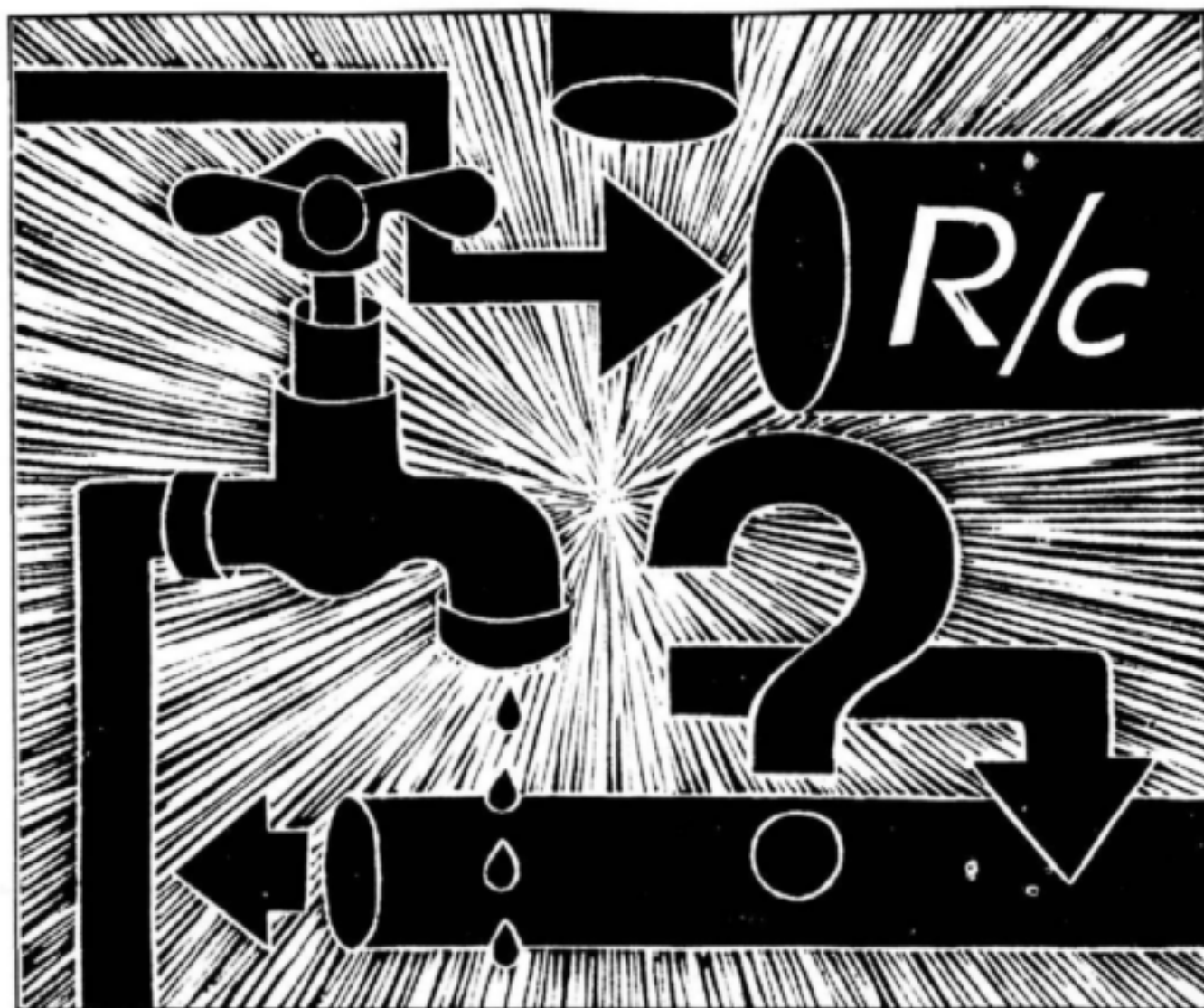




Inanda:

Case study of water supply arrangements to a peri-urban area.

SUPPORTING DOCUMENT TO REPORT KV 73/95

Working paper prepared as part of a project titled:

Evaluation of Water Supply to Developing Urban Communities

May 1994

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Preface

The Water Research Commission appointed Palmer Development Group to carry out an evaluation of water supply to developing urban communities in South Africa in May 1992.

The broad objective of this project is: to carry out a strategic evaluation of the present status of domestic water supply to developing communities in the urban areas of South Africa with a view to providing relevant and up to date information and analysis upon which rational policy and practice may be based so that the large and increasing demand for basic water supply services in developing urban communities may be met in an economically efficient and equitable manner.

The project was conceptually divided into three phases as follows:

Phase 1: Overview

- a. A review of the current status with water supply to developing areas internationally.
- b. Execution of a survey of water supply to the urban areas of South Africa, based on questionnaires and interviews, to determine who has access to adequate water supply, what type of systems are being used, and to obtain as much operating and cost information as possible.

Phase 2: Evaluation

- a. Evaluation of water supply systems from the point of view of: level of access and acceptance by communities; technical options; cost; financial viability; management efficiency; and environmental impact. The method of evaluation was largely based on a case study approach.

Phase 3: Proposals

- a. Putting forward proposals for improving water supply in these developing urban areas over the next decade.
- b. Preparation of guidelines for the planning and implementation of water supply systems.

A comprehensive set of reports has been prepared for each phase of the project, as listed on the following page.

This report is one of the set of case studies which has been carried out to get a more in-depth understanding of the factors affecting water supply in South Africa, with an orientation as described below.

Orientation of case studies

The intention has been to select case studies to cover a wide variety of water supply situations, from those in metropolitan areas to those in "dense settlements" which are remote but still considered to be functionally urban. In each case specific factors of importance were identified. The findings from each case study have been drawn together in the summary report (Report No 20) where they are used to develop overall proposals for improving water supply services in South Africa.

It is important to note that the case studies are not intended to be used as a basis for planning water supplies in the particular areas studied.

List of documents

 PHASE 1

- 1 **Main Report:** Evaluation of Water Supply to Developing Urban Communities in South Africa

Regional profiles: Domestic Water Supply : Regions A - J

- 2 Region A: Western Cape
 3 Region B: Northern Cape
 4 Region C: Orange Free State, including QwaQwa and part of Bophuthatswana
 5 Region D: Eastern Cape, Ciskei and portion of Transvaal
 6 Region E: Natal / Kwazulu
 7 Region F: Eastern Transvaal
 8 Region G: Transvaal, Gazankulu, Lebowa and Venda
 9 Region H: PWV and the Adjacent Areas of KwaNdebele and Bophuthatswana
 10 Region J: Western Transvaal including Bophuthatswana

Bulk Water Supply to Metropolitan Areas

- 11 Bloemfontein
 12 Cape Town
 13 Port Elizabeth
-

 PHASE 2

- 14 **Ikapa:** Case study of a water supply system in a metropolitan area.
 15 **Mamelodi:** Case study of a water supply system in a metropolitan area.
 16 **Botshabelo:** Case study of water supply and sanitation arrangements.
 17 **Inanda:** Case study of water supply arrangements to a peri-urban area.
 18 **Winterveld:** Case study of informal water supply arrangements.
 19 **Lebowa:** Case study of water supply in dense settlements.
-

 PHASE 3

- 20 **Main report:** Evaluation of water supply to developing urban communities: summary
 21 Costing of water supply arrangements.
 22 Water and sanitation handbook for communities.
 23 Guidelines for the provision of water supplies to developing urban communities (Still to be prepared).
-

Acknowledgements

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"Technical, socio-economic and environmental evaluation of water supply to developing urban areas in South Africa".

