority issue 0 = otherwise	+
SATISFACTION	0.13 (0.33)	1 = satisfied with current sanitation services 0 = otherwise	-

Solid Waste Management			
BIN	0.39 (0.49)	1 = household already has refuse bin 0 = otherwise	?
HH SHARING	8.17 (9.95)	Number of households sharing bin	-
Human Excreta Disposal			
TYPE OF TOILET	0.32 (0.47)	1 = Private Blair or Flush toilet 0 = otherwise	-
TOILET OWNERSHIP	0.62 (0.49)	1 = private/household 0 = otherwise	+
TSATISFACTION	0.34 (0.47)	1 = satisfied with toilet 0 = otherwise	-
TSHARING	0.61 (0.49)	1= used by one household 0=otherwise	+
Drainage			
DRAINAGE FACILITY	0.28 (0.45)	1 = Area has drainage facilities 0 = otherwise	-
TAP WITHIN HH	0.39 (0.49)	1 = tap within household 0 = otherwise	+
DRAINAGE PROBLEM	0.616 (0.486)	1 = household faces critical drainage problems 0 = otherwise	+
General Environmental Sanitation			
ENVIRONMENT	0.354 (0.48)	1 = Environmental awareness 0 = otherwise	+
HEALTH HAZARD	0.99 (0.01)	1 = Household thinks poor sanitation is a health hazard 0 = otherwise	+
DISEASE	0.31 (0.46)	1 = one or more family members suffered from water and sanitation related diseases 0 = otherwise	+

7.2.1 Determinants of Willingness To Pay for Refuse Collection

In order to better understand the determinants of the households' willingness to pay for improved refuse collection, WTP bids were regressed on a number of selected explanatory variables using Ordinary Least Squares (OLS). Table 7.4 below shows the mean willingness to pay bids which were reported by various categories of respondents.

Figures in that table show that people living in illegal areas, female respondents, the rich etc. are willing to pay more than others.

Table 7.4: Mean Willingness To Pay for Refuse collection of Various Categories of Respondents

Variable	Groups	Mean WTP Z$/Month	Overall Mean Z$/Month
TENURE	Legal	26	25
	Illegal	17	
SEX	Female	26	25
	Male	23	
HOUSE	Owner	29	25
OWNERSHIP	Lodger	22	
HOUSE QUALITY	Good	33	25
	Poor	15	
INCOME	Less than Z$1,000	19	25
	Above Z$1,000	25	
BANK ACCOUNT	Yes	29	25
	No	19	
MODE OF	Local Authority	30	25
PAYMENT	Others	22	

Results of the regression analyses are presented in Table 7.5 below.

Table 7.5: Models of the Determinants of Willingness-To-Pay for Refuse Collection

Model	Coefficient	t-statistic
Intercept	4.604	0.245
TENURE	-7.986	-0.379
SEX	2.580	0.367
EDUCATION	-0.101	0.108
HOUSE OWNERSHIP	-0.026	-0.002
HOUSE QUALITY	19.105***	2.892
INCOME	28.653*	1.875
EXPENDITURE	-0.044	-0.266
BANK ACCOUNT	2.263	0.264
BIN	50.126***	2.923
HH SHARING	-1.258*	-1.663
DISEASE	8.546	1.034
PRIORITY	-6.714	-0.695
SATISFACTION	-3.235	-0.304
MODE OF PAYMENT	13.246**	2.080

F-statistic	5.723
Probability > F	0.000
R^2	0.72
Adjusted R-squared	0.60
N	546
Mean WTP Z$/Month	**27.45**

***Coefficient is significant at the 1% significance level
**Coefficient is significant at the 5% significance level
*Coefficient is significant at the 10% significance level

Overall, the multivariate results are remarkably robust. The model shows that 60% of the variation in WTP bids is explained by the independent variables (Adjusted R-squared = 0.60). This is far higher than Adjusted R-squared values reported in similar studies. For example, Whittington et al. (1991) and Lauria et al. (1999) reported Adjusted R-squared values of 0.24 and 0.15, respectively. The significance of the model was tested using F-test at the 1% significance level. The F-test shows that the explanatory variables collectively, explain a significant part of variation in WTP bids. The full model is presented in Appendix 7.

The results are also in accord with economic theory and our prior expectations. For example, most of the variables in the full model have the expected signs except for TENURE, EDUCATION, HOUSE OWNERSHIP, and PRIORITY. These variables have negative coefficients yet they are expected them to be positive. The negative coefficients imply that households living in illegal areas, those with lower levels of education, and those who did not state sanitation as a top priority issue are willing to pay more than others. This is contrary to prior expectations and mean figures which are shown in Table 7.4. For example, people who are living in illegal settlements are expected to be willing to pay less, since they are threatened with eviction and therefore there is no incentive for them to invest in refuse collection.

A possible explanation for this unexpected result is that paying to the local authority for refuse collection may also have been perceived as conferring official recognition on the illegal settlements. This is supported by the positive effect of the variable MODE OF PAYMENT. This implies that households who prefer paying to the local authority bid

more than those who want to pay to other organisations. In Onitsha, Nigeria Whittington et al. (1991) also found that residents living in slums were willing to pay more for a water connection than those in other parts of the city. The high willingness to pay for water in slums was also interpreted as reflecting demand for legal recognition. The unexpected sign on PRIORITY is due to the fact that less than a quarter of the respondents stated sanitation as the top priority issue. However, all these variables with unexpected signs have insignificant coefficients, showing that they could be by chance.

The majority of the variables have the expected signs and the results are also consistent with economic theory and those obtained through simple tabulations in Table 7.4. For example, the results in Table 7.5 show that, as is expected, income has a positive and significant effect on willingness to pay for refuse collection. House quality and possession of a bank account, which are used as proxy variables for wealth and savings, also have a positive effect on willingness-to-pay. Wealthier households and those with savings are willing to pay more than poorer households.

The current level of refuse collection services and consequences of poor sanitation also have significant effects on willingness-to-pay. The positive sign on the variable BIN shows that households who are currently using refuse bins are willing to pay more than others. This is consistent with results obtained in Chapter 6, in which Gutu residents, who have refuse bins, are willing to pay amounts which are substantially higher than those households using other means of refuse disposal. However, as the number of households sharing one refuse bin increases, the willingness of households to pay decreases. This is shown by the negative and significant coefficient of the variable HH SHARING. This confirms the problems of sharing facilities alluded to earlier. Lodgers increase the number of households sharing a bin. In Mbare for example, seven households share one refuse bin. As a result the bin fills in a matter of hours yet refuse is collected only once per week. Households who are satisfied with the current environmental situation are willing to pay less than those who are not satisfied. This is shown by the negative coefficient on the variable SATISFACTION. Poor water supply and sanitation lead to water and sanitation related diseases. The positive coefficient of the variable DISEASE

implies that households with one or more members who had suffered from water or sanitation related diseases in the period six months prior to the survey are willing to pay more for refuse collection. Wattage et al. (1999) also found that a household's WTP to avoid an episode of illness in Petrochemical and Urban Taiwan increased with illness, with the number of symptoms experienced, and severity of illness.

The magnitude of the effect that a variable has on willingness to pay can be deduced from the size of its coefficient. A look at the size of the coefficients in the full model shows that BIN has the highest effect on WTP followed by INCOME, HOUSE QUALITY, and then MODE OF PAYMENT. These are the key variables that policy makers need to target in order to improve refuse collection services. The important policy implication is that although income has an effect on willingness to pay it is by no means the most important factor. Willingness to pay is most affected by the quality of the service and the sanitation situation as shown by the effect of the variable BIN. Therefore both the rich and poor are more likely to join the refuse collection programme if they face critical refuse collection problems and if they are guaranteed that increased tariffs will lead to improved services.

The preceding discussion shows that most of the variables have the expected effect on WTP bids based on the sign of the coefficients. However, most of the coefficients are not statistically significant, suggesting that these variables may not be major determinants of WTP for refuse collection. However, this is typical of demand assessment surveys that use cross sectional data. In most of such studies less than half of the variables used to explain variation in WTP bids are significant (Whittington et al 1992; Lauria et al., 1999; Vaidya, 1995; AIMS Research, 1996). Only measures of wealth (HOUSE QUALITY and INCOME) and refuse collection situation (BIN and HH SHARING) have a significant effect on the willingness of households to pay for refuse collection. The significance of measures of wealth, once again underlines the need to solve sanitation problems in the larger context of poverty alleviation. The effect of the variables BIN and HH SHARING suggests that households prefer household and not shared refuse bins. The variables also show that the quality of sanitation services has a significant bearing on the willingness of

households to pay for refuse collection. This means that if the local authorities want to increase charges for refuse collection they should make sure that increases in charges are accompanied by improvements in the quality of the service.

It is recommended that household willingness-to-pay should be calculated econometrically (Parry-Jones, 1999; Arrow et al., 1993) instead of just reporting mean and median figures, as was the case in Chapter 6. The model which is presented in Table 7.5 was used to calculate mean willingness-to-pay for refuse collection. The result is presented in the last row of Table 7.5. The willingness-to-pay bid which is calculated using the model is not very different from the mean calculated using simple statistics in Chapter 6. The econometrically estimated willingness to pay bid is Z$27.45 (US$0.67) per months compared with the mean of Z$25 (US$0.61). This reiterates what other studies have also found, that both simple and rigorous analyses of WTP bids produce results which are not very different (Choe et al., 1996a). Therefore, simple analysis of demand assessment data can give local authorities information which is important for planning. Overall, these results are in accord with economic theory, with prior expectations and results obtained through simple tabulation, lending credence to the plausibility of the survey.

7.2.2 Determinants of Willingness To Pay for a Blair Latrine

As with Section 7.2.1 above, the household's WTP responses for construction of a Blair latrine, were regressed against the variables which are listed in Table 7.6 using Ordinary Least Squares (OLS). Table 7.6 shows the mean willingness to pay bids which were reported by various groups of respondents.

Table 7.6: Mean Willingness To Pay of Various Categories of Respondents

Variable	Groups	Mean WTP Z$/Month	Overall Mean Z$/Month
TENURE	Legal	413	388
	Illegal	314	
SEX	Female	350	388
	Male	457	

HOUSE OWNERSHIP	Owner	350	388
	Lodger	409	
HOUSE QUALITY	Good	415	388
	Poor	374	
INCOME	Less than Z$1,000	353	388
	Above Z$1,000	452	
BANK ACCOUNT	Yes	456	388
	No	411	
TYPE OF TOILET	Blair/Flush	240	388
	Others	432	
TOILET OWNERSHIP	Private/household	252	388
	Communal	454	
MODE OF PAYMENT	Local Authority	377	388
	Others	392	

Results of the regression analyses are presented in Table 7.7 below.

