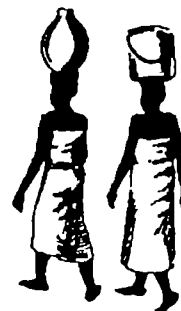


URBAN SANITATION IN ZIMBABWE AND THE RELATION TO ENVIRONMENTAL POLLUTION

Library
IRC International Water
and Sanitation Centre
Tel: +31 70 35 889 89
Fax: +31 70 35 889 84



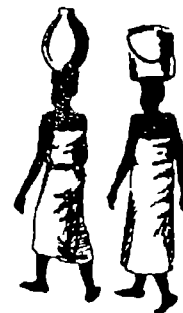
Institute of Water and Sanitation Development

ACRONYMS

CRF	Central Rates Fund
CSO	Central Statistical Office
DDF	District Development Fund
DWR	Department of Water Resources
MLAWR	Ministry of Lands and Water Resources
MLGRUD	Ministry of Local Government, Rural and Urban Development
MOF	Ministry of Finance
MOHCW	Ministry of Health and Child Welfare
MPCNH	Ministry of Public Construction and National Housing
PCB	Pollution Control Branch
RDC	Rural District Council
WPAB	Water Pollution Advisory Board
ZINWA	Zimbabwe National Water Authority

Library
IRC International Water
and Sanitation Centre
Tel.: +31 70 30 689 80
Fax: +31 70 35 899 64

URBAN SANITATION IN ZIMBABWE AND THE RELATION TO ENVIRONMENTAL POLLUTION



Institute of Water and Sanitation Development

LIBRARY IRC
PO Box 93190, 2509 AD THE HAGUE
Tel.: +31 70 30 689 80
Fax: +31 70 35 899 64

BARCODE: 14008
LO: 824 2w97

March 1997

URBAN SANITATION IN ZIMBABWE AND THE RELATION TO ENVIRONMENTAL POLLUTION

EXECUTIVE SUMMARY	3
BACKGROUND	6
Urban Africa	6
Urban Sanitation current trends	9
URBAN ZIMBABWE	11
Urban growth	11
Access to sanitation service in urban areas	12
Technology choice	12
Effluent disposal	14
Institutional rôles and responsibilities	16
Financing of urban sanitation	18
Operational status of technology	20
Regulation	22
Human resources	26
CONCLUSIONS	27
Coverage/ technology	27
Operation and maintenance issues	27
Legislation	27
Management of pollution	28
Investment and financing	29
Environmental and health concerns	30
Human resources issues	30
Institutional issues	31
REFERENCES	32

Acknowledgments

We would like to thank Mr M Mtetwa, Pollution Control Branch, Department of Water Resources, for assistance with information collection and analysis. The UNDP-World Bank Water and Sanitation Program (RWSG - EA) provided financial assistance for the preparation of the report. We are grateful to Dr P Robinson for comments on the draft.

**Dr. P. Taylor and Eng. N. R. Mudege,
Institute of Water and Sanitation Development, Box MP 422, Mount Pleasant
Harare, Zimbabwe.**

EXECUTIVE SUMMARY

In urban areas of the developing world, inadequate sanitation is one of the principal health problems facing the poor. Almost 40% of the urban population in low income countries remain without adequate sanitation despite massive investments during the 1980's. Additionally, a growing awareness of the limited availability of fresh water resources draws attention to the impact of sanitation services, or the lack of them, on the availability and usefulness of our water resources. Sanitation is thus inextricably linked to the broad development process as well as to the specific issues of environment, health and water resources management.

In most African countries the largest cities grow most rapidly with urban growth estimated at 4.37% per annum across Africa and 5.28% in Zimbabwe where over one third of the urban population live in Harare. Poor people, informal settlements and squatters all tend to be found on the worst land - steep slopes, low lying land prone to flooding, areas with high water table - and they may not be settled in a pattern convenient for service delivery, all of which can severely limit the sanitation options. The provision of services in urban areas often favours the well off with subsidies whilst denying the disadvantaged. The high cost of sewerage has limited the technology choice for many cities in Africa and the confusion of regulatory and implementation roles of government has weakened the ability of many governments to enforce service standards.

Coverage with sanitation services averages 70% across Africa but the quality of that service is hard to determine. In Zimbabwe coverage with acceptable sanitation (flush toilets) in the urban areas varies from 85 to 98%. A total of 42,996 households do not have access to adequate sanitation in urban areas on the basis of census figures. A survey of 1910 urban households by CSO in 1994 confirmed the high access to flush latrines but also reported that 28.8% of urban households were sharing a flush toilet. Urban growth in Zimbabwe has been accompanied by increased subletting and the construction of backyard shacks which have resulted in the sharing and overloading of household toilets.

The focus on water borne systems for urban areas has the consequence that water supplies must be reliable and also that a full sewerage system is required. There is a good range of waste disposal technologies in use in Zimbabwe from the simple pit latrine (not allowed in urban areas) to full sewerage with activated sludge treatment systems. The majority of off-site treatment systems use oxidation ponds but there is increasing adoption of more advanced treatment systems. There is generally a lack of information at municipal level on the system capacity and actual flows for sewerage systems. A large number of the smaller systems throughout Zimbabwe, mainly ponds, have no flow measuring devices.

The quality and disposal of treated effluent is a factor of major concern when considering the environment and the sustainable use of limited water resources. There is no mechanism for systematically recording how or where effluent is disposed of but the records from visits of the Pollution Control Branch in the Department of Water Resources (PCB) to waste water treatment works shows that the majority of wastewater treatment plants dispose of treated effluent to natural water bodies or use

it in irrigation. Of these systems almost 50% produce effluent of poor quality. Lake Chivero is an example where inadequately treated effluent and inadequate controls over industrial effluent are believed to contribute to unacceptable levels of pollutants in the lake.

There are few examples of true recycling of treated wastewater in Zimbabwe but Marondera has been actively examining the cost benefits of recycling water from the wastewater treatment plant rather than constructing an expensive new water storage and reticulation system.

Responsibility for sanitation does not fall clearly within any government agency. Whilst local authorities are tasked with responsibility for service provision, unlike with water supplies, they do not have any technical agency to resort to for advice, policy guidelines or other technical support. Urban sanitation standards are set and controlled through a variety of legislative mechanisms from the Housing Standards set by MLGRUD, the Public Health Act enforced by the MOHCW and the Water Act enforced by the MLWR.

Within urban authorities there is usually a works division with a subdivision dealing with water and sewerage. Smaller urban authorities may lack the services of an engineer and rely on artisans whereas growth points and service centres may lack even this level of technical support with no clear allocation of responsibility to the local authority or Local Board. The Central Rates Fund (CRF) builds, owns, operates and maintains sanitation systems in small urban centres. In all cases the CRF has retained responsibility for the maintenance of the facilities it has constructed but is experiencing difficulty due to reduced budgetary allocations. The CRF does not act as a fund but as a supplier of goods and services at subsidised prices.

Large urban centres in Zimbabwe are considered to be providing a reasonably well managed service as regards water supply and sanitation and are considering separating the water and sewerage department to improve efficiency and management of the services. Municipalities largely manage to finance the operation and maintenance of the sewerage system from the income from sewage charges but there is no strong linkage between the real cost of effective service provision and the service charge applied with the consequence that service charges may lag behind the cost of provision or income from the service may be used to finance other local authority activities to the detriment of the sanitation service. The general trend is that operation and maintenance is under-financed resulting in a gradual decay of the system to the point where a very large investment is required for rehabilitation.

The condition of the wastewater treatment plants when last visited by the PCB shows that only 20% could be regarded as good with almost 45% in the poor category. There is no fixed schedule of examination of sites by PCB who are understaffed. From 1971 to 1991 107 original exemption permits were granted to allow temporary discharge of inadequately treated waste and in many cases the exemption was renewed, even for periods of over 10 years, without the pollution being controlled.

The majority of sewerage reticulation systems are facing problems due to overloading in the high density areas. Where additional treatment works have been built or

extensions made to existing ones, often the reticulation system has not been upgraded as the increased flows are coming from infilling or densification, subletting and increased occupancy rates

Laboratory services are found in the main urban centers and these provide basic analysis of water and wastewater quality. The lack of access to laboratory services may present difficulties for the introduction of effective management of effluent quality.

The experience outlined in case studies suggests that the pollution control regulations are rarely enforced, prosecution rarely results and the low staffing levels of the PCB make investigation a long and drawn out process. Permits are often renewed for long periods of time. The data from the PCB suggests that a large number of agencies pollute without obtaining exemption permits and that exemption permits are only sought as a means of avoiding imminent prosecution.

Sanitation standards in urban areas are governed by the following.

- Town Planning Act
- Public Health Act
- Housing Standards Act

In terms of these regulations local authorities are forced to provide water borne sanitation and potable water supply in all urban areas. The water must be approved by the MOHCW who must also be satisfied with the standard of sanitation provided. There are no regulations requiring that wastewater treatment plants are operated by qualified or trained operators. The attention given to wastewater treatment is indirect, coming from the effects of discharge on water quality and the breach of the Water (Effluent and Waste Water Standards) Regulations, 1977. There is no regulatory act governing the performance, standard of operation, personnel qualifications, health and safety standards for wastewater treatment works and therefore there are no personnel able to supervise or assess these.