The Steering Committee for this project included the following people:

HC Chapman	Water Research Commission (Chairman)
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C Croeser	PLANACT
C Sweigers	Department of Water Affairs
B Myrdal	Development Action Group
M van Ryneveld	University of the Witwatersrand
JP Rodrigues	Municipality of Durban
S van der Merwe	Rand Water Board
A Fourie	Cape Provincial Administration

The financing of the project by the Water Research Commission and the contribution of the members of the Steering Committee is gratefully acknowledged.

The information upon which this document is based was obtained from a range of persons and organisations whose assistance is sincerely appreciated (see list of interviews at the back of the document).

Project team

This document has been written by Ernst Zöllner of Palmer Development Group, Cape Town. Ian Palmer and Rolfe Eberhard assisted with editing and the drawing of conclusions. Frances Cullinan (edits), Trevor Hughes (graphs), Lynette Booyens (maps and figures) and Meta Zöllner (cover page) provided technical assistance.

Summary

Inanda Released Area 33 is a collection of informal and squatter settlements, formal townships and smallholdings north of Durban. Urban development in the area was largely unplanned and unmanaged, and complex tenure arrangements and institutional fragmentation have made upgrading of facilities and services and general development in the area difficult.

Diverse tenure arrangements and settlement types and an often *ad hoc* development process have brought about a wide spectrum of water supply services in the area: tanker points, water tanks, water kiosks, uncontrolled public standpipes, yard taps and house connections. Not only do communities in Inanda have access to varying levels of water supply, but different pricing policies apply across the area. Prices charged for the same type of water supply differ widely between the NPA-controlled areas in Inanda, the Urban Foundation-managed informal settlements and the neighbouring Kwa-Zulu townships. This causes significant tension between communities and supply agencies.

Another source of conflict is the various pricing policies which apply to the different water services: users of the kiosk systems pay much more for their water than do households which have access to public standpipes or house connections, despite a much lower level of convenience. Violent conflict has occurred when residents of the formal townships have prevented households in areas with kiosks from obtaining water free of charge from the public standpipes.

Very few households in the formal township areas pay the already highly subsidised fixed monthly levy for water from standpipes and yard taps, the supply authority has *no effective mechanism through which to ensure payment*. The only situation where operating and maintenance costs are fully recovered is at the approximately 100 water kiosks. It is then not surprising that kiosks are unpopular amongst communities in the area, since their users are the only group who consistently pay for water. The report describes the present water supply arrangements, traces how these arose and suggests policy approaches to remedy the situation.

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1. INTRODUCTION

1.1 Case study objectives

The United Nations Centre for Human Settlement Development (1992) identified, amongst others, the following two objectives for water supply policies in the 1990's:

- ▶ supplying sufficient safe water to meet basic human needs, and
- ▶ overcoming funding limitations affecting progress in water supply coverage through greater cost recovery

The achievement of both objectives within water distribution systems in poor, developing communities is a challenging task. In the absence of sound city or regional wide supply and pricing policies it may be an impossible task. This is certainly true for water supply arrangements in Inanda Released Area 33. The interspersed formal and informal settlements in this part of Greater Inanda are serviced by several operating agencies, using a wide range of technology. Different pricing and supply policies apply in neighbouring communities, with water retail prices not reflecting either the ease of access to supply or the actual cost of supplying water. The resulting lack of progress towards addressing basic needs and cost recovery issues provides important lessons for those involved in planning and operating water systems.

1.2 Methodology

Due to a lack of published material on water supply in the Inanda area, most research was done through interviews with persons working in the area or within the field of water supply to developing urban communities (see bibliography for list of persons interviewed). Such communicated information was supplemented with general background literature on development issues in the Inanda area.

1.3 Structure of the document

Section 2 of the document briefly presents the most important characteristics of the Inanda area within the larger context of the Durban Functional Region. The important link between administrative and tenure arrangements and the level of infrastructure and services is explained. The various water supply arrangements within the area are described through a series of tables, maps and diagrams in Section 3. In line with the objectives of the case study, the levels of access to water and sanitation by the Inanda population, and the levels of cost recovery are examined in greater detail. The document concludes with Section 4

which attempts to draw out lessons from this case study for future water supply in developing urban areas. These lessons are not conclusive statements, but rather pointers for the direction which future policy and project designs should take.

2. BACKGROUND TO THE INANDA AREA

2.1 Context and structure

Inanda is a densely-settled area of approximately 12 600 hectares situated in the northern interface between the Durban Functional Region and its surrounding rural areas.

To the east and the south of Inanda are the sprawling townships of Phoenix (Indian), KwaMashu (Black) and Ntuzuma (Black). To the west is the vast Inanda Mission Reserve which extends as far as the Valley of the Thousand Hills, and to the north is the steep area surrounding Inanda Mountain.