Table 7.7: Models of the Determinants of Willingness-To-Pay for Blair Latrine

Model	Coefficient	t-statistic
Intercept	208.187	1.307
TENURE	65.799	0.632
SEX	76.022	1.277
EDUCATION	11.410	0.192
HOUSE OWNERSHIP	377.807***	4.040
HOUSE QUALITY	-7.895	-0.116
INCOME	222.503**	2.113
EXPENDITURE	0.690	1.215
BANK ACCOUNT	-126.113	-1.467
TYPE OF TOILET	-258.101***	-2.769
TSHARING	53.306	0.728
TOILET OWNERSHIP	281.925***	2.803
TSATISFACTION	-220.348***	-2.617
DISEASE	32.729	0.488
PRIORITY	48.958	0.732
SATISFACTION	-201.140**	-1.969
MODE OF PAYMENT	-142.427**	-2.223
F-statistic	4.928	
Probability > F	0.000	
R^2	0.17	
Adjusted R-squared	0.14	
N	384	
Mean WTP Z$/Month	**478.14**	

***Coefficient is significant at the 1% significance level
**Coefficient is significant at the 5% significance level
*Coefficient is significant at the 10% significance level

The explanatory power of the model is low (Adjusted R-squared less than 14%) but consistent with those reported by other authors. This means that only 14% of the variation in willingness to pay bids for a Blair latrine is explained by changes in the household socio-economic factors and other variables. This implies that much of the variation in the willingness to pay bids is explained by factors other than those included in the model. A possible explanation of the low Adjusted R^2 reported here and those reported in other contingent valuation surveys which looked at sanitation, could be a weakness with economic theory in modelling social variables. Hygiene practices in many developing countries are linked to social norms, beliefs and attitudes. For example, some communities believe children's faeces to be harmless since they come from milk. This belief affects their attitude towards children's faeces, which in turn affects the way they handle them. This will ultimately affect a household's willingness to pay say, for children friendly latrines. In this study when respondents say they are willing to pay for a Blair latrine it is not clear whether they are willing to pay for the privacy, prestige, convenience or health benefits resulting from having one. Unfortunately economic theory does not cover the complex interactions between beliefs, attitudes and choices comprehensively. Green and Tunstall (in Bateman and Willis, 1999), have developed a psychological model that tries to solve this problem.

However, the R^2 for the Blair latrine model of 17% is higher than the minimum acceptable level of 15% (Mitchell and Carson, 1989) and is typical of such studies (Lauria et al., 1999). The F-statistic shows that together the independent variables explain a significant proportion of the variation in household WTP bids. This is also supported by the fact that most of the variables have the expected signs except for HOUSE QUALITY, EXPENDITURE and BANK ACCOUNT. The signs of these variables suggest that households who are living in poor quality houses and those without bank accounts are willing to pay more for a Blair latrine than others. This is contrary to prior expectations and the mean figures which are shown in Table 7.6. The positive sign on

EXPENDITURE may be interpreted as implying that those households who are currently spending more on water and sanitation services are more likely to join the latrine construction programme. On average, households are currently spending 6.5 % of their income on water and sanitation services. The rest of the variables have the expected signs and the results are consistent with those shown in Table 7.6. For example, the positive sign on sex confirms earlier observation that male respondents are willing to pay more (Z$457 per month) for the construction of a Blair latrine compared with females (Z$350).

The purpose of this chapter is to identify variables with the greatest influence on willingness to pay for improved sanitation which should be considered when designing cost recovery policies. The multivariate analysis presented in Table 7.7 shows, once again, that measures of wealth (INCOME, HOUSE OWNERSHIP), the quality of sanitation services (TYPE OF TOILET, TOILET OWNERSHIP, TSATISFACTION), and trust in the service provider (MODE OF PAYMENT) are the key determinants of willingness to pay. Wealthier households, house owners, and those who are currently using unsanitary latrines are more likely to join the latrine construction programme than others. This suggests that for the latrine construction programme to be successful it should be implemented as an integral part of a comprehensive strategy that addresses poverty alleviation and housing. In order to improve the quality of services households should be provided with household, as opposed to communal latrines (TOILET OWNERSHIP). Unlike the case of refuse collection, the effect of MODE OF PAYMENT is negative suggesting that households are more likely to join the latrine construction programme if they are paying to NGOs rather than to the local authority. This, linked with high WTP for a Blair latrine, may imply that communities trust NGOs more than local authorities. Therefore trust, accountability and transparency may be important factors in the success of latrine construction programme.

Overall, the results of the multivariate analysis are consistent with prior expectation and economic demand theory, except for the fact that the model explains only a small percentage (less than 14%) of the variation in WTP bids. However, this is typical of such studies (Mitchell and Carson, 1989). Most of the explanatory variables are significant and

have the expected signs. The econometrically estimated mean willingness to pay of Z$478.14 (US$12) per month is also comparable to Z$388 (US$10) which was calculated using simple descriptive statistics.

7.2.3 Determinants of Willingness To Pay for Improved Drainage

Once again the variables listed in Table 7.3 were used to better understand the determinants of willingness-to-pay for improved drainage. The results of the regression analysis are presented in Table 7.8 below.

Table 7.8: Models of the Determinants of Willingness-To-Pay for Drainage

Model	Coefficient	t-statistic
Intercept	-1.663	-0.273
TENURE	-2.354	-0.490
SEX	-0.045	-0.018
EDUCATION	0.121	0.332
HOUSE OWNERSHIP	-2.940	-0.816
HOUSE QUALITY	-0.871	-0.288
INCOME	3.277	0.825
EXPENDITURE	-0.167	-1.102
BANK ACCOUNT	-2.269	-0.667
DRAINAGE FACILITY	-7.642***	-2.427
TAP WITHIN HH	6.638**	1.980
DRAINAGE PROBLEM	25.148***	9.682
DISEASE	6.680***	2.560
PRIORITY	4.701*	1.762
SATISFACTION	-2.891	-0.586
MODE OF PAYMENT	8.640***	3.236
F-statistic	9.352	
Probability > F	0.000	
R^2	0.22	
Adjusted R-squared	0.20	
N	505	
Mean WTP Z$/Month	**14.80**	

***Coefficient is significant at the 1% significance level
**Coefficient is significant at the 5% significance level
*Coefficient is significant at the 10% significance level

The explanatory power of the model of about 20% is within the acceptable range. The F-statistic shows that there is a statistically significant relationship between willingness to pay bids and the explanatory variables. Most of the explanatory variables have the expected signs except for TENURE, HOUSE OWNERSHIP, HOUSEQUALITY, and BANK ACCOUNT. Contrary to prior expectations, these results suggest that households living in illegal settlements, lodgers and those without bank accounts are willing to pay more for improved drainage. However, all the coefficients of these variables are not statistically significant so it can be concluded that there is no significant difference between the willingness-to-pay of lodgers and house owners, male and female respondents, and legal and illegal settlements.

Household characteristics have the expected signs although their effect on willingness-to-pay is small. For example, education and income have a positive but small effect on household WTP for improved drainage. On the other hand most of the variables that describe water supply and the drainage situation in the study sites have huge and significant effects on willingness-to-pay. This may mean that drainage conditions are more important determinants of WTP for improved drainage than household socio-economic characteristics. For example, respondents who are living in areas without drainage facilities (Gokwe residents for example) and therefore face critical drainage problems, especially during the rainy season, are willing to pay amounts which are substantially higher than those living in areas with drainage facilities.

The key determinants of willingness to pay for improved drainage are DRAINAGE FACILITY, TAP WITHIN HH, DRAINAGE PROBLEM, DISEASE, PRIORITY, and MODE OF PAYMENT. Households who live in areas without drainage facilities and thus face critical drainage problems are more likely to join a drainage improvement programme. The same applies to households with members who suffered from water and sanitation related diseases in the period six months prior to the survey, those who have water taps within the household, and those who consider sanitation as a high priority issue. Improved water supply increases water consumption and thus wastewater generation. Disposal of wastewater is therefore a major problems in areas like Mbare

where households have unlimited access to water but there are no drainage facilities to transport wastewater. Households who face serious drainage problems bid amounts which are Z$25 more than others.

Mode of payment also has a significant effect on willingness to pay for drainage. As is the case with solid waste management, households prefer paying monthly premiums for drainage to the local authorities. Once again this may suggest that communities feel that communal services like drainage and solid waste management are best provided by local authorities.

The econometrically estimated mean willingness to pay of Z$14.80 (US$0.36) per month is close to that which was obtained using simple descriptive statistics (Z$13.22). Again this reinforces the fact that WTP bids which are calculated using rigorous econometric methods are not very different from those obtained using simple descriptive statistics.

7.2.4 Determinants of Willingness To Pay for Improved Environmental Sanitation

The last multivariate analysis looked at the determinants of willingness-to-pay for the improvement of the general environmental situation in the study sites. Respondents were asked how much they would pay for the cleaning of streets, maintenance of dumpsites, and treatment of sewage before it is discharged into public streams. Once again variables in Table 7.3 were used in the regression analysis. The results of the estimated model are presented in Table 7.9 below.

Table 7.9: Models of the Determinants of Willingness-To-Pay for Environmental Sanitation

Model	Coefficient	t-statistic
Intercept	-15.274	-0.982
TENURE	8.523	0.698
SEX	-2.792	-0.410
EDUCATION	1.108	1.083
HOUSE OWNERSHIP	12.221	1.404
HOUSE QUALITY	6.294	0.831
INCOME	19.120*	1.929

EXPENDITURE	-0.858	-1.221
BANK ACCOUNT	1.750	0.189
ENVIRONMENT	115.246***	16.640
DISEASE	2.663	0.384
PRIORITY	-10.986	-1.468
SATISFACTION	17.863	1.455
MODE OF PAYMENT	-4.318	-0.622
F-statistic	24.837	
Probability > F	0.000	
R^2	0.33	
Adjusted R-squared	0.32	
N	660	
Mean WTP Z$/Month	**46.90**	

***Coefficient is significant at the 1% significance level
**Coefficient is significant at the 5% significance level
*Coefficient is significant at the 10% significance level

The value of Adjusted R-squared shows that the models explain about 32% of the variation in WTP bids which is relatively high. The F-statistics also indicate that the model is significant. Only two variables, PRIORITY, and SATISFACTION have unexpected signs. Contrary to prior expectations these results suggest that households who did not state sanitation as a top priority issue and those who are satisfied with the current sanitation situation are willing to pay more for improved environmental sanitation. However, these results are not statistically significant.