The problem of urban sanitation in Zimbabwe, unlike in other parts of Africa, is not primarily one of access to services but one of disposal of the effluent. Environmental pollution, reduction in usable water resources and health risks all result. An alternative pollution control management approach is suggested based on shifting responsibility from government to the discharge authority. A review of this system is urgently required to create an environment where pollution will be effectively and progressively controlled.

BACKGROUND

In urban areas of the developing world, inadequate sanitation is one of the principal health problems facing the poor. Almost 40% of the urban population in low income countries remain without adequate sanitation despite massive investments during the 1980's (Watson, G 1995, World Development Report 1994). The results are not difficult to see and they are largely restricted to the poorer communities of high density areas, informal and illegal settlements where sanitation systems are either not provided, have been allowed to fall into disrepair or are inadequate for the population they are expected to serve.

Additionally, a growing awareness of the limited availability of fresh water resources must draw attention to the impact of sanitation on the availability and usefulness of our water resources. Sanitation is therefore inextricably linked to the broad development process as well as to the specific issues of environment, health and water resources management.

Zimbabwe is not immune to these problems and, whilst generally proud of the level of its urban services, increasing pressures from rapid urban growth, economic constraints and the institutional reforms taking place under structural adjustment have already resulted in a decline in environmental health. This study looks at the present situation regarding urban sanitation in Zimbabwe and the actions being taken to maintain or improve the service.

URBAN AFRICA

Urban growth

Table 1 The growth of some African cities (Rossi-Espagnet, 1984, and CSO Zimbabwe.)

	Population in millions			City's popn (1980) as % of:	
	1950	1980	2000	National popn	Urban popn
Cairo	2.5	7.4	12.9	17.6	38.6
Addis Ababa	0.2	1.7	5.8	5.2	36.6
Nairobi	0.1	1.3	5.3	7.9	57.3
Kinshasa	0.1	3.1	8.0	11.0	28.0
Harare*	0.02	0.66	1.18	11.4	37.1

(* Harare data are from 1941, 1982 and 1992 and the national comparisons are for 1992)

In most countries the largest cities grow most rapidly and it is evident from Table 1 that there is a rapid urban growth taking place. In many African countries, including Zimbabwe, over one third of the urban population live in one city.

Whilst most developing countries in Africa are keen to slow down the rural to urban migration for a variety of reasons which include the access to services, so far no country has really succeeded (Nordberg & Winblad, 1992). Becker et al (1986) conclude that the migration is inevitable, not necessarily undesirable, a natural consequence of economic growth and reflects the not mistaken belief amongst the migrants that opportunities are in fact better in the urban areas.

URBAN SANITATION IN ZIMBABWE

Habitat, in a global report on human settlements (Habitat, 1996) shows a rapidly urbanising population in Africa and also Zimbabwe (Table 2) whilst other studies in Zimbabwe estimate urban growth to be even higher (Zimconsult, pers. comm.)

Table 2. Urbanisation trends in Africa, 1975-2025. (Habitat, 1996)

	% Total population in Urban settlements			Urban Population. Annual growth rate (%)		Rural population Annual growth rate (%)	
	1975	2000	2025	1975-2000	2000-2025	1975-2000	2000-2025
Africa	25.15	37.30	53.77	4.37	3.81	2.08	1.13
Zimbabwe	19.56	35.97	55.39	5.28	3.53	1.93	0.36

From Table 2 Zimbabwe shows a more rapidly urbanising population than Africa in general and will have almost 11 million urban residents by 2025.

Service coverage

Table 3. Urban sanitation coverage in Africa 1980-90 and expected coverage for the year 2000 at the current rate of progress. (Nordberg & Winblad, 1992; Christmas & de Rooy, 1991)

	Population (millions)	% Coverage	No served (millions)	No unserved (millions)
1980	119.77	65	77.85	41.92
1990	202.54	79	160.01	42.53
2000	332.49	73	242.17	90.32

Sanitation in urban areas tends to be more of a problem than water supply. During the International Drinking Water Supply and Sanitation Decade from 1980 to 1990 approximately 82 million urban residents in Africa were provided with adequate sanitation (Table 3) (Christmas & de Rooy, 1991)

However, there were almost the same number of unserved people in urban areas at the end of the decade as at the beginning and the rapid growth being experienced in urban populations suggest that the projections for the year 2000 could even be an underestimate. Figures from Africa published more recently show that from 36 countries listed, 15 had less than 50% of the urban population with access to sanitation facilities (World Bank, 1996)

Although official figures suggest that people in urban areas are better served than in rural areas, public provision to remove human excreta and to dispose of it safely is usually no better in poor urban neighbourhoods than it is in rural areas. The health

Some African Cities:

Dakar

Senegalese towns have no provision for the removal of household and public waste. A survey in 1980/81 found only 28% of households have private water connections. Nearly one sixth of human solid wastes is dumped outside proper toilet facilities.

Dar Es Salaam.

From a survey of 660 households at all income levels in 1986/87 47% have no piped water supply within the immediate vicinity. Only 13% of the dirty water and sewage is regularly disposed of. As many as 89% of households used simple pit latrines. Only 4.5% had toilets connected to septic tanks or sewers and most households had to share sanitary facilities.

Khartoum

The systems of water supply sewage disposal and refuse disposal are all inadequate both in the coverage of the urban area and the maintenance of the service. The municipal sewerage system serves only about 5% of Khartoum urban area and is susceptible to breakdowns when waste is discharged directly into the river or onto open land (Habitat, 1989)

problems that arise from this are usually more serious in urban areas due to the high population densities (Habitat, 1989, Wateraid, 1996)

Official figures of population covered with adequate services are often difficult to believe and unfortunately “adequate” is rarely defined and may include situations where a hundred or more people are expected to share a single public latrine, or where simple pit latrines are an accepted technology for high density urban communities. The figures quoted above however show that there is going to be an increasing number of urban residents without access to even the simplest form of latrine.

The Habitat report on human settlements (Habitat, 1996) presents a gloomy picture of a significant decline in service provision in urban areas of Africa. Whilst also recognising a transition from public investment and provision of services to increased private activity this is not widely practised with the resulting steady deterioration in services (see box on deterioration of services)

Deteriorating services

In many African cities, most refuse is uncollected and piles of decaying waste are allowed to rot in streets and vacant lots. Schools are becoming so overcrowded that many students have only minimal contact with their teachers. Basic drugs have disappeared from public clinics and professional medical care is extremely difficult to obtain. more and more people live in 'informal' housing, where clean drinking water must be directly purchased from water sellers at a prohibitive cost. In Dar Es Salaam there was a decline in expenditure on services and infrastructure of 8.5% per year from 1978/79 to 1986/87. The capital expenditures of the Nairobi City Commission (US\$ per capita) for water and sewerage fell from \$27.78 in 1981 to \$2.47 in 1987, and per capita maintenance expenditures fell from \$7.29 to \$2.30. Such figures suggest an alarming decrease in the ability of a modern African city to service the needs of its population. (Habitat, 1996)

South Africa evaluated access to sanitation in urban areas and included in the definition of urban the “dense settlements” to be found on the fringes of cities but not officially within the city limits (Table 4) (WRC, 1993). This type of settlement has as its primary economic base the urban economy yet usually ignored as they are not formally within a municipal area. Of those without adequate access to sanitation 51% are in metropolitan areas, 22% in towns and 27% in the “dense settlements” (WRC, 1994)

Table 4. Urban sanitation coverage in South Africa (WRC, 1993)

Sanitation type	Population	
Full water borne	15,718,000	Adequate 69%
Septic tank	439,000	
VIP latrine	266,000	
Other	398,000	
Unimproved Pit	5,253,000	Inadequate 31%
Bucket	1,926,000	
None	491,000	
TOTAL	24,491,000	

Demand and willingness to pay

The World Bank states that there is abundant evidence that urban families are willing to pay substantial amounts for the removal of excreta and waste water from their neighbourhoods (World Bank, 1992). As with water, this is most evident in those areas where people lack access to the service. In Kumasi, Ghana for example, the use of

public latrines and bucket latrines accounts for large recurrent expenditures of about 2.5 and 1 % respectively of family income. In Kumasi and in Ouagadougou families are willing to pay about 2 % of household income for an improved sanitation system (World Bank, 1992)

Institutional issues

A World Bank review of more than 120 water and sanitation sector projects over 23 years concludes that in only four countries have public sewerage and water utilities reached an acceptable level of performance (World Bank, 1992). The natural monopoly of sanitation service provision does not lend itself to accountability. This is particularly so where the regulatory framework is weak or not separated from the service provider. The thrust of structural adjustment in Africa has revolved around an opening up of the economy and a greater involvement of the private sector. However the limited application of this to water and sanitation provision such as the Lusaka Water and Sewerage Corporation has not yet shown itself to be superior to well run municipal utilities. There are several examples of well managed water utilities (Republic of Guinea, Ivory Coast, Botswana) but the same can not be said of sanitation which is often not catered for in the commercialisation of water supplies.

Institutional reform should not only deal with the operation and maintenance of existing services but also with investment. Infrastructure development, especially water supply and sanitation, goes hand in hand with economic growth, mutually supporting each other. The lack of investment in urban infrastructure not only inhibits economic expansion but imposes heavy additional costs on manufacturing enterprises (Habitat, 1996).

Inappropriate institutional arrangements was cited as one of the constraints and problems facing urban sanitation provision at an Urban Sanitation Workshop held in Uganda under the auspices of UNICEF, HABITAT and UNDP-World Bank Water and Sanitation Program. The present sector trends identified by the workshop were:

- demand driven service,
- community management,
- strategic planning, and
- increased private sector involvement,

all of which imply a revised institutional framework and sector strategy.