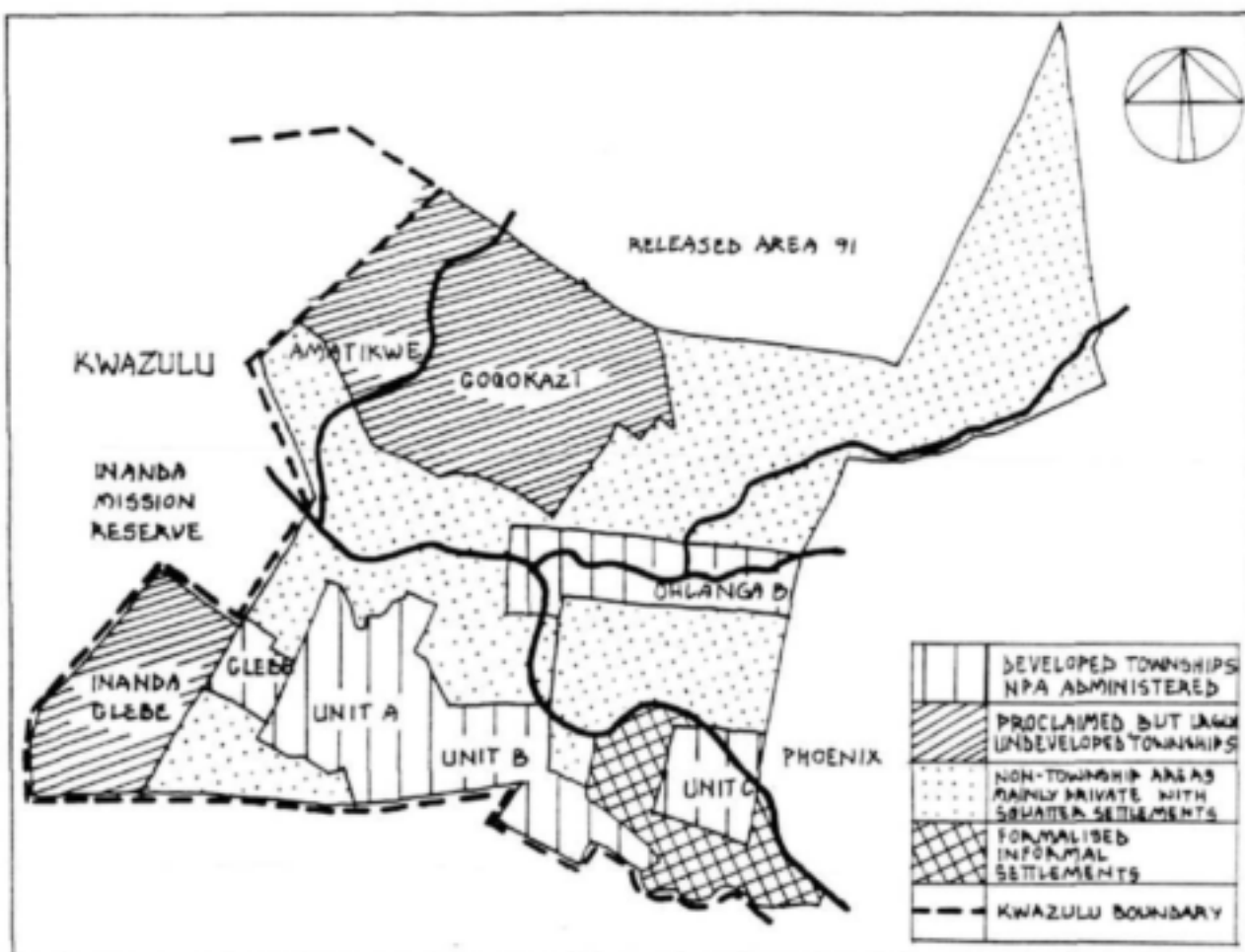
Figure 1 : Regional context



Inanda has a complex settlement pattern with formal townships and informal squatter settlements of varying densities and sizes, and small agricultural plots with some remaining farming activity. In terms of settlement structure, the area can be divided into four categories, as shown on Figure II:

- Formal township areas developed during the 1980's
- Four informal settlements which have been or are in the process of being formalised
- Twenty squatter settlements on occupied or farming land
- Remaining rural and natural areas

Figure II : Structural components



The area is characteristically hilly, with one-third of the slopes steeper than 1 in 3. The climate is typical of the Natal coastal region, with hot humid summers and warm winters.

There are no significant rivers in the area, but a number of streams which define the landscape.

This coastal topography with its steep slopes, the road systems (with the important bus routes), and land ownership patterns have been the strongest factors influencing the development of urban settlement in the area.

2.2 A developing urban community

The Inanda area shares many characteristics with the peripheral urban areas which surround most larger Third World cities, namely rapid and unmanaged settlement growth, complex tenure arrangements, a population in flux, high degrees of poverty and a lack of basic services, infrastructure and facilities.

a) Rapid, unmanaged growth

Two decades ago the Inanda area had less than a hundredth of its present population of an estimated 320 000 people. This population explosion in the area was not planned for - the little growth management by the authorities which did occur was reactive and mostly inappropriate¹.

The scale of settlement growth and its demands on infrastructure, services and facilities completely outstripped the resource capacity of the authorities. For example, between 1982 and 1988 only some 650 formal sites were developed, while some 13 000 households settled in the area.

The transformation of Inanda from a small-scale farming area into a vast urban settlement within two decades represents the most problematic aspects of urban development in the Third World: undirected land invasion, widespread 'squatter farming', township construction in the absence of proactive planning, and infrastructure and services inadequacy.

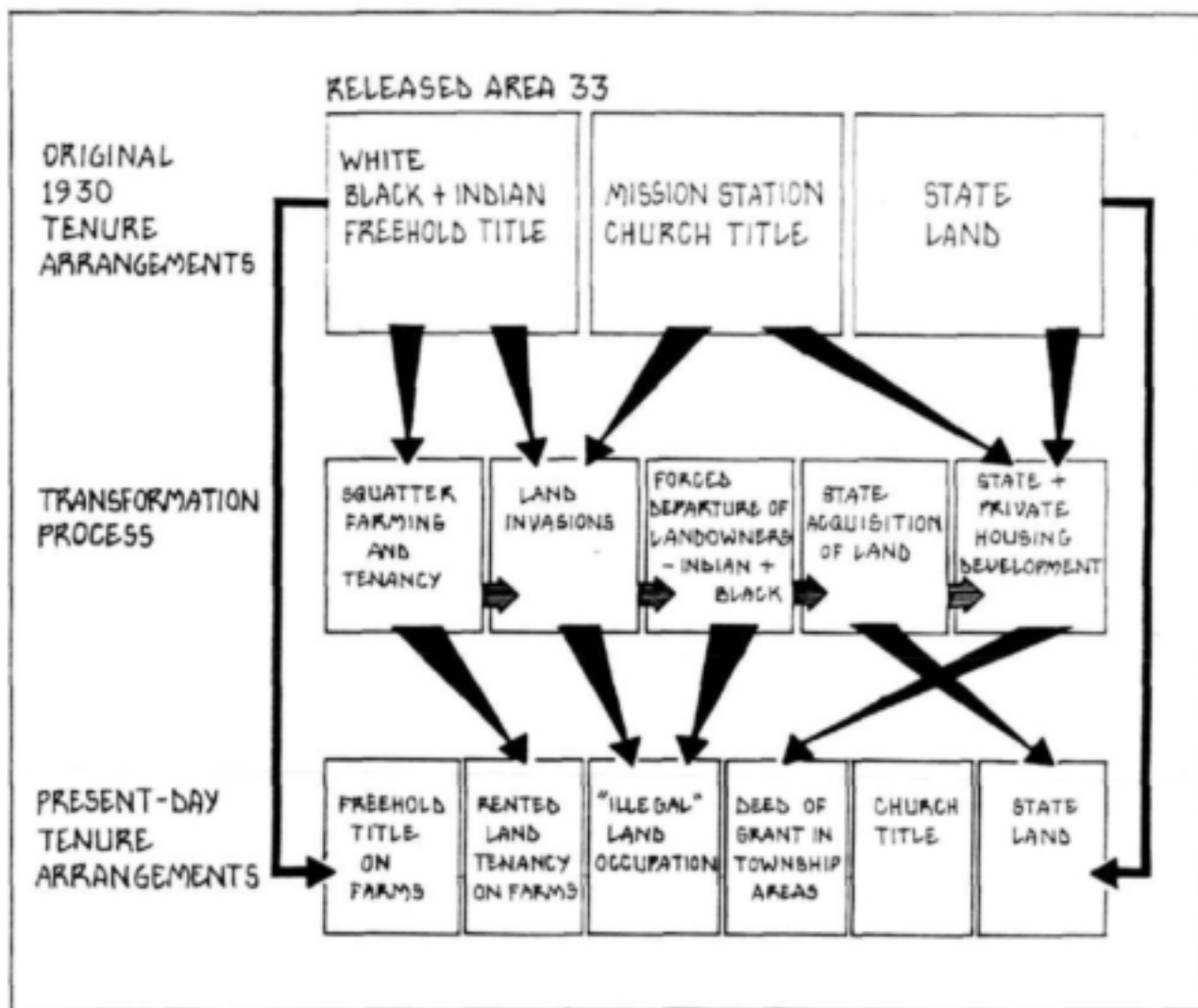
b) Complex tenure arrangements

Land tenure arrangements within Inanda have been transformed by the rapid population growth within the area and the attempts by the state to react to this settlement growth. The