Only three variables have significant coefficients. Willingness to pay for improved drainage is influenced mainly by income and environmental awareness. Environmental awareness (ENVIRONMENT) has the greatest influence on whether or not a household will support an environmental clean up programme. Households who are concerned about or affected by poor solid waste disposal, discharging of raw sewage into public water courses and the general dirtiness of the neighbourhoods are willing to pay more to reverse the situation. This suggests that environmental awareness programmes and health and hygiene promotion may be necessary to convince households to contribute towards the environmental clean-up programme. Alternatively public services such as environmental sanitation and drainage may have to be paid through local taxes.

The mean willingness to pay calculated using the models in Table 7.9 is astonishingly close to that obtained using simple descriptive statistics. The WTP bid which was estimated using the model is Z$46.90 (US$1.15) per month which is almost equal to the mean WTP of Z$46.49 (US$1.14) obtained in Chapter 6.

7.3 Summary

This chapter set out to identify key determinants of willingness to pay for improved sanitation which should be considered in designing policies aimed at improving cost recovery for sanitation services. The results show that the prevailing sanitation situation, measures of wealth and household perceptions about the service provider are the major determinants. The significance of variables that reflect the sanitation situation show that households are generally not satisfied with the current sanitation situation and they are prepared to pay substantial amounts of money for an improvement. Households who are not satisfied with refuse collection, those using unsanitary communal toilets, and those who are living in areas without drainage facilities are prepared to contribute substantial amounts for an improvement. Increases in tariffs should be accompanied by improvements in the quality of sanitation services. Respondents who are aware of the negative effects of poor sanitation and thus consider improved sanitation a high priority issue, are more likely to pay their sanitation bills. Therefore, environmental awareness raising and health and hygiene promotion campaigns should be an integral part of sanitation programmes.

Income is also a key determinant of whether or not households will join projects that require substantial contributions from them, such as construction of Blair latrines. Therefore, it is important for local authorities and other service providers to design financing mechanisms that ensure that the poor are not excluded. These alternative mechanisms may include loans, credit and subsidies which were discussed in Chapter 6.

Household perception about the service provider also affects willingness to pay significantly. Households seem to be willing to pay more to the local authorities for communal as opposed to household facilities. This suggests that households think that local authorities should continue to be responsible for communal services such as drainage. However, this may also show lack of trust in local authorities. In cases where willingness to pay bids are relatively high, such as for construction of a Blair latrine and for overall environmental sanitation, households prefer paying to NGOs rather than to local authorities. Therefore trust, accountability and transparency may have a significant effect on the success of cost recovery policies. This discussion generally illustrates how willingness to pay information can inform cost recovery policy design.

This chapter also assessed the plausibility of the contingent valuation survey. Except for signs of starting point bias, there are no strong signs of strategic bias or question-sequence effect. Starting point bias is most likely to be due to cost-response since respondents were told that the offered bids were the estimated costs of providing the services. Generally, the results of this study are considered to be of acceptable accuracy, comparable to those reported by other authors, and consistent with economic theory and prior expectations. Tolerance values presented in Appendix 6, and an inspection of residual plots show that collinearity and heteroskedasticity are not serious problems. Mean willingness to pay bids which were calculated using econometric models are comparable to those calculated using simple descriptive tools. Therefore local authorities can obtain useful information from simple analysis of willingness to pay data which they can use to set tariffs and design cost recovery policies. The policy implications of these results are discussed in the final chapter.

CHAPTER 8: DISCUSSION AND CONCLUSIONS

Almost half of the world's population is living in urban areas and between 40 and 60 percent of them live in informal settlements with inadequate or no sanitation facilities. Poor cost recovery was identified as one of the major causes of failure of sanitation programmes during the 1980s and 1990s. Low tariffs, and poor billing systems and revenue collection meant that local authorities collected little revenue so that they could not cover the cost of operations and maintenance let alone extend services to uncovered areas. This is why current market-oriented approaches such as the Strategic Sanitation Approach (SSA), which is now the principal approach of leading organisations in the water and sanitation sector, emphasise **full cost recovery** for sanitation services in urban areas.

However, given the level of poverty in cities of developing countries, full cost recovery may further marginalise the poor. The vast majority of people without access to improved sanitation services are poor, living on less than US$2 per day. Introduction and enforcement of high water tariffs in South Africa forced households to revert to unsafe water sources resulting in a cholera outbreak in 2000 which claimed 250 lives. Increased user fees and enforcement of payment in the health sector in Africa also caused a lot of suffering to the poor (Section 2.4). Therefore, whereas cost recovery is necessary, there is need to set tariffs which the urban poor can afford to pay without compromising consumption of other basic necessities.

This thesis set out to investigate ways through which cost and willingness to pay information can be used to design tariff structures that improve cost recovery without denying the urban poor access to basic sanitation services. Although a number of willingness to pay studies have been conducted in the water and sanitation sector the policy recommendations have focused on those who can pay and little attention has been given to those who cannot afford to pay for services. This study differs from other willingness to pay studies by focusing on those households who may not be able to pay even those tariffs which are based on mean willingness to pay.

The specific objectives were to: (1) assess the level of sanitation services in selected poor urban areas, (2) identify weaknesses and strengths of the current cost recovery policies of local authorities, (3) calculated the actual cost of providing sanitation services, and (4) determine the willingness of poor urban households to pay for improved sanitation services.

Various methods (Section 4.2, 4.7 and 4.8), which include full cost accounting, the contingent valuation method, and participatory techniques were used to achieve the objectives of this study. The results of this study show that, contrary to claims that almost all urban residents in Zimbabwe have access to safe drinking water and improved sanitation, the water and sanitation situation in poor urban areas in Zimbabwe, as is the case in most developing countries, is generally deplorable. Whereas the majority of the urban poor fetch water for drinking and cooking from improved sources, they also use water for laundry and bathing from unprotected sources such as streams and shallow wells. Urban environments are generally dirty (Sections 5.2 through 5.4). Almost 70% of the respondents use unsanitary pit latrines and dilapidated communal facilities or they practise open defecation. There are no drainage facilities or refuse collection services in most of the areas. Wastewater is discharged into roadside ditches and drains while raw sewage or poor quality effluent is discharged into local streams. Heaps of decomposed refuse are scattered all over poor urban residential areas threatening the health of residents, especially children. Given this situation, the governments of Zimbabwe and of other developing countries urgently need strategic plans to deal with poor sanitation in informal settlements, especially given the high urbanisation rate.

Poor cost recovery and centralised financial mechanisms are among the major causes of poor sanitation in informal settlements (Sections 6.3 and 6.3.1). Local authorities in Zimbabwe, as is the case in most developing countries (Wright, 1997), do not have clear cost recovery policies for sanitation services in poor urban areas. Local authorities charge tariffs which are extremely low, regulated by statutory instruments and divorced from actual capital or recurrent costs. Tariffs hardly cover a significant proportion of operational and maintenance costs and they do not cover capital costs at all. For example,

residents are paying Z$10 for refuse collection yet the cost is estimated to be almost three times more. Low tariffs coupled with poor billing and revenue collection mean that little revenue is generated for operation and maintenance; thus local authorities cannot maintain the facilities and the quality of services falls still further

However, there is hope for improvement since many households are willing to pay substantial amounts for improved sanitation. Results of the demand assessment survey show that on average households are willing to pay Z$25 per month for refuse collection, Z$388 per month for construction of a household Blair latrine, Z$13 for improved drainage and Z$46 for environmental sanitation (Sections 6.5.1, 6.5.2, 6.5.3, and 6.5.4). Mean willingness to pay for refuse collection is more than double what households at growth points are currently paying. Therefore local authorities can significantly improve their financial resources by charging realistic tariffs based on cost and willingness to pay information. This can then be invested in improving sanitation services.

However, a significant proportion of the households cannot afford to pay the full cost of sanitation services at once, especially for huge investments such as construction of a household Blair latrine (Figure 6.3). Most willingness to pay studies make policy recommendations based on mean willingness to pay (Section 2.6). In cases where willingness to pay is low the common recommendation has been to defer investment until such a time when income and thus willingness to pay has risen (Chao et al., 1996b; Lauria et al., 1999; Altaf and Deshazo, 1996, AIMS Research, 1996, World Bank Demand Research Team, 1993). In some cases protesters and zero bids are completely excluded from the analysis (AIMS Research, 1996). These recommendations add to the fears that the poor may be excluded from projects which base participation solely on willingness to pay. However, it should be remembered that basic sanitation is not a luxury that can wait until better economic times but a key element in creating them.

The main contribution of this thesis is that instead of deferring investment or simply doing nothing in situations where willingness to pay is low, cost and willingness to pay information could be used to design alternative cost recovery or financing mechanisms

for those who may not be willing to pay. This study demonstrated how cost and willingness to pay information can be used to classify residents into four groups[31] (Figure 8.1); 1) protesters who are unwilling-but-able to pay for sanitation services, 2) those who are willing-and-able, 3) those who are willing-but-unable, and 4) those who are unwilling-and-unable to pay for the full cost of services (zero bids). Appropriate cost recovery mechanisms can then be designed for the various groups. The last three groups are shown in Figure 8.1 below which uses information on cost of and willingness to pay for the construction of a household Blair latrine.