South Africa's draft white paper on sanitation recognises the institutional complexity of dealing with sanitation and it is probably this institutional complexity which makes it difficult in many developing countries to identify one lead agency responsible for sanitation policy and regulation.

URBAN SANITATION: CURRENT TRENDS

Poor people, informal settlements, squatters all tend to be found on the worst land - steep slopes, low lying land prone to flooding, areas with high water table - and they may not be settled in a pattern convenient for service delivery, all of which can severely limit the sanitation options. Much work has been carried out on on-site sanitation options such as improved pit latrine design, and pour flush latrines favouring low cost yet improved social and environmental benefits. The inability of many urban authorities

in Africa to provide a reliable access to water supplies has meant that on site sanitation has been a possible, if not a desirable option. However, for a variety of reasons, such as high housing density, impermeable soils, high water table, and the need to dispose of considerable quantities of domestic wastewater, on site sanitation solutions do not function well in many urban areas, especially where water supplies are adequate.

Table 5 Typical range of capital costs per household of alternative sanitation systems (Nordberg and Winblad, 1992; World Bank, 1992).

TECHNOLOGY	COST US\$
Twin pit. pour flush latrine	75-150
VIP latrine	68-175
shallow sewerage	100-325
Small bore sewerage	150-500
Conventional septic tanks	200-600
Conventional sewerage	300-1.000

Conventional sewerage is considered too expensive for most developing countries but there are a range of alternative, cheaper, sewerage options which can cut costs to 20-30% of conventional sewerage (see Table 5, also condominial sewerage example from Brazil, World Bank, 1992). Advances have also been made in sewage treatment from the relatively low cost stabilisation ponds to the Modified Activated Sludge processes. The important point being to develop and adopt technical solutions appropriate to the climatic, economic and managerial realities. However on the other hand the social and environmental goals place demands for a minimum level of service and it is the match between these two which must be found in terms of affordability and technical and managerial skills.

Other than technological issues, probably the most significant changes taking place relate to an acceptance of the important role that consumers themselves have to play. Water and sanitation services are a natural monopoly and consumers cannot force service suppliers to be accountable. However examples from around the world have shown that a separation of the regulatory and service functions has allowed a greater consumer involvement, more accountability of the service provider, and an improvement in services. New approaches in service provision such as the Orangi Pilot Project in Pakistan and Condominial sewerage in Brazil have provided examples of very successful partnership between a formal sector responsible for “trunk” services and communities responsible for “feeder” infrastructure (World Bank, 1992).

URBAN ZIMBABWE

In examining the urban sanitation situation in Zimbabwe a few centres were selected for detailed examination (Chegutu, Marondera, Gutu-Mupandawana and Mutare) but most information was collected from interviews, a study of existing reports and records and selected site visits. In the context of this report large urban centres refer to designated towns, cities and municipalities of which there are about 21 in Zimbabwe. Small Urban centres refer to growth points, service centres and other groups of high population density which are managed under a variety of systems such as Town Boards, Area Boards, Township Superintendents, or the District Administrator.

URBAN GROWTH

Chegutu

Chegutu is designated as a town and has a population estimated to have swelled from 32,000 in 1992 to approximately 50,000 in 1996, mainly as a result of new mining developments taking place. The economy of Chegutu is dominated by two long established industries of farming and textile production and a more recent development of a platinum mining venture. A variety of service businesses support the town. The layout of the town can be described in 4 zones: industrial area, central business zone, high density (approx. 4,500 stands) and low density (approx. 1,500 stands) housing. It is estimated that stands designed to hold up to 8 people are now occupied by 12 - 14 people due to the practice of subletting rooms. The number of stands in the high density area has increased from 3917 in 1991 to 4592 in 1995.

Gutu Mupandawana

Gutu Mupandawana District Service Centre is one of the largest growth points in Zimbabwe. It is an amalgamation of two townships united under the Gutu Rural District Council. The 1992 census gives a population of 6,197 for the centre and this compares with a population of 4,409 in the 1982 census, an annual rate of increase of almost 15%. The centre is dependent upon small services and commercial activities in support of the surrounding farming community. The centre was originally serviced by communal septic tanks but this system was changed to a waste stabilisation pond system in 1975 and currently an estimated 95% of the population are thought to be on mains sewerage with the remainder on septic tanks.

Table 6. Percent annual urban growth in Zimbabwe and selected cities and municipalities from 1962 to 2020 (Zimconsult 1997)

	1962-1969	1969-1982	1982-1992	1992-1996	1996-2000	2000-2020
Harare	2.3	4.6	6.1	5.5	5.4	4.7
Bulawayo	1.7	4.4	5.4	4.9	5.2	4.5
Chitungwiza	n a	20.7	4.8	4.1	4.3	3.8
Mutare	-0.2	4.0	6.6	5.8	6.1	5.4
Gweru	2.6	4.2	5.0	4.6	4.8	4.3
Kwekwe	6.0	3.3	4.7	4.4	4.6	4.1
Marondera	6.5	4.9	6.9	6.4	6.7	5.9
Zimbabwe urban	1.9	6.0	5.3	4.9	5.2	4.5

ACCESS TO SANITATION SERVICES IN URBAN AREAS

The coverage and type of technology used in urban areas is documented in the national census data from 1992. These data have been summarised in the following table (CSO, 1993a-j)

Table 7 Percentage of urban households using each sanitation technology by Province (CSO, 1993a-j)

Province	TECHNOLOGY						No of H/holds
	Flush	Blair	Pit	Bucket	None	no data	
Manicaland	96.6	1.48	1.66	0	0.25	0.01	43857
Mashonaland Central	85.37	7.73	4.97	0.15	1.74	0.04	15684
Mashonaland East	87.94	4.88	3.69	0	3.14	0.05	15160
Mashonaland West	90.43	1.9	4.8	0	2.87	0	60767
Matabeleland North	91.44	1.33	5.53	0	1.64	0.01	16719
Matabeleland South	88.37	3.86	5.08	0.08	2.57	0.03	11964
Midlands	94.4	1.37	2.23	0	2.01	0.01	70196
Masvingo	97.01	1.04	0.93	0	1.03	0	24181
Harare	93.94	1.71	4.19	0	0.13	0.04	359216
Bulawayo	98.41	0.51	0.65	0	0.42	0.01	145962

From this table it can be seen that the coverage with acceptable sanitation (flush toilets) in the urban areas of Zimbabwe varies from 85 to 98%. A total of 42,996 households do not have access to adequate sanitation in urban areas on the basis of the census figures. However in addition to this is the problem of densification. In the large urban settlements, the housing crisis has seen the construction of large numbers of wooden shacks in the gardens of existing households. These shacks are let to tenant families who have to make use of the limited facilities of the main dwelling house. As a result large numbers of people may be using a single flush toilet. A survey of 1910 urban households by CSO in 1994 confirmed the high access to flush latrines (94.6%) but also reported that 28.8% of urban households were sharing a flush toilet (CSO, 1995).

In Chegutu, Marondera and Mutare over 95% of the population are on mains sewage with the remainder on septic tanks. The 1992 census reports one or two percent of the population in most urban areas use pit latrines or have no sanitation.

TECHNOLOGY CHOICE

The sanitation services afforded to the urban population of Zimbabwe is primarily based on the flush toilet. Bucket systems used to be permissible in urban areas but have been phased out over the last few decades. They are no longer a permissible technology in terms of the Housing Standards Act and have recently been excluded as an acceptable technology in mines also (Mining (Health and Sanitation) Regulations, 1995).

Urban areas classified as towns or cities are not permitted to have ventilated pit latrines as a sanitation option for housing. There are one or two isolated cases where water is

URBAN SANITATION IN ZIMBABWE

not available and there is a need for public facilities (e.g. some street vendor sites) Pit latrines of any description are not accepted as a sanitation option for urban housing. At small urban centres such as growth points and service centres, pit latrines are commonly found. In these situations water supplies are often run by an authority other than the local authority and may not extend to the whole urban community. Additionally, these small urban centres are run by a local board or the Rural District Council who have neither the technical skills nor financial resources to be able to install and maintain full sewerage.

The Central Rates Fund is constructing sewerage systems in these centres (growth points and service centres) to encourage water borne sanitation but they tend to be underutilised and maintenance is a problem. The installation of septic tank systems have proved to be a problem in the smaller urban centres due to the lack of access to a septic tank emptying service (e.g. Jerera in Zaka).

The focus on water borne systems for urban areas has the consequence that water supplies must be reliable and also that a full sewerage system is required. There is a good range of waste disposal technologies in use in Zimbabwe from the simple pit latrine to full sewerage with

Table 8. Number and type of wastewater treatment system recorded in Zimbabwe

Oxidation ponds	101
Activated sludge	13
Biological filters	12
Misc. treatment plants/ evaporation ponds/ slimes dams (mainly mines)	13

activated sludge treatment systems. The records of visits to off site treatment plants by the DWR Pollution Control Branch (PCB) over the past 10 years show the numbers and types of systems in operation as in Table 8. Not all systems throughout Zimbabwe have been visited but this represents the closest to a complete record that is available.

For sampled towns the technology in use is shown in Table 9. Of interest is the lack of information at municipal level on the system capacity and actual flows. A large number of the smaller systems throughout Zimbabwe, mainly ponds, have no flow measuring devices.

Table 9. Wastewater treatment technology in use in sampled towns.