¹ A structure plan for the Greater Inanda Area was produced in 1982 which allocated future uses to every piece of land and located major infrastructure. This initiative was followed by a Development Framework Report produced by a group of consultants for the DDA's Chief Directorate of Planning Services.

transformation of essentially freehold title of small and medium-sized farms into a present-day disarray of legal and illegal land occupation is illustrated in Figure III.

Figure III : The development of tenure arrangements



The lack of defined and commonly accepted property and community boundaries outside the formally proclaimed townships has far-reaching legal and cost recovery implications for any development within the area. Not only does it constrain infrastructure and services provision, but it is a continuing source of social and political conflict in the area.

c) A population in flux

Although many of the people in Inanda have been there for 20 years, and have established strong civic structures, a large percentage of the population are new arrivals. Some of these

people regard their settlement in the area as a temporary stop-over in the search of a secure livelihood and tenure arrangement.

Because of the 'transit' element of the population dynamic in the area, geographically-defined communities are fluid in size and structure as power-relations shift and change.

d) High degrees of poverty

Typically households living in Inanda form part of the poorest segment of Durban's urban population. A survey by Cross et al (1992) in three communities in the area found that roughly one in every two households lived below the Household Subsistence Level for Durban. Overall unemployment is estimated to be 47%, whereas adult literacy levels are about 50%. Household sizes, at 5.5 persons per household, were found to be slightly smaller than in areas closer to the city.

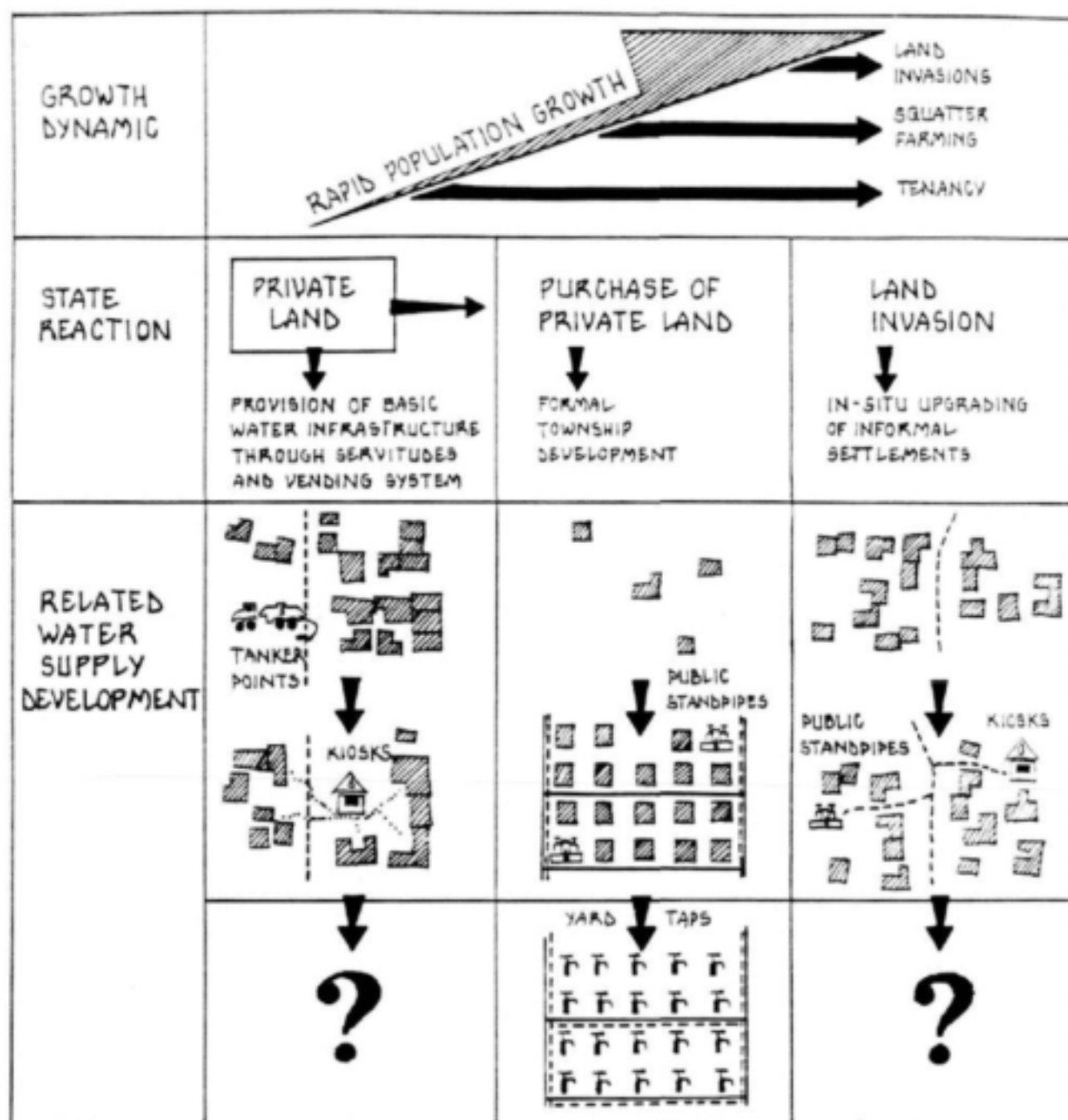
There is, however, a wide range of income levels throughout the area. In a recent survey in Inanda Newtown, Data Research Africa found that 15% of households earned more than R2 200 per month and 20% less than R250. The mean income for the township survey was R1 150 per month per household, substantially higher than in surrounding informal settlements.

e) Lack of basic services, infrastructure and facilities

Due to its explosive and unmanaged growth, its complex land tenure arrangements and funding constraints, there has been limited development of infrastructure, services and social facilities in the area. Very few households have electricity, the roads are in need of repair, refuse removal serves most of the population inadequately, and community facilities such as schools, creches, churches, sport and recreation, health and civic amenities are in dire shortage.

The response by the state to the rapid population growth in the area took three basic forms, depending on the ownership of the land and the erratic funding process. These are illustrated in Figure IV.