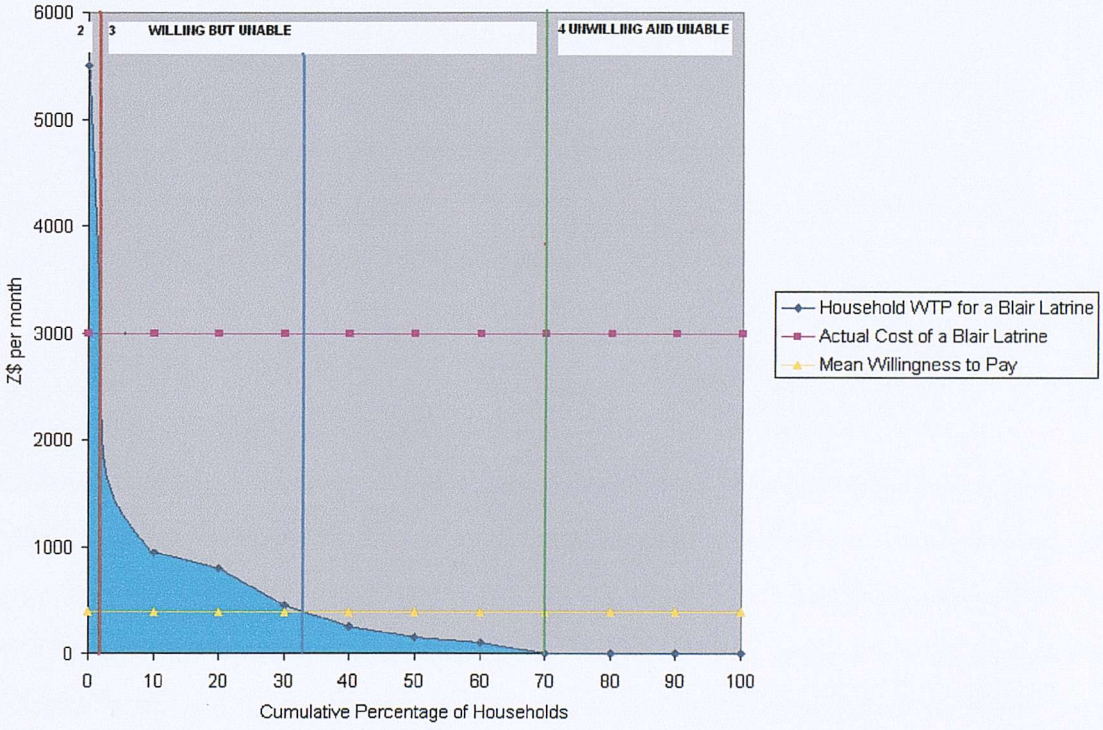

Figure 8.1: Various Categories of Residents Based on Cost and WTP for a Blair Latrine

About 5% of respondents in this study are protesters who fall into Group 1. The majority of protesters (60%) cited lack of trust in the local authority as their main reason for protesting. The econometric analyses also show that household perception about the service provider is a major determinant of willingness to pay (Table 7.7). Local authority

[31] The classifications which are presented in Figure 8.1, are based on the assumption that under the ideal situation households should be able to construct a Blair latrine within a month. That is they should be willing and able to pay Z$3,000 per month.

cost recovery strategies for this group in situations where services are already provided, may include dialogue and measures to ensure accountability and transparency. Legal recognition of "squatters", community and NGO participation in sanitation programmes, and regular meetings between local authorities and the community they serve could help to improve trust.

As shown in Figure 8.1, only 1% of the respondents can afford to pay for the construction of a Blair latrine within a month (Group 2). These do not require financial assistance from local authorities or NGOs. Reasons which were given by respondents in this group for using unsanitary latrines include waiting to be connected to the sewer system by the local authority (Section 5.2.3). However, given the financial resources of local authorities and the water supply situation, sewer systems may not be feasible in most of the poor urban areas. Therefore, the appropriate policy for this group would be to promote Blair latrine construction and to revise the restrictive building standards (Section 4.7.1) which compel local authorities to provide all urban residents with flush toilets and prohibit construction of on-site facilities for household use.

Group 3 in Figure 8.1 consists of respondents who are willing to contribute something towards the construction of a Blair latrine but they are unable to pay the full cost of Z$3,000 in a month. This group has been the focus of most willingness to pay studies. As alluded to earlier, these studies recommend tariffs which are based on mean willingness to pay. However, Figure 8.1 shows that if respondents were asked to pay Z$388 per month (the mean willingness to pay for the construction of a Blair latrine) only 33% of the respondents would participate in the latrine construction programme. This thesis suggests that instead of being silent about the other 67% who cannot pay the Z$388 (mean WTP bid), willingness to pay results in conjunction with cost information should be used to design alternative financing mechanism for this group.

The 67% who cannot pay the mean WTP bid can be subdivided into two groups; those who gave positive bids which are lower than the mean WTP bid of Z$388 per month (the area between the vertical blue and green lines in Figure 8.1) and those who gave zero

bids (the area to the right of the green vertical line in Figure 8.1). Alternative financing mechanisms for those who are willing to pay something but are unable to pay the full cost in one payment may include community finance, loan or credit facilities. Community finance programmes in which communities raise a certain percentage of the total programme costs over a specified period have been used successfully to construct sewer systems in the Orangi Pilot Project (OPP) in Pakistan and PROSANEAR in Brazil. The Orangi Pilot Project brought low cost sewerage to 700,000 informal settlement residents (Hardoy and Satterthwaite, 1995). Loan and credit facilities are used by building societies in Zimbabwe to construct houses for low-income residents and have been used for water supply and sanitation in India and Bangladesh (UNDP-World Bank WSP, 2002). Credit facilities have also been used successfully to extend latrine coverage in Lesotho and Indonesia. Credit repayment rates in these programmes were high, 80% in Lesotho and 100% in Indonesia (Saywell, 1998). Ongoing activities such as contributions to housing cooperatives and women's clubs in Zimbabwe could also be utilised to raise funds for latrine construction. Since most of the households have bank accounts, they could be asked to save a certain amount in order to get assistance for latrine construction.

The last group consists of respondents who gave zero bids (Group 4 in Figure 8.1). Instead of doing nothing in such circumstances (as is recommended by some willingness to pay studies), this group could be helped through subsidies. The majority of those who gave zero bids especially for the construction of a Blair latrine are female-headed households who earn less than Z$1,000 per month. These households could be given free cement and asked to dig the pits for the latrines and to pay the builder. The subsidies could be paid for by national governments, donors or NGOs. However, such subsidies, like most subsidies, are prone to abuse. One deterrent measure could be to ask households to do some community work such as cleaning drains before they receive free cement. Those who have the money will pay for services while those who cannot pay do community work in their neighbourhood. Such approaches have been used to distribute food aid in Zimbabwe and other African countries through food-for-work programmes. In Chile and Panama households are asked to apply for subsidies from the local authorities (Alfaro, 1997a; Foster et al. 2000). Those who qualify are given cards which they

produce when paying their bills. Therefore, unlike current practices where geographical location is used to target subsidies, willingness to pay and cost information could be used to assess whether subsidies are necessary, the amount of the subsidy required, and the proportion and characteristics of residents that may require subsidies. Information from contingent valuation surveys could also be used to design forms which will be used when applying for subsidies. Targeting of subsidies could further be improved by having a transparent selection process and the involvement of community leaders, NGOs, church leaders, school teachers, residents' associations and councillors.

Although there could be practical problems in implementing the programme suggested above, this thesis has generally illustrated that the urban poor are not a homogeneous group, therefore basing tariffs on mean willingness to pay alone may not benefit the very poor residents. Appropriate cost recovery mechanisms are required which meet the specific needs of the various groups. In brief, the contribution of this study is that instead of focusing on those who are willing and able to pay, willingness to pay studies in conjunction with full cost accounting could be used to design appropriate tariff structures that improve cost recovery without denying the very poor access to basic sanitation services. Cost and willingness to pay information could be used to design alternative financing mechanisms and to improve targeting of subsidies.

8.1 Policy Implications

The policy implications of this study are listed below.

1. Local authorities should use demand assessment surveys and costing exercises to assess the needs and willingness to pay of residents and the cost of sanitation services. Organisations such as NGOs, donors, academic institutions, and government departments which are collecting various types of information in urban areas could pool their expertise and financial resources together and implement rigorous demand assessment surveys and full cost accounting exercises. Contingent valuation surveys and full cost accounting should become

an integral part of the local authority planning process. These methods force local authority planning to be rigorous and the very poor who are normally left out in policy debates are given a chance to air their views. Therefore, although contingent valuation has some weaknesses, its strongest point is that it allows poor urban communities to participate in the local authority planning process.

2. Local authorities should base tariffs on cost and willingness to pay information and not on subjective factors such as political issues. Tariffs could be based on mean willingness to pay bids calculated using simple descriptive statistics which are then adjusted yearly for inflation. Local authorities may have to conduct demand assessment and costing exercises approximately every five years. After setting the tariff, local authorities should use willingness to pay and cost information to design appropriate cost recovery policies for the various classes of poor urban residents, especially the very poor, who may not be able to pay for sanitation services. This information could be used to design alternative financing mechanisms and to improve targeting of subsidies. Alternatively, by-laws may have to be changed to allow the construction of affordable facilities or to adopt cheap ways of providing services such as community participation in refuse collection.

8.2 Areas for Further Research

Since this study could not exhaust all the issues which affect the provision of sanitation services in poor urban areas, due to the complex nature of sanitation problems, two areas that require further investigation are listed below.

1. Further research is required to investigate the actual design of subsidy systems; the legal framework, the eligibility criteria, targeting and administration of the subsidy.
2. Further research is also required to identify the best elicitation format that best mimics the way prices for sanitation services are set in Africa and the culture of

the local people. Although the National Oceanic and Atmospheric Administration (NOAA) recommend the referendum format people in Zimbabwe have experienced only one referendum in the past 20 years. Iterative bidding may trivialise the whole exercise when prices are changed up or down.

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APPENDICES

Appendix 1: Institutional Questionnaire

Interviewer Observations

Interviewer Code [ ] [ ]

Area Code [ ][ ]

Name of the Organisation/Local Authority in full _____

Organisation Code [ ][ ][ ][ ][ ]

Name of City \Service Centre Where Organisation is base:-

_____

Population Served by the Organisation [ ][ ][ ][ ][ ][ ][ ][ ]

Name of Respondent _____

Designation of Respondent _____

Sex of Responded. Code [ ]

Code	
(1)	Male
(2)	Female

Sex of Interviewer Code [ ]

Code	
(1)	Male
(2)	Female

DATE(S) OF INTERVIEW **Starting time** [ ][ ]**Hrs** [ ][ ]**mins**

1. [ ][ ][ ][ ][ ][ ] **Finish Time** [ ][ ]**Hrs** [ ][ ]**mins**

Call-Back

1. [ ][ ][ ][ ][ ][ ]
2. [ ][ ][ ][ ][ ][ ]
3. [ ][ ][ ][ ][ ][ ]
4. [ ][ ][ ][ ][ ][ ]

Q1. What is the population of the area which you serve? [ ][ ][ ][ ][ ]

Q2. How many households have benefited from your services?