Urban centre	Treatment system	Capacity	Average flow/day	Effluent quality	Maintenance
Chegutu	3 waste stabilisation pond systems	records lost	no measuring devices	not monitored	Poor
Marondera	1 stabilisation pond system	200,000cu m	5.8Ml/day	lab available	good
Mutare	Biological filter Biological filter M.A.S. plant	6140cu m/day 4090cu m/day 23,400cum/day		monitored fortnightly	good
Gutu	2 Stabilisation pond systems	unknown	no measuring devices	not monitored	fairly good

Gutu Mupandawana as one of the largest growth points has two waste stabilisation pond systems, both of which are considered to have considerable spare capacity at the present time. The second system was built in 1994 to cater for expected growth to the south of the centre.

EFFLUENT DISPOSAL

The quality and disposal of treated effluent is a factor of major concern when considering the environment and the sustainable use of limited water resources. There is no mechanism for systematically recording how or where effluent is disposed of but the records from visits of the PCB to waste water treatment works provides some insight into the methods used (Table 10).

Table 10. Methods used for the disposal of treated wastewater in relation to the quality of the effluent (Poor = most parameters do not meet required standards; average = more than half the parameters meet the standards, good = all parameters meet the standards)

Disposal method	Number of systems	Effluent quality (where available)		
		Poor	Average	Good
to natural waters	52	30	11	2
irrigation	41	17	14	4
recycling	3	0	2	1
evaporation	9	4	3	2

In Chegutu, most of the effluent from the treatment works is pumped to a commercial farm where it is used for irrigation of citrus. As the ponds are overloaded this avoids pollution of the river system however the farmer does not have to accept the partially treated sewerage and from time to time the surplus is released into the river system. Water is a valuable commodity and whilst at the moment this is a relief for Chegutu, with better water treatment the water could either be recycled to the town or be sold for income generation to the farming community as a supplement to the increasingly scarce water resources for irrigation.

Effluent from Marondera is also disposed of to a commercial farm. Proposals have been made to improve the wastewater treatment and recycle the treated water thus postponing the need for the municipality to make a considerable investment in additional raw water supplies for the town. A consultants report on Bulawayo during the 1992/93 drought strongly recommended the recycling of water however this is an area still receiving only scant attention in the search for additional water supplies.

Mutare convey the effluent from the biological filters for further treatment in the M.A.S system. After this treatment it is then released directly into the Sakubva river provided that quality guidelines are met otherwise it is retained in a maturation pond. The City has been granted exemptions from time to time when it has been unable to achieve the desired quality of effluent necessary for release into the river system. Basic effluent quality tests are performed every 2 weeks by the city chemist and a more detailed examination carried out by the Government Analytical laboratories monthly.

Gutu Mupandawana has two treatment systems. The older 1975 system passes effluent to a tree plantation which is expected to provide some form of cost recovery. The 1994 ponds may eventually do the same but at the present time the small amount of

effluent generated flows onto disused land. The effluent is not examined to determine the quality.

Harare and Chitungwiza sit on the catchment of their own water supply. Problems related to urban population growth, delays in upgrading the wastewater treatment works, and periodic breakdowns has resulted in both cities releasing inadequately treated effluent into rivers and thereby polluting Lake Chivero. Inadequate controls over industrial effluent are also believed to contribute to unacceptable levels of pollutants in Lake Chivero (Environment 2000, 1996). The result has been an increase in the pollution levels of the Lake to the point where it is not only hypertrophic but also contains unacceptably high levels of heavy metals (Tables 11,12) (Zaranyika, 1996) and may pose a serious health threat to the population of the city as well as the environment.

Table 11. Levels of phosphate, nitrate and chloride ions (mg/l) at Lake Chivero in Oct 1995 (Zaranyika, 1996) (* exceeds WHO drinking water standards)

	Range	Mean
Phosphate	5.14-11.86	8.0*
Nitrate	1.70-45.70	12.0*
Chloride	137-221	177

Table 12. Heavy metal concentrations in water samples from Lake Chivero spillway, April 1996 (Zaranyika, 1996) (* exceeds WHO drinking water standards)

Element	ppm
Cadmium	0.018*
Copper	0.261
Nickel	0.147*
Lead	0.362*
Zinc	0.061

Effluent reuse for irrigation is viewed as a convenient way of disposing of inadequately treated waste water which would otherwise pollute a natural water body. Beneficially, it may also result in some revenue generation if the waste is irrigated onto local authority land but often it is supplied at low cost or free to the recipient farmer. There are few examples of true recycling of treated wastewater but Marondera has been actively examining the cost benefits of recycling water from the wastewater treatment plant rather than constructing an expensive new water storage and reticulation system (Robinson, 1996).

Disposal of treated effluent has posed problems in that technology available for most urban centres, even when working satisfactorily, produces water of high phosphate and nitrate levels causing pollution and eutrophication of receiving water (Lake Chivero supplying water for Harare is a well documented case where this has been a continuing problem for the last 30 years). Techniques for the full recycling of wastewater have not been widely adopted in Zimbabwe and the most significant method of avoiding pollution has been the use of effluent for irrigation. This use is controlled by the guidelines laid down in the Public Health (Effluent) Regulations, 1970, which regulate

the use of sewage effluent for irrigation purposes. The disposal of effluent into natural water bodies is controlled by the Water (Effluent and Waste Water) Regulations, 1977

INSTITUTIONAL ROLES AND RESPONSIBILITIES

Responsibility for sanitation does not fall clearly within any government agency. Whilst local authorities are tasked with responsibility for service provision, unlike with water supplies, they do not have any technical agency to resort to for advice, policy guidelines or other technical support. The Ministry of Health and Child Welfare has assumed responsibility for rural sanitation but not for Urban sanitation. Urban sanitation standards are set and controlled through a variety of legislative mechanisms from the Housing Standards set by MLGRUD, the Public Health Act enforced by the MOHCW and the Water Act enforced by the MLWR. The Ministry of Public Construction looks after wastewater treatment systems established at government institutions.

Local authorities.

Local authorities follow the appropriate legislation and bylaws which determine the standard of services to be provided. Within urban authorities there is usually a works division with a subdivision dealing with water and sewerage. The larger local authorities have a town engineer heading the works section and able to provide technical guidance for the authority. Smaller urban authorities may lack the services of an engineer and rely on artisans whereas growth points and service centres may lack even this level of technical support.

Small urban centres typically have a township superintendent and a Local Board but these centres have the greatest difficulty with sanitation services in that there are often differing institutional arrangements and no clear allocation of responsibility to the local authority or Local Board.

A case in point is Gutu Mupandawana which, along with other growth points, suffers from a lack of clear organisational responsibility. The Central Rates Fund (A section under MLGRUD) owns and operates the majority of the sewerage system in GM although one high density area, constructed with donor support is owned and maintained by the RDC. This section feeds into the main trunk sewer owned by the MLGRUD. Unfortunately neither the MLGRUD nor the RDC have the technical skills to manage the system as there are no qualified staff employed by either organisation. Unlike larger urban centres which have water and sewerage sections under a works department, there is no such structure for Gutu Mupandawana or other growth points and no clear lines of accountability or responsibility.

Central Rates Fund

Central Rates Fund (CRF) is another agency responsible for sanitation services in certain areas of the country. The CRF was established within the MLGRUD to finance the development of small growth centres in the rural areas (Lenneiyé, 1989). Pre independence there were 13 such centres which have now grown to 57 growth points (one per district) plus a large number of rural service centres. The growth points generally have a sanitation infrastructure covering at least part of the centre which is based on a full sewerage system. Only a few of the rural service centres have a

sewerage system with most relying on pit latrines or septic tanks. The CRF has not acted as a Fund and does not make loans to Local Authorities but builds, owns, operates and maintains the systems. In all cases the CRF has retained responsibility for the maintenance of the facilities it has constructed.

Water and sewerage charges are combined and while the rates are presently under review they have not been changed since 1986 and do not in any way reflect the real costs of maintenance let alone loan repayments. The CRF levies rentals and supplementary charges at Growth points, District Service centres and Rural service centres after making investment in the infrastructure in these centres. Prior to the implementation of the RDC Act the CRF was the body responsible for developing infrastructure in these centres. Since the RDC Act the CRF has continued to manage sanitation services and collect rates, fees and rents.

The revenue raised from charges is credited to the CRF at national level who then allocates finances for running the systems throughout the country. CRF employs township superintendents and one or two labourer staff to run their infrastructure and this is coordinated by the DA. The RDC has no role in the service provision to these growth points, at least as relates to the CRF facilities. This is inconsistent with the present RDC Act and also results in investment and management decisions being made far from the site of action. Not surprisingly, there is evidence that many of these CRF systems are poorly managed.

The CRF is operating on a decreasing budget and is unable to carry out any new works. There was evidence in 1989 of declining allocations to CRF and one of the reasons given was the failure of CRF to meet its repayment commitments to MOF. With the lack of any technical staff within the Fund, any complaint has to be referred to the private sector and supervision of the technical performance of the CRF facilities is severely limited. CRF receives finance from treasury and is expected to repay those loans - this it does through further grants from treasury to augment the income received from service charges. With the decreasing allocations from treasury the CRF is experiencing difficulty in effecting the required maintenance of its infrastructure.