Figure IV : The state's response to rapid growth



2.3 Political and administrative fragmentation

In addition to its more widely shared characteristics as a peripheral urban 'ghetto', coherent development of the Inanda area has been particularly constrained by the complex and paradoxical institutional arrangements for management in the area.

a) Two governments, many departments

The Inanda area is separated from Durban in the south and the rural areas in the north and west by a boundary which divides the area, some communities and even some households between the KwaZulu and Natal administrations. This political separation translates into very different policies regarding settlement growth and management, development structures, funding and cost recovery.

The result is a highly fragmented and piecemeal development process and constant crisis management operating within often conflicting policy frameworks. Examples of such institutional chaos are: consultants working in different areas with limited knowledge of each other's activities, neighbouring communities paying different tariffs for the same services, and a lack of coordination and standardisation in funding of capital projects and operating subsidies.

b) No local government

Unlike some other black freehold areas in the country, no comprehensive local system of authority exists in Inanda. Released Area 33 was managed by the now defunct Department of Development Aid (DDA) until 1992 when the Natal Provincial Administration's (NPA) Community Services Branch took over the management task but the Department of Regional and Land Affairs became the owner of public land in the area.

The lack of representative local government means that management and development decisions are made by the appointed state agencies in occasional consultation with community representatives. Such representation has seen a shift in recent years away from powerful land and commercial interests to broader-based ANC and Inkatha aligned groupings. The Inanda Forum has been set up to formalise such representation.

c) Resistance and conflict

Fragmented management and funding, a lack of political representation and the deprived nature of the community have resulted in violent conflict and tension in the area over the last decade. There is widespread resistance to state structures, and infrastructure and personnel are regular targets of political violence in the area. Conflict between communities over access to services and land have led to the loss of many lives and some 'no go' buffer zones between communities remain as testimonies to social intolerance and the failure of authorities to adequately manage growth and change on Durban's northern periphery.

3. WATER SUPPLY ARRANGEMENTS

3.1 Overview

Water supply arrangements at Inanda reflect the complex institutional and land tenure arrangements in the area and the piecemeal manner in which infrastructure is being provided. Table 1 compares existing infrastructure with what was available to an approximately 30% smaller population six years ago².

Table 1 : Water supply infrastructure

TYPE OF INFRASTRUCTURE	1987	1993
Water mains	approx 60 kms	approx 100 kms
Kiosks	106	90 (83 in operation)
Tanker points	30	55
Public standpipes	approx 100	approx 860*
Yard taps or house connections	-	1 880

- * This figure is the best estimate available but the NPA consider it to be too high, based on their belief that the number of standpipes have not increased dramatically.

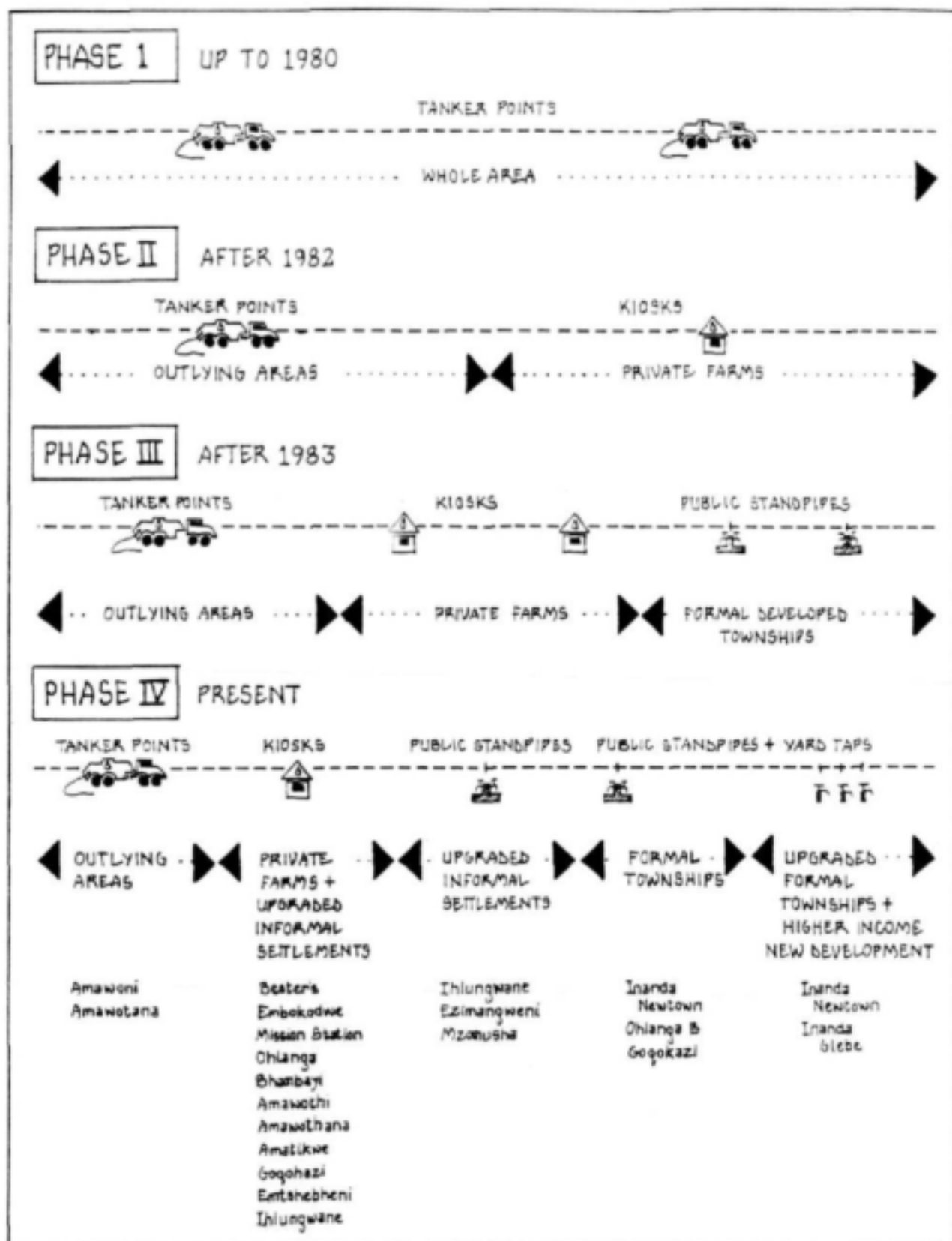
Figure V illustrates how water supply infrastructure has developed over time and in particular areas.

a) Water mains

Umgeni Water Board supplies bulk water to Inanda via Durban Corporation's Ntuzuma pump station in the south and reservoir P4 in Phoenix. In recent years bulk infrastructure has been expanded considerably to cope with the upgrading of rudimentary services in formal townships. The NPA has made R 3.4 million available in the 1993/94 period for further work on reservoirs and pipelines. The main focus of future investment is on the remoter northern areas and on the construction of a sewer outfall in the Piesangs River Valley, which eventually discharges into the KwaMashu sewage treatment works.

² This table has been compiled from various sources based on best estimates available.

Figure V : The development of water reticulation



b) Kiosks

The kiosk water vending system was introduced as an emergency measure on private farms in the area after the 1982 drought and accompanying typhoid epidemic. Failure by the approximately 300 private farm owners to provide safe and adequate water supplies to their thousands of tenants resulted in the DDA approaching landowners to register servitudes across their land and to erect kiosks along major roads.