[ ][ ][ ][ ][ ] Females Total [ ][ ][ ] [ ][ ][ ]

[ ][ ][ ][ ][ ] Males

Q3. What are your roles and responsibilities in the provision f sanitation services? What is the structure of the organisation?

1.
2.
3.
4.
5.

Q4. How will you describe the level and quality of sanitation services in poor urban areas?

Q5. What are the major constraints to effective provision of sanitation services in the poor urban area?

Q6. How many water and sanitation projects have you implemented so far?

[ ][ ][ ]

Q7. Of these how many were implemented in poor urban areas? [ ][ ][ ]

Q8. How did you design and implement the projects?

.....
.....
.....
.....
.....
.....
.....

Q9. How were the local communities involved in the projects?

Q10. Which areas did your project concentrated on?

Solid Waste
Toilets
Water
Drainage
Health education
Income generation
Housing

Q11. Did you assess the needs of the community before implementing the projects? How?

Cost information

Q1. Which types of latrines do you promote in poor urban areas? What are the capital and recurrent costs?

1.....
2.....
3.....
4.....
5.....

Q2. Is the technology chosen by the local community?

Q3: What are the capital and recurrent costs of the sewer system?

Q4: What are the capital and recurrent costs of solid waste management?

Q5: What are the capital and recurrent costs of storm water and wastewater drainage?

Q6: Do you charge for the services which you offer to poor urban communities? What were the charges for 980-1999? How are tariffs set? What was revenue and expenditure for 1980-1999?

Q7: How do you communicate with the communities you serve? Any problems? How can your organisation and communities work together to improve sanitation services? What limitations do you face in serving poor urban areas?

Q8: What do you think should be done by all stakeholders to improve sanitation services in poor urban areas?

Appendix 2: Household Questionnaire

Interviewer Observations

Interviewer Code [ ] [ ]

Area Code [ ][ ]

NAME OF RESIDENTIAL AREA IN FULL _____

Name of Respondent _____
Sex of Respondent CODE [ ]

Code	
(1)	Male
(2)	Female

Household Code [ ][ ][ ][ ][ ]

CITY\TOWN _____

POPULATION SIZE OF CITY\SERVICE CENTRE[ ][ ][ ][ ][ ][ ][ ][ ]
POPULATION SIZE OF RESIDENTIAL AREA [ ][ ][ ][ ][ ][ ][ ][ ]

RESIDENTIAL AREA CODE [ ]

Code	
(1)	Low density
(2)	High density
(3)	Middle density
(4)	Informal settlement

SEX OF INTERVIEWER CODE [ ]

Code	
(1)	Male
(2)	Female

DATE(S) OF INTERVIEW **Starting time** [ ][ ]**Hrs** [ ][ ]**mins**
1. [ ][ ][ ][ ][ ][ ] **Finish Time** [ ][ ]**Hrs** [ ][ ]**mins**

Call-Back Dates
1. [ ][ ][ ][ ][ ][ ]
2. [ ][ ][ ][ ][ ][ ]
3. [ ][ ][ ][ ][ ][ ]
4. [ ][ ][ ][ ][ ][ ]

A: HOUSEHOLD CHARACTERISTICS

Q1. Ask for all members of the household (including: relatives and employees who are living with the household). Fill in the details of each member of the household in the table below.

Relationship of each household member to the household head (codes) 1 head 6 brother 2 spouse 7 nephew/niece 3 daughter 8 cousin 4 son 9 grandchild 5 sister 10 other relatives 11 not related	What is the age of each household member (codes) 1. 0-5 7. 41-60 2. 6-10 8. >60 3. 11-15 4. 16-20 5. 21-30 6. 31-40	sex codes 1. Male 2. Female	Educational level of each member (codes) 1. No formal education 2. Grade 1-7 3. Form 1-4 4. Form 5-6 5. Diploma/Certificate after Primary 6. Diploma/Certificate after Secondary 7. University Graduate/Post graduate 8. Others (specify)	Are you normally living with the household for 9-12 months of the year codes 1. Yes 2. No
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

Q2. For how long have you been living here? [ ][ ]years

Q3. Where were you living before you came here?
.....

Q4. Why did you move to this place?
1. .....
2. .....
3. .....
4. .....
5. .....

Q5. Are you leading a better life here than where you were living before?
Yes [ ] No [ ].

Q6. If the answer to the question above is YES, why do you think life here is better than where you were living before?

Reasons
1.....
2.....
3.....
4.....
5.....

B: HOUSEHOLD ECONOMY.

(I) ASSETS

Q1. What is the tenure of the household Accommodation?
Tenure Codes
1. Owner/purchaser
2. Tenant
3. Lodger
4. Employment house
5. Informal settlement
6. Others (specify) .....

Q3. What is the quality of shelter? [ ]/[ ]

1. very good
2. good
3. poor
4. very poor

Q4. How many people share a room? [ ][ ]

Q5. How many of the following assets do you have?

Asset	Number
1. Cart	
2. Car	
3. Tractor	
4. Buses	
5. Emergency taxis	
6. Shops	

Q6. Do you have a Bank Account? Yes [ ] No [ ]

Q7. How much land do you cultivate

1. Arable (acres) ----------
2. Garden (acres) ----------

(ii) SOURCES OF INCOME

Q1. What is the main source of income of the household head? (Please rank in order of importance)

Sources of Income	Rank (in ascending order)
Salaried Employment	
Formal Business	
Informal Business (own-account worker)	
Pension	
Farming	
Interest on investments	
Dividends on shares	
Others (specify)	

Do you know the income of the household head Yes/No

Q2. How much do you earn per months (Z$) [ ]

1. < 500
2. 500 - 1000
3. 1100 - 2000
4. 2100 - 3000
5. 3100 - 4000
6. 4100 - 5000
7. >5000

Q3. Is any other member of the household employed?
YES [ ] NO [ ]

Q4. If the answer to the question above is YES, complete the table below.

Employment type	Income per Month

(iii) Household Expenditure Patterns

Q1. How much did the household spend on the following items during the last month (30 days)?

Items	Expenditure in Cash	Expenditure in Kind
1.Food		
2.Rent		
3. refuse collection		
4. sewage repairs		
5. water		
6. refuse + water ***(if combined)***		

Q2. Which item constitutes the largest proportion of the household expenditure?[ ]

Q3. Which item constitutes the least proportion of household expenditure?
[ ]

How do you budget for different expenditures. Who is responsible for paying for water, sanitation food school fees, rent etc

C Water and Sanitation

Q1. Which of the following water sources are used by the household?

	Piped water inside	Piped water outside	Communal tap	Protected well of borehole	Unprotected well	Collection rain water	River lake, stream or dam	others specify
Number available and used								
number available but not used								
Distance ranked								
Distance km								
time minutes								

Distance Ranked: *if the respondent is unable to estimate the distance to each water source from the household in km ask them to rank the distance using the following ranks*:
1=Closest 2=Second closest 3=Third closest

Q2. How many litres of water do you use per day? [ ][ ][ ][ ] litres

Q3. If the household uses a well for drinking water, what is the depth of the well?
[ ][ ]metres

Q4. How far is the main source of drinking water from the toilet?
[ ][ ][ ][ ]metres

Q5. What type of toilet is currently used by the household members?
1. Flush toilet
2. Blair toilet
3. Pit toilet
1 None

Q7. If the household uses a Blair or pit latrine, what is the depth of your latrine?
[ ][ ]metres

Q8. Is the toilet suitable for use by children under six years? Yes [ ] No [ ]

Q9. If the answer to the question above is NO, why is the toilet not suitable for use by children under six years?

1. .....
2. .....
3. .....
4. .....
5. .....

Q10. How do you dispose of children excreta?

.....
.....
.....
.....
.....

Q7. Is the toilet separated from the bathing room? Yes [ ] No [ ]

Q9. What is the type of toilet ownership? [ ]

1. Communal
2. Private/Individual

Q10. If the toilet is communal, how many households share the toilet? [ ][ ][ ]

Q11. How many people share a toilet? [ ][ ][ ]

Q12. Who cleans the communal toilet?

1.....
2.....
3.....
4.....
5.....

5. inconvenience of location
6. cleanliness
7. Others(specify).....

Q15. Which other types of toilets are you familiar with besides the one which you are using

1. .....
2. .....
3. .....
4. .....
5. .....

Q16. How did you get the toilet?

.....
.....
.....
.....
.....
.....

Q17. Did you contribute in cash or kind toward the construction of the toilet?
Yes [ ] No [ ]

Q18. If the answer to the question above is yes what did you contribute?

1. Z$.....
2. Labour
3. Others (specify).....

Q19. How far is the toilet from the house? [ ][ ][ ]metres

Q20. Who decided the location of the toilet?

.....

Q21. How often do you clean the toilet? [ ]
1 = twice a day 2 = once per day 3 = once per week 4 = others

Q22. How many sewage blockages do you experience per month? [ ][ ][ ]

Q25. How many times are refuse containers collected per week? [ ][ ][ ]

Q26. Have you ever dumped waste on places other than the refuse container/pit?
Yes [ ] No [ ]

Q27. If the answer to the question above is Yes, what are the reasons for dumping solid waste on places other than the refuse container/pit?

1. .....
2. .....
3. .....
4. .....
5. .....

Q25. and Do you think poor sanitation (poor drainage, indiscriminate dumping of solid waste unsanitary latrines) is a health hazard?
Yes [ ] No [ ]

Q26. If the answers to the question above is YES, which diseases do you think are linked to poor sanitation?

1. .....
2. .....
3. .....
4. .....
5. .....

Q27. Did any household member suffer from the following diseases in the past three months? YES [ ] NO [ ]
1=Diarrhoeal 2=ascariasis 3=hookworm 4=schistosomiasis 5=trachoma 6=malaria

Q28. If the answer to question 24 above is Yes, what do you think were the causes of the disease?

1. .....
2. .....
3. .....
4. .....
5. .....

Q29. How far is the local authority/industrial dumping site from your house?

2. .....
3. .....
4. .....
5. .....

Q32. Did the household receive any advice from the environmental health technicians over the past two months (60 days)? Yes [ ] No [ ]

Q33. Where do you dispose of water from bathing, laundry and cooking?