The centralised nature of the CRF means that a simple breakdown at the furthest part of the country has to be referred to Harare. The CRF does not act as a fund but as a supplier of goods and services at subsidised prices. Not surprisingly it is difficult to hand over such a service to another agency who does not have the largesse and would have to face the social and political consequences of the required large increases in fees. This was presumably the reason for the commissioning of a study on the development of a revenue collection system for District service centres (Lenneiyee, 1989) but which seems not to have been effective.

The CRF of necessity managed these facilities whilst there was no effective local authority. In the present circumstances they feel unable to hand facilities over to the RDC as the RDC is presumed unable to repay the loans to treasury. In fact with the present charging system the CRF is also not able to recover enough money to maintain the services.

Privatisation

Large urban centres in Zimbabwe are considered to be providing a reasonably well managed service as regards water supply and sanitation. This is in an environment where there has been considerable attention given internationally to the benefits of privatised water utilities. The success of the systems in the municipalities might suggest that a water utility may not provide any particular advantages for Zimbabwe. However, there have been concerns that the full incorporation of water and sanitation services into municipal accounts and management results in revenue from these services being used to subsidise deficits in other areas rather than in ensuring the proper maintenance and development of water and sanitation services. It is for this reason that some municipalities have been considering separating the water and sewerage department to stand alone but still remaining within Council in an effort to improve efficiency and management of the services. This would provide a compromise between the privatisation advocates and the public concerns for efficient, accountable management of these essential services.

The small urban centres provide a completely different scenario where accounts do not balance, charges bear no relation to service provided, no one agency is responsible or accountable and there is a serious lack of technical skills. As growth points attempting to attract investors the lack of reliable services is a major drawback. The possibility exists that management contracts for such areas may be an appropriate way to move forward.

Given the financing situation and the operation and maintenance status for urban sanitation systems it is essential that the management issue be addressed urgently. Local authorities should review the management system for water and sanitation services to ensure the revenues match the real costs, to ensure that adequate allocations are made for operation and maintenance of sanitation systems, and to ensure timely investment in new infrastructure to meet the demands of growth. There is little or no accountability in the present system and the lack of effective policing from national level removes all incentives for urban sanitation to perform effectively and efficiently.

FINANCING OF URBAN SANITATION

Investment

Urban centres rely on loans from central government or external agencies such as the World Bank for investment in new infrastructure. The income and expenditure statements for the urban centres shown below do not suggest that the sanitation services are generating enough revenue for the operation and maintenance let alone for loan repayments. The separation of the water and sewerage services into a separate entity may be more effective in ensuring the maintenance of a high standard of service by linking the charges to the real cost of providing the services.

The World Bank Urban II project provides assistance to 21 large urban local authorities in terms of loans. It is interesting to note that of the 21 local authorities, 20 have proposals in stream for sanitation related projects and there are additional sanitation projects being funded outside of the Urban II project. This shows that

sanitation is recognised as a high priority and an area requiring urgent attention in many of these urban centres.

The CRF obtains loans from treasury for infrastructure development in the designated sites in rural areas. However these are not handed over to the local authority. The amount of investment and the prioritisation bears no relation to the ability or willingness of the beneficiaries to pay for the intended service and given the limited government finances, priorities end up being set at national level.

Financing operation and maintenance

Municipalities largely manage to finance the operation and maintenance of the sewerage system from the income from sewage charges (Table 13).

Table 13. Annual income and expenditure patterns for selected large urban centres (Z\$)

Chegutu

Year	Income from sewage charges	Expenditure
1991	149,189	?
1992	301,164	370,150
1993	410,038	615,251
1994	675,452	771,660
1995	910,747	1,026,830

Marondera

Year	Income from sewage charges	Expenditure
1991	411,188	540,468
1992	619,620	787,046
1993	840,390	824,545
1994	1,362,995	898,136
1995	1,448,185	1,631,262

Mutare

Year	Income from sewage charges	Expenditure
1991	2,639,865	2,881,973
1992	3,027,838	3,637,332
1993	3,895,562	4,627,403
1994	5,362,142	5,779,133
1995	6,636,512	7,310,398

Sewerage rates vary considerably e.g. the Municipality of Kadoma charge \$43/ household/ month as a flat rate whereas Marondera have differing rates for domestic, and commercial /industrial premises with additional charges for additional toilets. Mutare have a fixed monthly charge of \$53.55 which is included in the rates bill issued on a monthly basis. Marondera as with most of the larger municipalities, has a fully computerised billing system and has a team of staff designated to the collection of outstanding bills.

No figures of revenue generated were available from either the RDC, CRF or the MLGRUD in Gutu, Mupandawana and the present institutional system makes it unlikely that a management system based on sound commercial principles can be implemented for the sanitation services in small urban communities.

Whilst it varies from local authority to local authority, it would appear that service charges are not set in relation to the cost of the service provided but in relation to the overall municipal budget. Similarly financial allocations for operation and maintenance and investment are made by taking into account the whole local authority budgetary requirements. As a result there is no strong linkage between the real cost of effective service provision and the service charge applied with the consequence that service

charges may lag behind the cost of provision or income from the service may be used to finance other local authority activities to the detriment of the sanitation service.

It is also difficult without a detailed survey, to assess how much money should be allocated for operation and maintenance of each system. The general trend is that operation and maintenance is under-financed resulting in a gradual decay of the system to the point where a very large investment is required for rehabilitation. The local authority then claims that neither it nor the government has the financial resources for this rehabilitation and pollution continues indefinitely.

The separation of the water and sewage operations, accounts and budgets from the general local authority system may be one way to resolve this but it is imperative in the face of rapid urban growth that a revised management system is put in place to ensure that

- a) fees are realistic and cover operation and maintenance as well as investment costs,
- b) operation and maintenance is not carried out as crisis management but retains the operating standard of the service, and
- c) that the management is accountable for the service provided

A corollary to this is that an effective water pollution control system is put in place by government to monitor effluent discharges and ensure compliance with the regulations. The lack of any effective sanctions against polluters is believed to have a significant influence on the allocation of operation and maintenance funds by urban authorities whereby finance is allocated to activities of a higher public profile.

OPERATIONAL STATUS OF TECHNOLOGY

The PCB inspect water in rivers and trace problems back to their source. A number of local authorities are polluting natural waters in terms of the Water Act and the smaller growth points and service centres are also considered to be major offenders. The condition of the plants when last visited by the PCB shows that only 20% could be regarded as good with almost 45% in the poor category (Table 14). There is no fixed schedule of examination of sites with some not visited since the 1970's but the indications from the table are that there has been an improvement in the condition of the plants over the last 20 years.

Table 14. Condition of treatment plants visited by the PCB at the last visit, which varies from 1971 to 1996, and those visited within the last three years (poor = maintenance lacking, plant just run down; average = some maintenance being done, good = well maintained plant with good housekeeping).

Condition of plant	All Data	Plant visited between 1994-96
Poor	44	13
Average	37	19
Good	22	11

From 1971 to 1991 107 original exemption permits were granted to allow temporary discharge of inadequately treated waste. These covered varying periods of exemption.

In many cases the exemption was renewed even for periods of over 10 years without the pollution being controlled. However in the vast majority of cases the exemption permits were not renewed with the assumption that pollution had ceased. Results from examination of wastewater treatment plants by PCB do not show that there has been any significant improvement in the quality of effluent being released (Table 15).

Table 15. Quality of effluent examined from treatment plants from 1971 - 1996 and those from 1994-96 (Poor = most parameters do not meet required standards; average = more than half the parameters meet the standards, good = all parameters meet the standards)

Condition of plant	All Data	Plant visited between 1994-96
Poor	51	23
Average	34	15
Good	11	8

In high density urban areas further densification has resulted in single stands actually housing up to 40 people as visitors, lodgers, or tenants in backyard wooden shacks. Existing sanitation services become overloaded causing increased blockages in pipes and overloading of the treatment facility. As the overloading is as a result of increased occupancy of stands, the local authority is not receiving increased revenue in terms of service charges. This situation is occurring in most cities.

Coverage is difficult to determine whereas in the past a 100% coverage used to be assumed this is now no longer the case. The occupancy of stands is assumed to be a maximum of 12 according to the housing standards and therefore occupancy higher than this with only 1 latrine is considered to be under-served. In addition there are high density settlements such as Epworth, Hatcliffe, Dzivaresekwa and Porta farm where sanitation is not at an acceptable standard for an urban community, and, falling outside city limits, the general regulations of rural district councils apply.

Chegutu is an example where the pond systems, whilst simple to maintain, have been allowed to become overgrown with weeds and to be in need of desludging. Mosquito breeding takes place and undoubtedly the system could work more effectively, have a higher capacity and therefore release more acceptable quality of effluent if properly maintained. The focus on Chegutu as a result of the new mining developments is likely to result in a pressure for action to be taken soon. In Chegutu, problems occur with pipe blockages due to the accumulation of sand and from the increased loading on the system as a result of further housing development and densification. The septic tank system in Chegutu has not apparently experienced any major problems. A tractor towed vacuum emptying system is used and the small number of septic tanks does not create a significant problem when it is under repair.