The number of kiosks peaked in 1987 after which vandalism and replacement with standpipes in areas formally developed reduced the number of operating vending points to the present 83. The technical details of a kiosk are shown in Appendix D.

Appendix E presents meter readings from 73 kiosks over the period March 1992 to February 1993. Analysis of these readings show that:

- average monthly water sales from individual kiosks are 167kl, ranging between 59kl and 634kl; and
- the income from such water sales accordingly ranges between R83 and R888 per month per kiosk operator.

It follows that kiosk vendors earn low incomes for the service which they provide, despite substantial subsidisation of bulk water costs by the NPA (see Table 8 in Section 3.3).

c) Water tanker points

Daily water delivery through tankers has been the only source of water to many households, schools and creches in Inanda for over two decades. Today this system largely operates in the remoter north-eastern parts where the kiosk system does not reach all communities. There are also a number of private households and schools throughout the area who have private water tanks filled by the tankers. At present 12 trucks are on loan from the Department of Environment Affairs for use in Inanda.

d) Public standpipes

The formal development of Inanda Newtown since 1981 brought rudimentary services in the form of public standpipes along streets to the township residents. Further township development after 1987 with initial rudimentary services greatly increased the number of standpipes in the area.

Table 2 : Formal water and sanitation supply in the proclaimed towns

AREA	POPULATION	WATER SUPPLY	SANITATION SUPPLY	CURRENT/PLANNED PROJECTS
Inanda Newtown	7 500	1250 sites (25%) with taps on site	VIP latrines	Water borne sewerage to be installed
	32 500	540 uncontrolled public standpipes serving rest of sites at 1 standpipe to 6 sites.	VIP latrines	All sites have possibility of tap on site if connection fee is paid
Ohlanga	20 000	235 uncontrolled public standpipes	Pit latrines	
Inanda Glebe (Innova project)	1 500	289 sites with house connections in Areas 1 and 2	Water borne sewerage	A further 261 sites have been developed but not yet occupied/sold
	2 050	340 sites with water on site in Area 4	Improved pit latrines	A further 343 sites have been developed but not yet occupied/sold
Gqokazi (RKDP project)	5 100	50 uncontrolled public standpipes	Block pit latrines	

e) Yard tap and house connections

Phased upgrading of the Inanda Newtown units provided full reticulation to nearly three-quarters of all formal sites, and on payment of a connection fee, yard taps are installed. In the more up market housing development in Inanda Glebe (Sections 1-2) house connections formed part of the services package. In Inanda Glebe Section 4, developed by Innova (now Newhco), yard taps were provided as part of the IDT-funded site and service scheme.

The result of this development process is summarised in Table 2, where the range of formal water and sanitation supply options in different parts of Inanda are shown. The information on this table has been compiled from over fifteen different sources and provides best estimates rather than empirical data³. Figure VI is an assembled map which shows the geographical location and extent of the areas listed in Table 2 and Table 3.

³ There are no commonly agreed boundaries to the different parts and communities within Inanda. Boundaries drawn on maps in planning offices mostly have little bearing to actual definitions used by people on the ground.

Table 3 : Institutionalised water and sanitation supply in the informal settlements/ settled areas

AREA		POPULATION	WATER SUPPLY	SANITATION SUPPLY	CURRENT/PLANNED PROJECTS
Besters (Urban Foundation Area)	Besters Camp	14 000	10 kiosks	Pit latrines	Further upgrading to full reticulation foreseen as part of Urban Foundation in-situ upgrading.
		1800	2 public standpipes in Area 4	Pit latrines	
	Ihlungwane	7 500	13 public standpipes (2 kiosks)	Pit latrines	
	Eziman-gweni	22 500	10 public standpipes	Pit latrines	
	Mzomusha	9 000	8 standpipes	Pit latrines	
Soweto		12 000	2 kiosks	None	Upgrading of R18 million in initial planning stages.
Embokodwa		22 000	5 kiosks	None	3 kiosks planned
Mission Station		14 000	10 kiosks	None	3 kiosks planned
Ohlanga and Bhambayi		27 000	10 kiosks	None	1 kiosk planned
Amawoti		30 000	15 kiosks Water tanker points	None	
Amawotana		38 000	10 kiosks Water tanker points	None	2 kiosks planned
Amatikwe		15 000	6 kiosks	None	1 kiosk planned; area to be supplied with rudimentary services
Goqokazi		9 500	3 kiosks	None	Area to be supplied with rudimentary services
Emtshebeni		39 500	15 kiosks	None	3 kiosks planned
Inhlungwane		5 000	2 kiosks	None	-

3.2 Access to water and sanitation

Average daily water consumption for Inanda is shown in Table 4. This overall figure is compared to that of Durban as a whole and other comparative areas. However, in the previous section the huge variation across Inanda in levels of access to water and sanitation supply was illustrated. Per capita water consumption will accordingly vary considerably depending on water supply infrastructure provided (see Appendix F).

Figure VI : Definition of areas

In the formal townships access to water and sanitation is generally adequate, but in the informal settlements on the private farms levels of access are very low. This large component of Inanda's population is unserved or under-served. The lack of sufficient safe water and sanitation supply to meet basic human needs is reflected in persistently high levels of disease (eg. typhoid and cholera) and generally poor community health standards.

The position of the Inanda population in terms of access to formal water and sanitation supply is summarised in Table 5 and Table 6. If public standpipes at sufficient densities and

Table 4 : Per capita water consumption

SETTLEMENT	AVERAGE DAILY WATER CONSUMPTION PER PERSON (1992)
Inanda Released Area 33 (all areas)	21 l/cap/day
Inanda: areas served by kiosks	4-5 l/cap/day
Inanda: areas with standpipes and yard taps	51 l/cap/day
City of Durban	183 l/cap/day
Borough of Westville	388 l/cap/day
Umlazi	115 l/cap/day
Clermont	157 l/cap/day
Folweni	17 l/cap/day

Source: Palmer Development 1993

yard connections are considered adequate levels of access to water supply to meet basic daily needs, then approximately 67% of the population of Inanda is not adequately provided for. (This figure includes kiosks which are considered to be inadequate for an urban area). The corresponding figure for sanitation is around 60%.

Table 5 : Access to water infrastructure

LEVEL OF SERVICE	POPULATION	%
On site		
House or yard connection	11 000	3.3
Off site		
Public standpipe	100 000	29.9
Kiosk, borehole and other sources	224 000	66.9

3.3 Cost recovery and maintenance

For the 1993/94 year the operating budget of the Inanda administration for water supply is R 2.66 million, which includes R 2.09 million payment for bulk water supplies and R 0.57 million for maintenance of infrastructure. This represents nearly a quarter of the total operating budget for the area.