1. Nearest pond
2. Ditch
3. Road
4. Open drainage
5. Others Specify .....

Q34. Are there drainage facilities for storm and waste water?
Yes [ ] No [ ]

Q35. How often are these drainage facilities cleaned?

1. Very often
2. Often
3. Never

Q34. What problems (if any) do you have with disposal of wastewater?

1. .....
2. .....
3. .....
4. .....
5. .....

D. Community Participation

Q1. Who is the local Authority in this area? [ ]

1. Municipality
2. Rural District Council
3. Local Board
4. Others (specify.....

Q2. What do you think are the roles and responsibilities of the local authority in sanitation?

1.....
2.....
3.....
4.....
5.....

Q3. What do you think are the roles and responsibilities of NGOs in sanitation?

1.....
2.....
3.....
4.....
5.....

Q4. What do you think are the roles and responsibilities of the private sector in sanitation?

1.....
2.....
3.....
4.....
5.....

Q5. Which government ministries and departments are involved in the provision of sanitation facilities and services

Q6. Which Private companies are involved in the provision of sanitation facilities and services?

1.....
2.....
3.....
4.....
5.....

Q7. Which Non-Governmental Organisations are involved in the provision of sanitation facilities and services

1.....
2.....
3.....
4.....
5.....

Q8. Do you have a committee which represents you?
Yes [ ] No [ ]

Q9. Did you take part in the selection of the representatives
Yes [ ] No [ ]

Q10. Are you consulted when the council is setting refuse collection/sewage fees?
Yes [ ] No [ ].

Q11. Is there any way you can influence the level and quality of sanitation which are provided in your area? Yes [ ] No [ ]

Q12. How do you report sewage blockages?

.....
.....
.....

Q13. What do you do if refuse is not collected in time?

.....
.....
.....
.....

Q14. How do you communicate your needs and concerns to the Local Authority?

.....

.....

.....

.....

.....

.....

.....

Q15. Which NGOs, private companies or donors are helping to improve the sanitary situation in your area?

1.....

2.....

3. .....

4.....

5.....

Q16. Did the organisation assess your needs and capabilities before implementing the project?

Yes [ ] No [ ]

Q17. Did you contribute anything during the project? (planning, implementation and operations and maintenance and cost recovery)

Yes [ ] No [ ]

Q18. Are you willing to take part in the cleaning of local streets/drainage?

Yes [ ] No [ ]

Q19. Are there any informal refuse collection/recycling in the area?

Yes [ ] No [ ]

Q21. Are you willing to work together with the local authority, the private sector and NGOs to improve sanitation services in your area?

Yes [ ] No [ ]

Q22. What constraints are you currently facing which prohibit you from working closely with the Local Authority, Private Sector and NGOs to improve sanitation services in the area

Q23. How do you thing these constraints can be solved so that the local community, local authority, private sector and NGOs all work together to improve sanitation services in the area?

.....
.....
.....
.....
.....
.....

E. Community Needs/Perceptions

Q1. What are the major problems which you are facing in this area? (starting with the most important)

1 .....
2 .....
3. .....
4 .....
5.....

Q2. Is sanitation a priority problem? Yes [ ] No [ ].

Q3. Do you think it is important to improve sanitation condition in this area? ?
Yes [ ] No [ ]

Q4. If the answer to the question above is **YES,** why do you think it is important to improve sanitation?

1 .....
2 .....
3. .....
4 .....
5.....

Q5. Are you satisfied with the sanitation services which are provided?
Yes [ ] No [ ]

Q6. If the answer is No, what do you think the local authority, NGOs or the private sector should do to improve the quality of services?

.....
.....
.....
.....
.....

Q7. Are you willing to work with the local authority, NGOs and the private sector to improve sanitation in the area?Yes [ ] No [ ]

Q8. If the answer to the question above is YES, what role do you think you (the household and the local community) should play in the improvement of sanitation services?

F Willingness To Pay for improved Sanitation

Opening Statement

In this section I would like to determine your willingness to pay for improved sanitation. Here ***SANITATION*** means the safe collection and disposal of solid waste, human excreta and wastewater.

Rapid urbanization in Zimbabwe out-pace the rate at which the government and local authorities can provide sanitation services. As a result latrines are awfully inadequate or not available at all, solid waste is not collected and there are no drainage facilities. Poor sanitation conditions lead to sanitation related diseases such as diarrhoea and cholera. Diarrhoea alone kills over 3 million children each year. This project is aimed at improving sanitation conditions in poor urban areas so that these diseases can be prevented. However, government alone cannot provide the necessary facilities and communities are expected to assist in any way they can.

The questions in this section are aimed at determining how much you would be willing to contribute in cash or kind towards improved sanitation in this area. Improved sanitation means efficient solid waste collection and safe disposal, good wastewater and storm water drainage, and the use of sanitary latrines. Although you will be asked how much you are willing to pay for solid waste management, household Blair latrine, and drainage separately, you are reminded that these payments will all be made monthly and will reduce the amount of money available for the purchase of other commodities. The information you give will affect the design of projects that are aimed at improving sanitation services in poor urban areas. You are kindly requested to give information which is as accurate and as realistic as possible. Always consider your income and

Q1: Suppose you were given a household refuse bin which would be collected three times a week. Money will be needed to buy the bins and pay for labour, fuel for the tractor, uniform for the workers and tools. Therefore households would be required to pay monthly charges in order to cover these costs. Do you have any questions before we continue?

.....

(i) Would you be willing to pay (in cash or kind) for this service Yes [ ] No [ ]
(if yes go to (iii))

(ii) If the answer to question **(i)** above is **NO** what are your reasons

(a) .....
(b) .....
(c) .....
(d) .....

(iii) Given your income of Z$----- and expenditure pattern of – on rent and –on food, would you be willing to pay Z$20.00 per months for improved solid waste collection? **YES** [ ] **NO** [ ]

Q3: What is the maximum amount that you would be prepared to pay per month for improved refuse collection?

(a) In cash Z$..... or.
(b) In kind .....

Q4: What are your reasons for willing to pay the amount you have stated in question **Q3** above?

1. .....
2. .....
3. .....
4. .....
5. .....

[The following question should be administered to households without any latrine or those using unsanitary facilities]

Q5: Suppose the local authority or NGOs in this area embark on a Blair latrine

(i) Are you willing to pay (in cash or kind) for the construction of a household Blair Latrine [ ] No [ ] ***(if yes go to (iii))***

(ii) If the answer to question **(i)** above is **NO** what are your reasons

a) .....
b) .....
c) .....
d) .....

(iii) Which organisation would you be willing to pay to?
Local authority [ ] NGOs [ ]

(iv) Given your income of Z$----- and expenditure pattern of – on rent and –on food, are you willing to pay Z$250 for the construction of a household Blair latrine? **YES** [ ] **NO** [ ]

Q6: What is the maximum amount you are willing to pay per month for the construction of the household Blair Latrine?
(a) In cash Z$..... or
(b) In kind .....

Q7: What are your reasons for willing to pay the amount you have stated in question **Q6** above?

1. .....
2. .....
3. .....
4. .....
5. .....

Q8: Suppose wastewater and storm water drainage facilities were constructed in your area and people were employed to clean the drains to avoid flooding. Do you have any questions before we continue?

(i) Would you be willing to pay (in cash or kind) for the cleaning of the drainage facilities Yes [ ] No [ ] ***(if yes go to (iii))***

(ii) If the answer to question **(i)** above is **NO** what are your reasons

(a) .....
(b) .....

Q9: What is the maximum amount which you would be prepared to pay per month for the cleaning of wastewater and storm water drainage facilities?
(a) In cash Z$..... or
(b) In kind .....

Q10: What are your reasons for willing to pay the amount you have stated in question **Q9** above?
1. .....
2. .....
3. .....
4. .....
5. .....

Q11: Suppose the local authority embarks on a project to improve public environmental sanitation by upgrading the dumpsite, and employing more people to clean the streets, the neighbourhood, the market place and the bus terminus; and to treat human excreta to safe standards before disposing it in natural water courses. More resources will be needed to achieve this and residents will be required to contribute. Do you nave any questions before we continue?

(i) Would you be willing to pay (in cash or kind) for the improvement of public environmental sanitation Yes [ ] No [ ] ***(if yes go to (iii))***

(ii) If the answer to question **(i)** above is **NO** what are your reasons
(a) .....
(b) .....
(c) .....
(d) .....

(iii) Given your income of Z$----- and expenditure pattern of – on rent and –on food, would you be willing to pay Z$50 for improved environmental sanitation in the area **YES** [ ] **NO** [ ]

Q12: What is the maximum amount you would be willing to pay per month for the improvement of environmental sanitation in the areas?
(a) In cash Z$..... or
(b) In kind .....

Q14:: If you are willing to pay for the improvement of sanitation services in your area (that is refuse collection, latrines, drainage and environmental sanitation), which mode of payment would you prefer?

1: A sanitation tax on all workers which should be collected by government
2: Pay monthly contributions to the local authority
3: Pay monthly contribution to the local Community Based Organisation
4: Pay monthly contributions to a Local NGO
5: Others (Specify).....

Thank you for your contribution and co-operation!!

Appendix 3: Summary of Study Sites Characteristics.