The Marondera pond system is very well maintained, shows no evidence of overloading at the present time, and is desludged annually. However, it is believed that if the current high rate of leakage of sewerage (40%) from the main sewer reticulation system were to be remedied, then the ponds would be close to capacity. The municipality has no vacuum system for emptying septic tanks, and whilst the number of these is small (400-500) the method of using labour is not satisfactory. There is no

evidence that the possible effects of the high leakage from the pipelines on groundwater quality has been investigated

The majority of sewerage reticulation systems are facing problems due to overloading in the high density areas. Where additional treatment works have been built or extensions made to existing ones, often the reticulation system has not been upgraded as the increased flows are coming from infilling or densification, subletting and increased occupancy rates. Common problems, and in cases such as Marondera they are serious, are leakage and blockages. Commonly, sand is used for the cleaning of utensils and accumulates in the reticulation system. Additional problems are caused by solid objects which enter the system via squat pans or opened/ vandalised manhole covers. Such objects block, or restrict the flow through pipes. These problems are exacerbated by the fact that levels of sewage now being conveyed in the sewer networks are far higher than that for which the sewer was designed. This was found in virtually all systems examined.

In Mutare, the flow into the Gimboki M A S system has been increasing at over 10% per year. Gutu Mupandawana's reticulation system was installed in 1978/79 and therefore is relatively new. There are 2-3 blockages of sewers per month which are dealt with by labourers from MLGRUD. Owners of septic tanks carry out their own tank emptying. The ponds are relatively well maintained although with spare capacity at the present time.

Laboratory services are found in the main urban centers and these provide basic analysis of water and wastewater quality (Mutare, Marondera, Harare, Bulawayo). Additional tests are carried out by the government analysts laboratory in Harare. The lack of access to laboratory services may present difficulties for the introduction of effective management of effluent quality.

REGULATION

The control over urban sanitation is exercised through a mixture of legislative and institutional mechanisms. The Ministry of Lands and Water Resources has a Pollution Control Branch within the Department of Water Resources which monitors water pollution throughout the country. This includes the monitoring of the functioning of wastewater treatment works where they pose a pollution risk to surface or groundwater. The PCB uses the Water Pollution Advisory Board as a reference point for decision making on steps to be taken when pollution is observed to be occurring. The WPAB, established in terms of an amending Act, No 7/1979, to the Water

CASE STUDY 1

Problem Acid mine drainage

Duration 1992 - 1995

Key events

Sept 1992 complaint filed

Jun 1993 Final warning

Feb 1994 Commissioner of police approached after local police fail to take action

Feb 1994 Local police say no grounds for action

Nov 1994 Matter referred to Attorney General

1995 Court summons issued for August 1995

Jun 1995 Settlement reached, case withdrawn.

Outcome

Satisfactory in that action taken to control pollution

Unsatisfactory in failing to penalise the offender for

a) not taking timely action, b) environmental damage incurred, and c) the high government costs incurred

The message to the offender is to delay as much as possible as it makes no difference to the penalty.

Act, is made up of members appointed by the Minister of LAWR comprising Government, Local Government, and private sector interests and meets quarterly to consider reports from the PCB. The WPAB is purely advisory however the DWR refers most matters concerning breaches of the Water Act relevant to pollution to the Board. Action is then taken by the DWR in terms of the Water Act, 1976.

The PCB is staffed by 5 people and they have inspected treatment plants and reticulation systems over the whole country. They find it difficult in practice to prosecute local authorities as both refer the case to the Attorney General. However, the breach of Statutory regulations by local authorities are supposed to be handled by the local authority itself. The MLGRUD should only be involved and refer the matter to the Attorney General if it is a case of precedence or politically sensitive. The process followed is to first notify the offending authority and give recommendations for remedial action. The authority is given time to respond and if the response is not satisfactory then they are given a time limit for action to be taken prior to prosecution. The case is then sent to the Attorney General (see the case studies in Boxes 1-4).

Lock (1994) reports that the WPAB has had difficulty in persuading the police and the Attorney General's office to take the requested prosecutions seriously, and that the WPAB is powerless to force local authorities to implement pollution control works if government is unable or unwilling to allocate them adequate loan funds to do so (Lock, 1994).

Examining exemption permits granted between 1971 and 1991 shows a total of 107 original exemptions were granted. Fifty percent of these are assumed to have been remedied within the time allocated of 6 months to 2 years whereas others were granted further exemptions as shown in Figure 1. The number of new exemptions granted between 1991-95 was three with some being renewed while remedial work was in progress.

The experience outlined in the case studies (Boxes 1-4) suggests that the regulations are rarely enforced, prosecution rarely results and the low staffing levels of the PCB make investigation a long and drawn out process. Permits are often renewed for long periods of time. The data from the PCB suggests that a large number of agencies pollute without obtaining exemption permits and that exemption permits are only sought as a means of avoiding imminent prosecution.

CASE STUDY 2

Problem Pollution from a water treatment works

Duration 1991 - present

Key events

May 1991 application for exemption refused as no pollution abatement works in progress

Nov 1993 re-application for exemption refused

March 1994 application for exemption approved based on work in progress

1995 exemptions renewed as offender fails to complete pollution abatement work

Apr 1995 final warning sent, exemption permit not renewed

Nov 1995 River board unsuccessfully attempted prosecution on behalf of farmers through the Administrative court

Feb 1996 unopposed application to High Court by DWR for an order to offender to effect remedial action

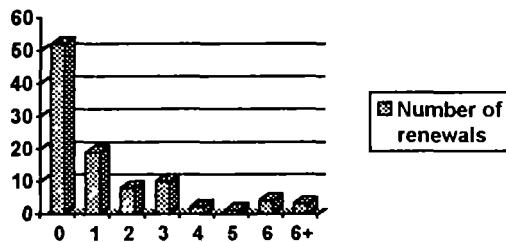
Jun 1996 High Court requested reasonable time for offender to remedy the situation and further explanation of dangers caused by pollution

Problem continues

Outcome

Unsatisfactory in that pollution continues unabated, no penalty for the polluter, no exemption permit in place. High Court acting on behalf of the offender in an unopposed application

Figure 1. Number of renewals to pollution exemptions



The Ministry of Health, through the directorate of environmental health becomes involved where polluted water is being used for human consumption or for the irrigation of crops for possible human consumption. Action is then taken in terms of the Public Health Act.

The Natural Resources Act is also relevant to control pollution. In terms of regulation, the Ministry of Public Construction and the Department of Physical Planning set standards controlling development. The local authorities have bylaws which also control the type and standard of development activities. Sanitation standards in urban areas are governed by the following:

- Town Planning Act
- Public Health Act
- Housing Standards Act

In terms of these regulations local authorities are forced to provide water borne sanitation and potable water supply in all urban areas. The water must be approved by the MOHCW who must also be satisfied with the standard of sanitation provided. For example, Chitungwiza sought permission from the MOHCW to deviate from the Housing Standards Act and use pit latrines in the urban area. They were refused permission and forced to install water borne sewerage in new housing developments.

In the situation of small urban centres classified as growth points or service centres regulations are not so clear. In many of the new Rural District Councils, who are the local authority for these centres, there are no bylaws governing service standards. They have to meet the approval of the MOHCW but there are difficulties in applying the Public Health Act except for the public facilities in these growth points and service centres. The MOHCW aims for water borne sanitation where there is a water supply,

CASE STUDY 3

Problem discharge of untreated sewage into natural water course

Duration 1985-1994

Key events

Dec 1985 Attention drawn to the offence
 Feb 1987 Farmers complain to DWR
 1987- 1994 Correspondence between offender and DWR
 Feb 1994 Water samples taken as basis for prosecution
 ???1994 Application by DWR to prosecute offender
 Farmers representatives make court application against offender
 Oct 1994 Offender given interdict to stop pollution and ordered to compensate farmers

Outcome

Satisfactory in that pollution now ceased, compensation paid
 Unsatisfactory in that it took so long and final outcome was driven more by farmer demands than government regulation

an upgradeable aquaprivy or where there is no reticulated water supply a Blair VIP latrine Sanitation standards for mines are set by the Mining Health and Sanitation regulations (1995) which in the recent amendment removed bucket latrines as an acceptable sanitation option Under the Public Health Act government actually has the power to rectify an illegal situation and then recover the cost from the offender This power has not been used as yet

If government systems are not functioning properly the MOHCW can a) advise, b) prosecute, c) rectify with MOF permission, or d) close the premises. The MOHCW has found the latter action to be the most persuasive and there are many examples, including hospitals, where the MOHCW have applied the regulations to temporarily close premises which violate the Public Health Act The support that the MOHCW has received for these actions and the subsequent remedial action taken has to a large extent shown how the enforcement of regulations has been pivotal in the maintenance of sanitation standards

There are no regulations requiring that water or wastewater treatment plants are operated by qualified or trained operators The actual status is unknown but it is suspected that a large number of treatment plants are therefore being operated by poorly trained or supervised operators.

CASE STUDY 4

Problem discharge of poor quality effluent to river.

Duration 1982 - 1996

Key events

1982 Problem identified but no exemption permit granted as no firm proposals submitted by offender for control of pollution

1984 Problem continues and offender fails to address DWR recommendations

1993 Pollution continues but consultant recruited by offender to review sewerage and water reticulation needs

1994 Application for exemption permit refused pending firm proposals for remedial action

1995 Exemption permit granted for 3 months but conditions not fulfilled.

Dec 1995 Construction of more houses by offender without addressing sewerage system Final warning by DWR

1996 Application for exemption permit refused pending proof of allocation of funds for remedial action

March 1996 Application to high court for an order against the offender

1996 Attorney general unwilling to progress as the offender is a local authority and therefore falls under the Ministry of LGRUD and the Plaintiff and the accused are both seeking representation from the Attorney general

Outcome

Unsatisfactory in that pollution continues; government (AG) unable to identify its regulatory function, long delays before action taken

The Water Act does allow for wastewater treatment plants to be required to monitor the quality of effluent and to submit such information to the relevant ministry Given that the PCB is so understaffed and pollution is such a problem, it is surprising that these powers have not been used

The case studies show a lack of appreciation of environmental issues by enforcement agencies and confusion in the Attorney General's office as to function in upholding regulations or protecting government and quasi government agencies The exemption

permit system is a way of legally gaining time in order for remedial action to be taken by the offender. However, it is questionable whether it really serves any purpose as the large number of agencies releasing unacceptable effluent into natural water bodies neither have an exemption permit nor are they being prosecuted. The very low number of exemptions being granted could indicate that it is difficult to get an exemption without beginning remedial works or simply that offenders see no incentive to apply for an exemption. A further point is the lack of any fee for a permit which, to be effective, should penalise the offender and encourage remedial action without waiting for prosecution.