Table 6 : Access to sanitation infrastructure

LEVEL OF SERVICE	POPULATION	%
Water borne sewerage	1 500	0.5
Improved pit latrine	122 000	36.4
Pit latrine and other	211 500	63.1

It is not possible to determine whether such operating costs are recovered since payment made on water accounts or general site levies are paid directly into the State Revenue Fund. Analysis of bulk supply costs and payment records show, however, that recovery falls far short of costs, but the extent of this subsidy can not be determined.

Reasons for low cost recovery include lack of metering and accounting, a complex and uneconomical tariff structure, and unwillingness or inability to pay monthly levies.

a) Lack of administrative control

Water from public standpipes, yard taps and house connections in the formal townships is unmetered and access is not controlled. Payment for water is included in the monthly levies payable by formal sites within these areas. These gazetted levies are uniform and apply to all former DDA-controlled areas in the country. Very little control over payment exists and no effective penalty for non-payment is applied.

Where water is sold through kiosk vendors in the private farming areas much better control is exercised. Vendors are appointed by the community and have to make a R150 deposit before being allowed to operate⁴. Vendors typically appoint 2-3 assistants who sell water in 25 litre containers during daytime opening hours. The unit selling price for water is set by the NPA and kiosks are metered and billed monthly. If payment falls into arrears the situation is investigated, but after a three month arrears period the case is generally referred to the Attorney General⁵.

⁴ In the past communities were not consulted on vendor appointments, which have led to a number of violent acts against vendors and vending points.

⁵ Political violence has prohibited meter readings in some areas over periods of time, thereby reducing effective control over water supply. In the Bhambayi area, for example, NPA staff have been unable to read meters or perform any maintenance tasks at the five kiosks since December 1992.

An attempt to increase administrative control of public standpipes was made in the Urban Foundation's Besters upgrade project. Here Water Committees were to take responsibility for collecting monthly water levies calculated from a bulk meter reading for the particular area of control. Despite initial community support for this system, no monthly accounts have been paid since water was delivered to the area. The failure of this system to provide better control over public standpipe use is examined in Appendix A.

b) Complex and uneconomical tariff structure

The complex institutional arrangements in the area and the range of different water supply infrastructures to which communities have access result in very different water tariffs. Tariffs charged throughout the area and responsibility for administration and maintenance are shown in Table 7.

From experience, a ratio of retail price to bulk tariff of approximately 3.0 has been found to be effective in ensuring that revenue from sale of water is sufficient to cover the operational and maintenance of public distribution systems (i.e. standpipes, kiosks, water points), including a degree of capital loan redemption and water losses (Rivett-Carnac, 1989). Umgeni Water charges Inanda R1.01 per kl water consumed.

Table 8 compares the unit costs of water for households in different water supply areas using the same assumed average household consumption level of 3,2kl water per month, and calculates the ratio of retail to bulk tariff for each supply arrangement.

Based on the assumptions made, and the figures in Table 8, it can be concluded that none of the tariffs charged for public supply systems cover operation and maintenance costs. Kiosks are the closest to meeting these costs, and the uncontrolled public standpipes in the formal townships the most heavily subsidised.

c) Lack of payment

Few households in the formal townships pay the monthly levy for water and other services, and at present no costs are recovered for water sold from kiosks in the Besters Camp area (see Appendix A). The only communities effectively paying for water at present are those serviced by the kiosk system in the rest of Released Area 33.

Table 7 : Water tariffs, administration and maintenance

TYPE OF WATER SUPPLY		WATER CHARGE	OPERATION AND MAINTENANCE COST OF WATER SYSTEM	METERING, ACCOUNTS AND FEE COLLECTION	OPERATION AND MAINTENANCE
On-site connections		R4.80 monthly levy	N/A	NPA	NPA
Public Stand-pipes	Released Area 33	R2.00 monthly levy	N/A	NPA	NPA
	Kwa-Mashu, Ntuzuma (Kwa-Zulu)	R 6.00 monthly (all services)	N/A	NPA	NPA
	Besters Camp Area	R5.00 monthly levy	N/A	Urban Foundation (metering and accounts), NPA (bulk metering & account) and Water Committee (levy collection)	NPA
Kiosks	Released Area 33	5c per 25l to public 1.5c per 25l to vendor	R0.80 per kJ for NPA	NPA (metering) Vendor (receives payment)	NPA
	Besters Camp Area	7c per 25l to public 3c per 25l to vendor	R1.20 per kJ for NPA	Urban Foundation (metering and accounts), NPA (bulk account) and Water Committee (vendor receives payment)	Urban Foundation
Water tanker points	Amawoti Amawotana	No cost charged to fill up 20/ containers and water tanks at schools and creches	N/A	NPA	NPA
	Area outside township	R10.00 per tanker (4000l) for filling up water tanks at private dwellings			

Table 8 : Comparison of unit water costs and retail to bulk tariff ratios

TYPE OF WATER SUPPLY		DOMESTIC TARIFF AT AN ASSUMED MONTHLY HOUSEHOLD CONSUMPTION OF 3.2KL	RATIO OF RETAIL TARIFF TO BULK TARIFF IN THE AREA *
On-site connections	City of Durban	R 1.50 per kl	1.64
	Released Area 33	R 1.50 per kl	1.5
Public standpipes	Released Area 33	R 0.63 per kl	0.63
	KwaMashu/ Ntuzuma (KwaZulu)	R 0.35 per kl	0.35
	Besters area	R 1.56 per kl	1.56
Kiosks	Released Area 33	R 2.00 per kl	2
	Besters area	R 2.80 per kl	2.8
Tanker points	Amawoti & Amawotana	R 0.00 per kl	0
	Private household with water tanks	R 2.50 per kl	2.5

* Note: Assuming bulk supply tariff of R1.00 for Inanda area.

Reasons for non-payment of water levies include:

- The perceived unfairness of charging neighbouring communities different tariffs for water, with particular reference to low service charges in KwaZulu.
- The perceived inability of authorities to act in the case of non-payment⁶.
- Dissatisfaction with the quality and maintenance of water supply infrastructure, which is considered inferior to that which is supplied in Durban City.
- The uncontrolled use of water from public standpipes by neighbouring informal communities who are not required to pay monthly levies.
- Political demands that water should be provided as a free or inexpensive social service to disadvantaged black communities.

⁶ Authorities acknowledged during negotiations with community leaders in 1992 that the serious social and political implications of cutting off water supply to whole areas make such action very unlikely

- High levels of poverty and unemployment, which inhibits payments of monthly service charges by many households.

3.4 Evaluation

The previous sections have outlined the water supply arrangements in Inanda and examined more closely levels of access to water and sanitation and the administrative control of water operations. It is evident from this preceding analysis that water supply arrangements in Inanda are insufficient, unfair and unsustainable in the medium to long term.

a) Lack of adequate water supplies to some communities

It was pointed out in Section 3.2 that the basic need for safe water in a significant part of Inanda's population is not met. This situation is clearly unsatisfactory, but a number of factors constrain attempts to address this situation:

- Despite continuing purchases of land by the state, many urban settlements in Inanda are still on private farmland and therefore difficult to service.
- Funding to expand infrastructure is limited and high levels of violence and crime increase the costs of construction work in the area.
- The lack of cost recovery in formal township areas reduces available finances for expanding reticulation and operation and maintenance deficits.

b) Unfair water pricing

In general the price of water should be related to the level of convenience at which it is supplied and the amount of water consumed. When this is not so, supply arrangements will be perceived as unfair.