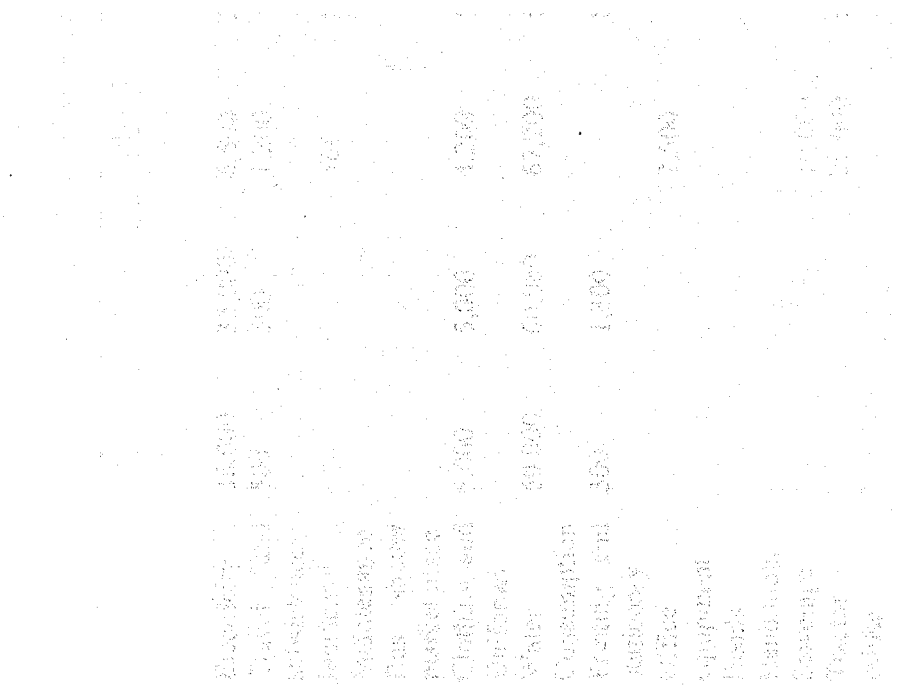
Country	Study site	Locality	Legal status and authority	Population+
ZIMBABWE	Newlines	Mbare (Inner Harare)	Legal (Harare City Council)	10,000
	Shawasha		Legal (Harare City Council	8,000
	Zinyengere	Epworth (near Harare)	Uncertain (Local Board)	100,000
	Overspill		Legal (Local Board)	
	Gada		Illegal	
	Old Location	Gutu (growth point)	Legal (Central Rates Fund)	22,000
	Hwiru		Legal (Rural District Council)	
	Farmagrida		Illegal	
	Cheziya	Gokwe (growth point)	Legal (Rural District Council)	60,000
	Mafungautsi		Legal (Rural District Council)	
	Nyaradza		Legal (Rural District Council	

Note: + Figure is local authority estimate.

Appendix 4: Names of Persons Interviewed

Name	Position	Organisation
Dr T. Stamps	Minister	Ministry of Health and Child Welfare
Dr D. Parirenyatwa	Deputy Minister	Ministry of Health and Child Welfare
Mr Mudege	Director	Institute of water and sanitation Development
Dr Ndamba	Research Manager	Institute of water and sanitation Development
Ms Nyoni	Depute Director	Institute of water and sanitation Development
Mr Sibanda	Training Officer	Institute of water and sanitation Development
Dr Saywell	Researcher	WEDC
Dr Tayler	Consultant	GHK International
Dr Stevens	Lecturer	London School of Health and Tropical Medicine
Mr Fawcett	Lecturer	Southampton University
Mr Murenga	Officer	Inter-Country People's Aid (IPA)
Mr Chidavaenzi	Officer	Blair Research Institute
Mr Proudfood	Director	Mvuramanzi Trust
Dr Gumbo	Lecturer	University of Zimbabwe
Prof Whittington	Lecturer	University of North Carolina
MRS Mambudu		MLGPWNH
Mr Matinyarare		MLGPWNH
Mr Gwachiwa	Commissioner	Gokwe Town Board
Mr Mbire	Planning Officer	Gokwe rural District Council
Mr Mpofu	Environmental Health Officer	Gokwe District Hospital
Mr Magurane	Senior Clerk	Gokwe Central Rates Fund
Mr Mutanda	Assistant District Administrator	Gokwe District

	Services	
Mr Kuimba	Public Relations Officer	Harare City Council
Mr Guzha	Officer	Mvuramanzi Trust
Mr Chari	District Officer Mbare	Harare City Council
Mr Chive	Chairman	Mbare Residents Association
Mrs Zimbudzana	Market Supervisor	Harare City Council Mbare District
Mr Paradzai	Superintendent	Central Rates Fund Gutu
Mr Mugabe	Assistant Superintendent	Central rates Fund Gutu
Mrs Mugadza	Environmental Health Technician	Ministry Of Health and Child Welfare Gutu
Mr Chinamatira	Environmental Health Technician	Ministry Of Health and Child Welfare Gutu
Mr Madondo	Councillor	Gutu Growth Point
Mr Mukaro	Chief executive Officer	Gutu rural District Council
Mr Mtimukhulu	Planning Officer	Gutu Rural District Council
Mr Chimombe	Education Officer	Gutu Rural District Council



Appendix 5: Local Authority Expenditure at Gutu Growth Point

Table A5.1: Expenditure of the Central Rates Fund at Gutu Growth Point (Z$)

Item	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1999	2000
Telephone	1,500	1,500	1,800	2,000	2,500	2,625	3,000	3,200	3,000	15,000
Transport	2,500	2,500	3,000	5,000	5,500	5,775	7,000	7,400	7,000	
Electricity	36,000	35,000	6,500	28,000	44,500	25,725	25,000	26,300	23,800	70,000
Travel and subsistence	500	500	1,200	1,500	1,000	1,050				80,000
Incidental			364	800		840	500	500	500	20,000
Maintenance					1,500	1,575	1,000	1,100	1000	15,000
Bus shelter market place										
Clothing and Uniforms	5,000	5,000	4,200	5,000	6,100	6,175	6,000	6,300	6,000	45,000
Water Consumption	60,000	60,000	67,200	50,500	60,500	63,525	70,000	74,000	70,000	150,000
Printing and stationary	300	1,300		800		1,050			10,000	15,000
Office equipment			2,500	1,500						
Roads				45,000	35,000	36,750	45,000		44,600	150,000
Hand tools				1,000	1,100	1,155	2,000	2,100	2,000	2,500
Sewerage			10,000	15,000	20,000	21,000	15,000	15,800	14,800	
Tractor refuse collection			20,000	5,000	2,500	2,625	10,000	10,500	9,000	120,000
Workshop stock			600	750	800	840	5,000	5,300	5,000	20,000
Water reticulation			7,500	8,000		10,000	7,500	7,900	7,100	

Table A5.2: Gutu Rural District Council Expenditure on Sewerage

	Gutu Rural District Council				
Items	**1995**	**1996**	**1997**	**1998**	**1999**
Plumber	11,304.00	15,060.00	18,927.00	25,236.00	33,648.00
Casual labour	7,724.00	8,372.50	7,724.00	22,750.00	37,993.64
Sewerage Maintenance	5,821.86	1,226.63	12,217.50	8,265.00	13,187.73
Transport	32,533.31	27,823.61	26,709.72	21,040.00	24,930.48
Protective Clothing	728.00	1,461.22	1,863.32	3,138.48	3,138.48
Material Stores	6,084.20	181.69	15,844.33	17,373.47	3,360.00
Sewerage Construction	500,000				
Expenditure	**564,195.37**	**54,125.67**	**83,285.87**	**97,803.43**	**116,258.33**

APPENDIX 6: FREQUENCY DISTRIBUTION OF WILLINGNESS-TO PAY BIDS

Statistics				
	WTP for Improved Refuse Collection	**WTP for the Construction of a Blair Latrine**	**WTP for Improved Drainage**	**WTP for Improved Environmental Sanitation**
Mean	24.8859	388.1620	13.2231	46.4930
Std. Error of Mean	1.3052	16.7010	.7991	3.6252
Median	20.0000	150.0000	10.0000	5.0000
Mode	20.00	.00	10.00	.00
Std. Deviation	47.7063	511.4978	26.0280	127.7587