Part of the problem may relate to the fact that central government (e.g. CRF and MPCNH) is an owner and operator and therefore not in a position to prosecute itself. The most common examples of this appear to have arisen with local authorities who are not central government but have sought representation from the Attorney General's office when threatened with prosecution. This has been a useful tactic in delaying prosecution even further.

HUMAN RESOURCES

Zimbabwe does not have any regulations pertaining to the qualifications of staff operating water or wastewater treatment plants. Whilst the City of Harare has been offering training of water and wastewater treatment plant operators on an informal basis for many years, there are no regulations requiring that treatment plants have to be operated by qualified staff. Given the importance of these tasks, both in preventing epidemics by ensuring potable water is supplied, and in protecting the water resources and general environment from harmful pollution, as well as the large amount of money invested in the infrastructure, it is important to ensure the correct operation and maintenance of the facilities. The larger urban centres have at least a town engineer in charge of works and therefore there is access to qualified advice and supervision for the treatment works. The small urban centres may not have any staff with technical qualifications and may rely solely on untrained labour to manage the wastewater treatment works. Part of the problem of Chegutu relates to human resources. There is no superintendent responsible for the treatment works and none of the labour have had any formal training. GM has a township superintendent under the MLGRUD (Central Rates Fund). Under this structure there are two general hands to look after the sewerage works although they have not received any formal training.

On the regulatory side the control of pollution of natural water is managed by a staff of only 5 people in the DWR. They are about to open a water quality laboratory to carry out the water examinations but without any commitment to the 35 additional staff required to man the laboratory. Clearly it is virtually impossible for these few people to effectively control water pollution in Zimbabwe under the present system. The attention given to wastewater treatment is indirect, coming from the effects of discharge on water quality and the breach of the Water (Effluent and Waste Water Standards) Regulations, 1977. There is no clear regulatory act governing the performance, standard of operation, personnel qualifications, health and safety standards for wastewater treatment works and therefore there are no personnel able to supervise or assess these.

CONCLUSIONS

Coverage/ technology

Access to sanitation services in major urban areas of Zimbabwe is good by international standards. The technology in use is governed by a variety of legislation and bye laws and is mainly full sewerage with a small percentage of septic tank systems. Effluent is disposed of to waste stabilisation ponds and less frequently to further treatment with mass activated sludge treatment. Treated effluent is released into river systems or partially recycled by application to pasture, woodlots or other agricultural crops.

The situation in the smaller urban centres i.e. the growth points and service centres, is less clear. The responsible agency for sanitation services is not well defined and more than one may be present. There are usually some parts of growth points which are serviced by a full sewerage system but also many areas which rely on traditional or improved pit latrines. The key difference between the large urban centres and the small urban centres is that different regulations apply to the sanitation standards. Towns, cities and municipalities have the sanitation standards laid down in the Housing Standards Act whereas the growth points and service centres are governed by the Public Health Act. In all urban centres, especially the towns and cities, there is a rapid growth rate which is placing very severe strains on the capacity of the sewerage system. The densification of already medium and high density areas with the establishment of backyard shacks creates overloading of the sewage reticulation system which is not easy to address and additionally, the sharing of limited household sanitation facilities is likely to be very prevalent and lead to negative health impacts unless addressed soon.

Operation and maintenance issues

Blockages of sewers caused by overloading are frequent in high density areas of most towns and cities. This requires the commitment of increased manpower to address these problems although on occasion they may take over a week to repair. Thriving growth points such as Gokwe, Gutu, Mupandawana and Epworth have pond systems which are in different states. Gokwe is poorly maintained as well as underutilised, Gutu has been designed for a larger population than at present therefore is underutilised although well maintained, and Epworth has a pond system and trunk sewers but residents have not connected to the system since it was constructed five years ago.

It is clear from the data available that a large proportion of sewerage systems in urban centres are not being well maintained, effluent being released is not of an acceptable standard and significant pollution of surface and groundwater is occurring.

Legislation

Environmental legislation is currently under review by the Ministry of Natural Resources and Tourism but this is likely to take one or two more years. The scattering of legislation related to sanitation through several responsible

ministries is severely problematic. The types of sanitation service for urban areas are defined by legislation under the Ministry of Mines, the Ministry of Health and Child Welfare, MLGRUD as well as local authority bylaws. The discharge and use of treated wastewater are governed by legislation within the MOHCW and MLWR. Whilst agencies implementing sanitation services and subject to the legislation include the private sector, local authorities and ministries themselves MLGRUD, MPCNH

Undoubtedly the relatively high standard of sanitation service provision in large urban areas has been maintained by MOHCW insistence on enforcing the legislation. The continued but limited success in controlling environmental effects of waste disposal can be credited to the diligent efforts of an undermanned pollution control branch within the DWR aided by the WPAB

The control over pollution is relatively ineffective relying on too few staff and penalties which are not related to the damage caused or costs incurred. There is a need for a review of the legislation to ensure that there are established control systems specifically for wastewater treatment plants which define health and safety procedures for staff, operational parameters, effluent quality, testing requirements and reporting requirements. Additionally, the pollution control regulations should state the penalties to be incurred, which, in conformity with proposed changes in the Water Act, should be related to the benefits accrued and the damage caused.

Unfortunately effective use is not being made of existing legislation. No attempt is being made to force potential polluters to assume responsibility for monitoring effluent quality and reporting these results to the DWR. Exemption permits should be granted more readily but charged at a weekly or monthly rate which encourages remedial action to be taken. Greater efforts should be made to bring offenders speedily before the courts.

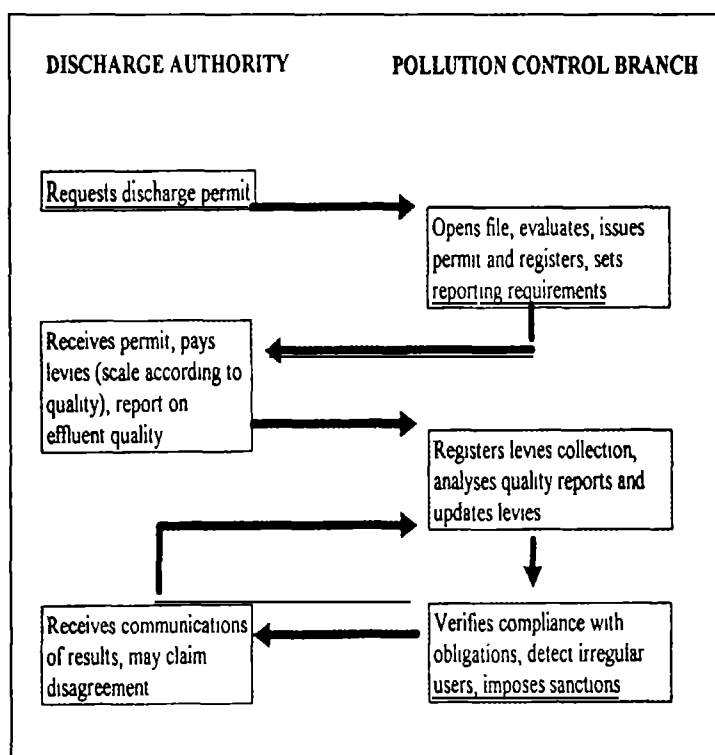
Management of pollution

The present management system for controlling pollution places the onus entirely on government for identifying who is discharging wastes, assessing the quality of the waste and financing the monitoring programme. An alternative system for implementing a pollution control programme is proposed in the following box which is self financing and places the onus for monitoring on the agency discharging the effluent. Any revised system adopted by government must

1. address these issues;
2. recognise that pollution is an inevitable part of our development, whilst
3. creating the incentives to reduce pollution; and
4. promote a progressive improvement in allowable standards

A REVISED WATER QUALITY MONITORING SYSTEM

Given the difficulties of the existing water Pollution Control Branch in carrying out their responsibilities and the current reform of the water sector, it is appropriate to consider whether alternative approaches to water quality monitoring in Zimbabwe may not be timely. The new system should emphasise the responsibility of the polluter rather than the responsibility of government. This could operate under the following scheme which is similar to that being implemented in other parts of the world.



The principles of this revised approach are.

- 1 All agencies/ authorities/ private individuals wishing to discharge any liquid into a natural water body (directly or indirectly) should have a permit issued by the PCB.
- 2 There is an administration charge for the permit but a scale of charges will be established which increases with the decrease in effluent discharge quality. Thus penalising polluters and encouraging improvement in effluent quality.
- 3 The discharging agency has to submit periodic reports on the quality of the effluent. Thus removing the burden of inspection from the PCB and placing it on the discharging

- 4 The PCB checks the accuracy of the reports and imposes penalties for non compliance where necessary.