Figure A6.1: WTP for Improved Refuse Collection

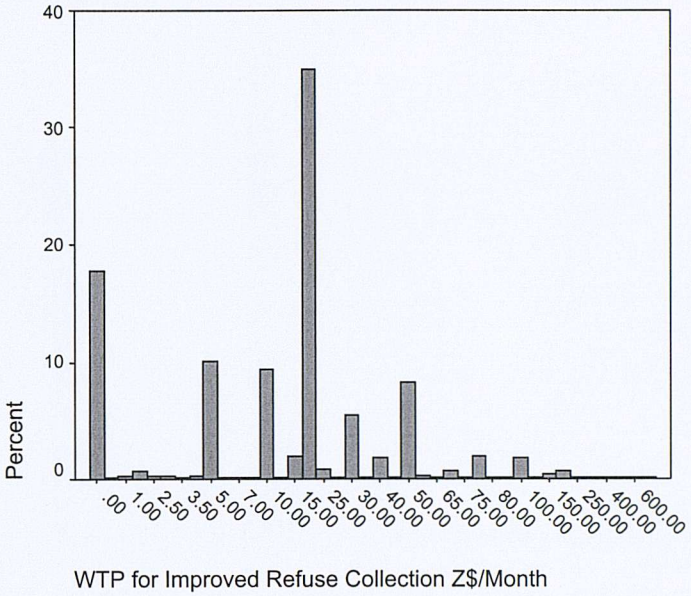


Figure A6.2: WTP for Blair Latrine Construction

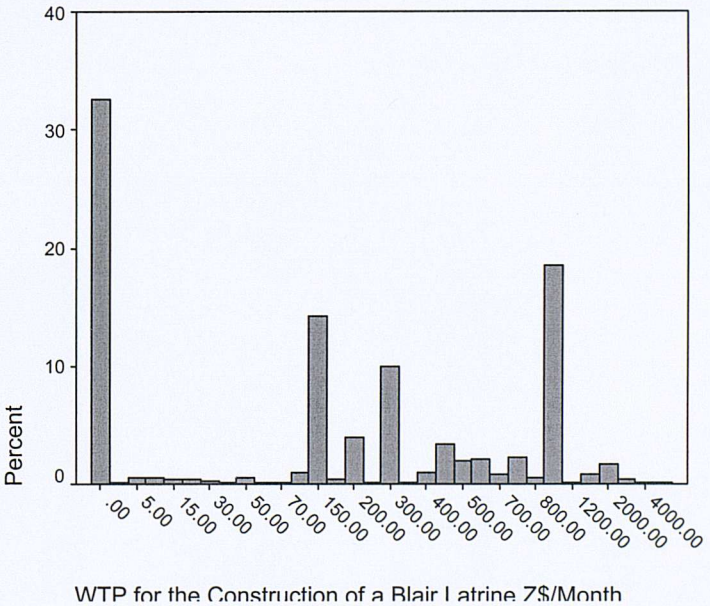


Figure A6.3: WTP for Improved Drainage

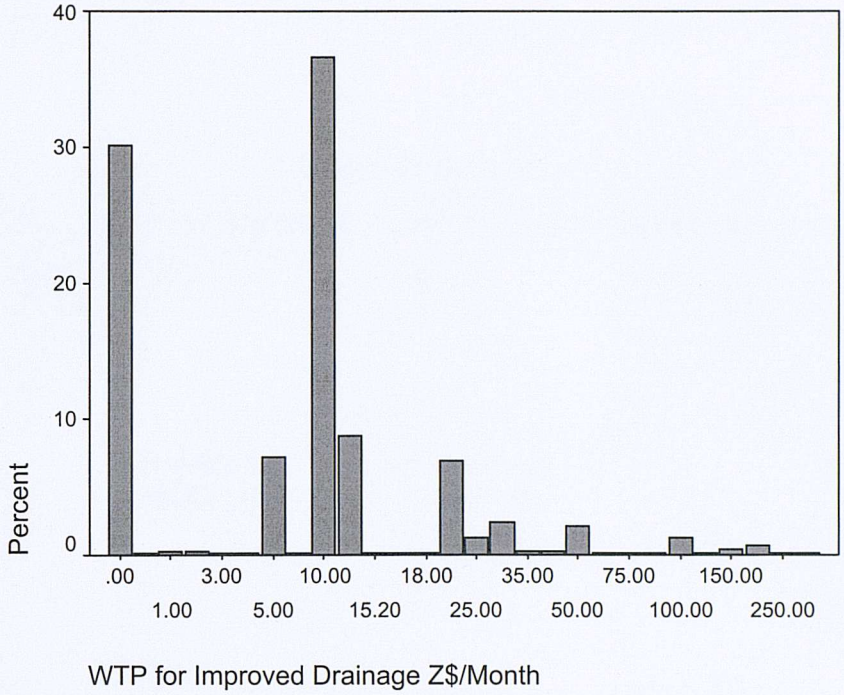
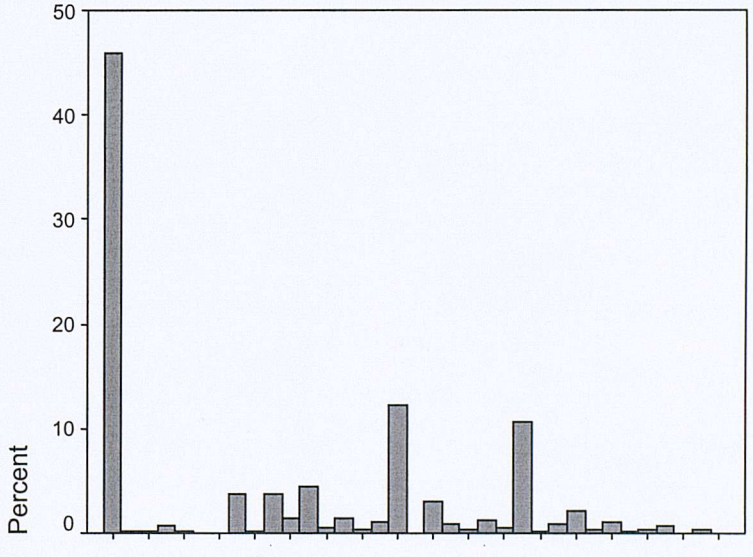


Figure A6.4: WTP for Improved Environmental Sanitation



APPENDIX 7: FULL REGRESSION MODELS

Table A7.1: Solid waste Management Regression Model

Model Summary(b)					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.849(a)	.721	.595	17.6370	1.437

Coefficients(a)								
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
Model		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.604	18.807		.245	.808		
	Tenure	-7.986	21.052	-.137	-.379	.707	.069	14.402
	Sex	2.580	7.028	.046	.367	.716	.575	1.740
	Education	-.101	.936	-.014	-.108	.915	.524	1.910
	House Ownership	-2.601E-02	12.843	.000	-.002	.998	.172	5.810
	House Quality	19.105	6.605	.340	2.892	.007	.651	1.537
	Bank Account	2.263	8.567	.030	.264	.793	.714	1.400
	Income	28.653	15.279	.213	1.875	.070	.696	1.436
	Bin	50.126	17.147	.892	2.923	.006	.097	10.356
	HH sharing	-1.258	.805	-.196	-1.563	.128	.573	1.745

Disease	8.546	8.265	.146	1.034	.309	.450	2.220
Priority	-6.714	9.667	-.121	-.695	.493	.294	3.396
Satisfaction	-3.235	10.644	-.052	-.304	.763	.310	3.230
Mode of payment	13.246	6.369	.242	2.080	.046	.667	1.500
Expenditure	-4.436E-02	.167	-.034	-.266	.792	.551	1.817

a Dependent Variable: WTP for SWM

Model	Dimension	Eigenvalue	Condition Index
1	**1**	7.876	1.000
	2	2.335	1.837
	3	1.126	2.645
	4	.706	3.340
	5	.659	3.458
	6	.526	3.871
	7	.474	4.075
	8	.444	4.212
	9	.305	5.084
	10	.228	5.883
	11	.112	8.371
	12	9.758E-02	8.984

13	7.943E-02	9.958
14	2.266E-02	18.642
15	1.142E-02	26.256

Table A7.2: Blair Latrine Regression Model

Model Summary(b)					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.411(a)	.169	.135	578.9306	1.681

Coefficients(a)								
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
Model		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	208.187	159.270		1.307	.192		
	Tenure	65.799	104.073	.040	.632	.528	.523	1.913
	Sex	76.022	59.542	.061	1.277	.202	.954	1.048
	House Ownership	377.807	93.518	.270	4.040	.000	.481	2.079
	House Quality	-7.895	67.847	-.006	-.116	.907	.723	1.382
	Bank Account	-126.113	85.964	-.072	-1.467	.143	.900	1.111
	Disease	32.729	67.018	.024	.488	.626	.892	1.121
	Priority	48.958	66.868	.036	.732	.465	.864	1.158
	Satisfaction	-201.140	102.141	-.097	-1.969	.050	.891	1.122
	Mode of payment	-142.427	64.069	-.109	-2.223	.027	.897	1.114

Type of toilet	-258.101	93.204	-.154	-2.769	.006	.690	1.449
Toilet Ownership	281.925	100.591	.186	2.803	.005	.485	2.062
TSharing	53.306	73.178	.042	.728	.467	.651	1.536
TSatisfaction	-220.348	84.201	-.147	-2.617	.009	.681	1.469
Income	222.503	105.325	.102	2.113	.035	.921	1.086
Education	11.410	8.730	.067	1.307	.192	.825	1.213
Expenditure	0.690	3.797	.138	2.882	.004	.940	1.063

a Dependent Variable: WTP for HH Latrine

Model	Dimension	Eigenvalue	Condition Index
1	**1**	7.781	1.000
	2	1.836	2.058
	3	1.023	2.757
	4	.950	2.861
	5	.840	3.044
	6	.762	3.195
	7	.740	3.243
	8	.592	3.625
	9	.564	3.715

	10	.497	3.956
	11	.404	4.390
	12	.364	4.625
	13	.306	5.045
	14	.132	7.677
	15	.108	8.496
	16	7.445E-02	10.223
	17	2.655E-02	17.120

Table A7.3: Drainage Regression Model

Model Summary(b)					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.472(a)	.223	.199	26.8244	1.902

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1.663	6.092		-.273	.785		
	Tenure	-2.354	4.807	-.027	-.490	.625	.529	1.890
	Sex	-4.467E-02	2.475	-.001	-.018	.986	.956	1.046
	Education	.121	.365	.015	.332	.740	.816	1.226
	House Ownership	-2.940	3.603	-.044	-.816	.415	.550	1.817
	House Quality	-.871	3.027	-.014	-.288	.774	.637	1.570
	Bank Account	-2.269	3.404	-.028	-.667	.505	.904	1.106
	Income	3.277	3.971	.035	.825	.410	.876	1.142
	Tap Within HH	6.638	3.353	.104	1.980	.048	.571	1.752
	Disease	6.680	2.610	.106	2.560	.011	.919	1.088
	Drainage Facilities	-7.642	3.148	-.112	-2.427	.016	.741	1.350
	Drainage Problem	25.148	2.597	.408	9.682	.000	.893	1.120

Priority	4.701	2.668	.073	1.762	.079	.928	1.078
Satisfaction	-2.891	4.934	-.024	-.586	.558	.932	1.073
Mode of payment	8.640	2.670	.135	3.236	.001	.917	1.090
Expenditure	-7.210	6.545	-.048	-1.102	.271	.824	1.214

Model	**Dimension**	**Eigenvalue**	**Condition Index**
1	**1**	7.931	1.000
	2	1.379	2.398
	3	1.033	2.771
	4	.911	2.951
	5	.772	3.206
	6	.718	3.324
	7	.624	3.565
	8	.599	3.639
	9	.527	3.881
	10	.504	3.968
	11	.320	4.982
	12	.248	5.651
	13	.215	6.073
	14	.113	8.390

	15	7.710E-02	10.142
	16	2.982E-02	16.308

Table A7.4: Environmental Sanitation Regression Model

Model Summary(b)					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.577(a)	.333	.320	83.9947	1.881

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-15.274	15.554		-.982	.326		
	Tenure	8.523	12.217	.027	.698	.486	.680	1.471
	Sex	-2.792	6.808	-.013	-.410	.682	.966	1.035
	Education	1.108	1.023	.038	1.083	.279	.833	1.200
	House Ownership	12.221	8.707	.054	1.404	.161	.686	1.459
	House Quality	6.294	7.577	.030	.831	.406	.805	1.243
	Bank Account	1.750	9.251	.006	.189	.850	.934	1.071
	Income	19.120	9.914	.067	1.929	.054	.853	1.172
	Disease	2.663	6.938	.013	.384	.701	.972	1.029
	Priority	-10.986	7.486	-.049	-1.468	.143	.943	1.061
	Satisfaction	17.863	12.273	.048	1.455	.027	.945	1.059
	Mode of payment	-4.318	6.944	-.020	-.622	.534	.960	1.042
	Expenditure	-0.858	17.752	-.077	-1.221	.027	.868	1.152
	Environmental Awareness	115.246	6.926	.559	16.640	.000	.915	1.093

Model	Dimension	Eigenvalue	Condition Index
1	1	7.273	1.000
	2	1.133	2.533
	3	1.039	2.645
	4	.709	3.202
	5	.669	3.296
	6	.638	3.377
	7	.582	3.535
	8	.566	3.585
	9	.479	3.898
	10	.450	4.021
	11	.235	5.564
	12	.116	7.935
	13	7.707E-02	9.714
	14	3.453E-02	14.513