The advantages of such an approach are that it will

- reduce the need for prosecution.
- create the incentive for effective wastewater treatment, and
- finance the pollution control branch
- allow for a progressive improvement in standards

Much of the legal framework for this approach is already in place and the remaining issues regarding levies, the application, and the role of the pollution control branch could be specified in supporting regulations.

Investment and financing

Financing mechanisms for large urban centres have been provided through the World Bank Urban II project and many municipalities are taking advantage of this to improve the sanitation system. The service charges for sanitation do not reflect the full operational costs of the service and will require adjustment,

especially in view of the new loans being incurred Investment in sanitation services tends to be 'lumpy' in that high investment is infrequent but of large magnitude With the drying up of capital investment funds from CRF the small urban centres currently have little opportunity to access money for infrastructure.

Government should endeavour to remove itself as a provider of cheap sanitation services for small urban communities. The failure of these services undoubtedly serves to reduce investment in these communities. Regulations should state the standards of sanitation services for each category of urban centre but in all cases the responsibility for the provision of the service should rest with the local authority and be based upon a full cost recovery for the service provided. Government may determine specific categories of centre requiring grants or other capital support for investment in sanitation services but operating costs should be on a full cost recovery basis.

There is urgent need for a review of the management system for urban sanitation which would emphasise cost recovery, investment to cater for growth, and effective maintenance of existing infrastructure.

Environmental and health concerns

Poorly maintained infrastructure may contribute to a health and environmental risk but even well maintained sewerage systems have negative effects The overloading of many of the existing treatment systems, especially in the towns and cities, results in the release of inadequately treated effluent To a large extent this problem has not been ignored The PCB of the DWR is very active and takes appropriate measures where necessary and the municipalities themselves react to the problem by disposing of poor quality waste onto farm land. However the eutrophication of lakes and dams and the intermittent release of poorly treated waste water into rivers continues on a large scale. There is inadequate information on industrial pollutants in waste water and how these may affect the environment

The eutrophication of Lake Chivero as an example results in considerably increased water treatment costs for Harare and a significant negative social impact on the consumers. The lack of consumer confidence in Harare's water supply has led to the significant growth in the bottled water industry which was almost non existent 6 years ago.

Human resources issues

The towns and cities are supported by qualified engineers able to provide technical support and supervision to sanitation services. Other urban centres are less fortunate and the growth points and service centres only have access to management staff but rarely any trained technical personnel. The situation at the present time is that both water and wastewater treatment plant systems do not have to be staffed with qualified personnel. This lack of training plus a lack of technical supervision means that wastewater treatment plants may or may not be functioning as planned but there is little way of knowing. There is a need for increased access to training for treatment plant operators and also a

requirement that operators be certified. In addition, the treatment systems scattered throughout the country under the CRF require a new management system where they are supervised by qualified personnel. The lack of any clear ministry responsible for sanitation complicates the issue of where to assign this responsibility.

Large urban centres have access to the necessary skills for the effective management of sanitation services but lack the necessary incentives. The development of an effective regulatory system will provide those incentives. The small urban centres on the other hand suffer from a lack of access to technical expertise. Government does not have any agency tasked with the responsibility for overseeing urban sanitation service development and providing technical and advisory support. Consideration should be given to addressing this need which could be achieved through a variety of approaches:

- capacity building of the RDC,
- establishing the technical skills within e.g. ZINWA or DDF, to act in an advisory capacity to the local authority,
- promoting the concept of contracting out e.g. to ZINWA, DDF or the private sector,

Institutional issues

Outstanding points not dealt with above relate to the role of the local authorities and the operation of a water and sewerage account. All large urban centres operate a water and sewerage account but the revenue from the services goes into the general revenue of the municipality. The current debate about privatisation of water services is not strongly supported in Zimbabwe and other studies have also indicated that there are examples where local authorities can provide reliable services. Ways of improving the delivery and performance of water and sanitation services whilst retaining the control and responsibility within the local authority should be explored. One of these is for the separation of the water and sewerage services into an autonomous branch within the local authority. This would serve to keep rates closely tied to the service provision, to make the branch more accountable, and yet allow for the social and political objectives of the local authority to be addressed.

The RDCs are currently embarking on a capacity building programme to enable them to assume the wide ranging responsibilities they have been given. One of these responsibilities is for the provision of sanitation services. The Central Rates Fund should resume the role of a fund and transfer the assets of sanitation systems to the RDCs who are responsible for the urban areas where these facilities occur. This may take some time but about one third of the RDCs are believed by the MLGRUD already to have the capacity to manage services. Even those with little capacity are likely to have more capacity than the severely depleted CRF. To bring these services up to an acceptable operating standard is likely to require a significant increase in sanitation charges and to reduce the problems associated with this increase, the RDCs should not be burdened with loan repayments on transfer of the assets.

REFERENCES

- CSO, 1993a Census 1992 Provincial Profile, Bulawayo, Central Statistical Office, Harare, Zimbabwe.
- CSO, 1993b Census 1992 Provincial Profile, Harare, Central Statistical Office, Harare, Zimbabwe
- CSO, 1993c Census 1992. Provincial Profile, Midlands, Central Statistical Office, Harare, Zimbabwe
- CSO, 1993d Census 1992 Provincial Profile, Masvingo, Central Statistical Office, Harare, Zimbabwe
- CSO, 1993e Census 1992 Provincial Profile, Matabeleland South, Central Statistical Office, Harare, Zimbabwe
- CSO, 1993f Census 1992. Provincial Profile, Matabeleland North, Central Statistical Office, Harare, Zimbabwe
- CSO, 1993g Census 1992 Provincial Profile, Mashonaland East, Central Statistical Office, Harare, Zimbabwe
- CSO, 1993h. Census 1992 Provincial Profile, Mashonaland West, Central Statistical Office, Harare, Zimbabwe.
- CSO, 1993i Census 1992 Provincial Profile, Mashonaland Central, Central Statistical Office, Harare, Zimbabwe.
- CSO, 1993j Census 1992 Provincial Profile, Manicaland, Central Statistical Office, Harare, Zimbabwe
- CSO, 1995 Zimbabwe Demographic and Health Survey 1994, Central Statistical Office, Harare, Zimbabwe
- Becker, C M, C N deBodisco & A R Morrison 1986 Urban Africa in Macroeconomic and Microeconomic Perspective. Issues and Options. Discussion paper UDD-97, World Bank 236pp)
- Christmas, J & C de Rooy, 1991 The Decade and Beyond at a Glance Water International, 16, 127-134)
- Habitat, 1989 Urbanisation and sustainable development in the third world: an unrecognised global issue 78pp
- Habitat, 1996 An Urbanising World Global Report on Human Settlements 1996 United nations Centre for Human Settlements, 558pp
- Lenneive, N M 1989 Towards the development of a revenue collection system in gazetted District Service Centres, Zimbabwe MLGRUD, UNDP- World Bank, Ziken International
- Lock, R R 1994 Water Pollution Control in Zimbabwe and the role of the Water Pollution Advisory Board Paper presented to Workshop on Water Resources Protection and Water Economics in Zimbabwe 17-20 Oct 1994.
- Maya, R S (ed) 1996 Perspectives on water quality and conservation in Zimbabwe's urban centres, Southern Centre for Energy and Environment
- Mining (Health and Sanitation) Regulations, 1995 Statutory Instrument 182 of 1995
- Nordberg E & Winblad, U , 1992 Urban environmental health and hygiene in sub-Saharan Africa SIDA 31pp
- Rossi-Espagnet, A 1984 Primary health care in urban areas - reaching the urban poor in developing countries WHO, Geneva
- WaterAid, 1996. Thirsty Cities Water, Sanitation and the Urban Poor, WaterAid, 15pp.

URBAN SANITATION IN ZIMBABWE

- Watson, G 1995 Good sewers cheap? Agency customer interactions in Low-Cost Urban sanitation in Brazil Currents UNDP-World Bank Water and Sanitation Program 70pp (323 08)
- World Bank, 1992 World Development Report 1992 Development and the Environment, Oxford University Press, 308pp
- World Bank, 1996 African Development Indicators World Bank, 431pp
World Development Report 1994
- WRC, 1993 Urban Sanitation Evaluation Water Research Commission WRC Report No 385/1/93
- WRC, 1994 Water and Sanitation in Urban Areas. Financial and Institutional Review 6 Summary Report Water Research Commission, WRC report No 571/6/94)
- Zaranyika, M F & R Goredema, 1996, (in preparation) Concentration of Cd, Cu, Ni, Pb and Zn in bream, *Oreochromis machrochir*, during the 1996 mass fish deaths in Lake Chivero, Zimbabwe
- Zimconsult, 1997 Personal communication

The Institute

IWSD is a non profit, non-governmental organisation. The Institute aims to assist in the achievement of sustainable development of water resources and waste management through the provision of support to development agencies in Zimbabwe and the Southern Africa region. In particular, the Institute will address issues hindering access of the poor to services and the sustainability of services.

Specifically the Institute will:

- build capacity through training and education programmes,
- act as an information centre and endeavor to provide state of the art information on request,
- provide technical and advisory support to sector agencies and development institutions, and
- develop a strong applied research programme to support decision making and policy formulation in the sector

Institute of Water and Sanitation Development 7 Maasdorp Avenue, Alexandra Park, Harare (or Box MP 422, Mount Pleasant, Harare) Tel (263-4-) 738120 Fax (263-4-) 738120 email admin@iwsd icon co.zw

10/11
10/11