In the case of Inanda, specific arguments for deeming water prices to be unfair are:

- The population in Inanda is required to pay more for their bulk and domestic water than communities elsewhere in the Durban Region with much better levels of convenience.

- Within Inanda, communities with lower levels of service have to pay more for their water than neighbouring communities with far better convenience.
- Communities in Released Area 33 are required to pay more for their water than communities with the same level of service in neighbouring KwaZulu areas.

Particularly affected by these 'injustices' are the users of the kiosk system. Kiosk users pay twice the price of water than a household in the City of Durban which has water in-house. They also pay nearly three times as much for their water than the neighbouring communities who have public standpipes.

Seen in this light, resistance to an expansion or even retention of the kiosk system as expressed strongly in the Soweto upgrade project (see Appendix B) is understandable. Kiosk users have to pay a very high price for their water in exchange for low levels of convenience:

- Communities need to carry water over long distances, especially where population densities are low.
- Kiosks are only open during daytime hours and are often closed when the vendor is ill or on vacation.
- Many kiosk owners charge more than the set price for water, exploiting their monopoly positions⁷.
- When a vendor defaults on payment of water, the whole community could be affected when water supply is cut off.

Resistance to paying monthly service levies in township areas can also be attributed to a significant extent to the very low tariffs in neighbouring KwaZulu areas, which are half of what household residents using standpipes in NPA-controlled areas have to pay for the same services. Such perceived unfairness makes progress on cost recovery and reticulation very difficult.

⁷ Whereas on average vendors earn between R80 and R900 per month, some vendors reportedly earn up to R4000 per month by overcharging for water sold.

c) Unsustainable finance situation

Any free system of services provision will fail in the medium to long term when the capacity of the state to subsidise all operation and maintenance costs is exhausted and the system collapses through disrepair.

The lack of cost recovery in supplying water in Inanda limits options for further water reticulation. With this in mind, the Durban Corporation, in investigating a possible takeover of water and sanitation systems in the area, pointed to recovery of operating and maintenance costs as a prerequisite before any capital projects will be undertaken.

At present, the kiosk system in Released Area 33 is the only water supply arrangement which covers its operating, maintenance and even part of its capital costs. The understandable preference of authorities for retaining or even expanding this system is, however, met by political resistance from communities to whom it is, understandably, considered unjust and inconvenient. This system will remain unacceptable to communities for as long as users are in effect penalised for using the only water supply arrangement over which authorities can exercise some control over payment.

The cost recovery situation is likely to worsen in the near future as waterborne sewerage is introduced in Inanda Newtown and the number of unmetered public standpipes is increased in the proclaimed township areas of Goqokazi and Amatikwe.

In order to cover capital, operation and maintenance costs, water levies of over R80.00 per month (Durban Corporation, 1993) would have to be charged when water borne sewerage is installed. This amount clearly exceeds the ability and willingness of many households in this community to pay for water, considering that 35% of households in Inanda Newtown earn less than R500 per month.

4. CONCLUSIONS

The case study on water supply arrangements within the Inanda areas provides three important lessons for water supply in developing urban areas:

- *Water supply arrangements can only be as good as the institutional structures and policy framework through which they are implemented and operated.*
- *The poor should not bear the cost of institutional failure.*
- *Restructuring of regional tariff structures is a prerequisite for greater cost recovery on water distribution systems in developing urban communities.*

The policy implications of each of these points are briefly examined below.

4.1 Institutional and policy reform

Addressing the water supply problems of Inanda in the first place requires changes to larger institutional structures and operating policies in the Durban Functional Region. The problems of Inanda are essentially a product of the failure of these structures and policies and little meaningful improvement can be achieved unless the following actions are undertaken:

- a. The formulation of an appropriate growth management framework for the Durban Functional Region which directs settlement growth through integrated infrastructure provision and effective control over the usage of land⁸.
- b. Associated with the above framework, the formulation of a water policy which sets out investment priorities, service level options, operation and maintenance guidelines and tariff structures for the region and specific local areas.
- c. The implementation of a common water tariff structure and subsidy structure throughout the region is essential if progress is to be made with water supply to the poor. The basis should be a uniform bulk tariff to all areas, irrespective of age of infrastructure and volumes consumed⁹.

⁸ Continuing illegal occupation of land and tenancy on farms will ultimately lead to a breakdown of all service and infrastructure provision. The challenge is for the state to gain control over the growth process through a vigorous housing sector aimed at greater integration and compacting of the city.

⁹ It is the policy of Umgeni Water to move towards a uniform bulk tariff.

d. Institutional reform at national, provincial, regional and local government levels is required to address current fragmentation of development policies, strategies and project implementation. Local authorities need to be established in the urban periphery and these need to be linked to the core city through metropolitan and regional government.

4.2 New tariff structures

In not having access to "better" water supply services, kiosk users in Inanda are paying a financial penalty associated with a lack of local government in the area. At present the high water tariffs they have to pay for low convenience is shifting the burden of cost recovery in Inanda onto those who can least afford it. Within a regional policy framework for water provision, the following are some of the issues which need to be considered:

- a. The linkages between economic tariffs which cover operation, maintenance and capital costs and levels of consumption and convenience of access to water supplies.
- b. Cross-subsidisation of capital and a portion of operating costs between older, more established urban areas and the developing informal settlements.
- c. Reducing the price of water at kiosks by possibly subsidising construction and attendant salary costs in order to make it a more affordable source of water.

4.3 Greater local responsibility and control over water supply

When communities manage themselves and their water supply systems they can generally obtain higher levels of service at lower costs. Where poorer communities are organised and feel an ownership of their supply systems, international precedent has shown that they are better payers for services than the rich (Whittington et al, 1989).

The only sustainable system for ensuring greater cost recovery in the formal townships of Inanda would be one in which the local communities have a say in local government and in which control of the water supply system is community-based. More effective local government would allow for more effective water supply, provided a sensible policy was developed.

Such a policy could well include the following elements:

- a. Metering and accounting of all domestic water connections (individual or group connections). The rationale for such an approach is illustrated with reference to the Cato Crest experience (see Appendix C).
- b. Involving community-based organisations (CBO's) in the operation and maintenance of water distribution systems in areas where no effective local government is in place. Proposals for such structures in the Soweto upgrade are discussed in Appendix C, whereas the Bester's Camp (Appendix A) experience points to some of the short-comings of such an approach.
- c. Stricter discipline should be applied in cutting off water supply (after a process of negotiation) in the case of non-payment of accounts. It should be ensured that alternative (albeit inconvenient) water supply is available to cover basic consumption.

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Wilson, A. (1993) "Umgeni Water Rural Areas Water and Sanitation Plan", a paper delivered at the 1993 Annual Congress of the South African Institute of Civil Engineers entitled "Engineering in Africa", Durban 19-21 April.

5.2 Persons interviewed

Inanda Town Management

Mr Z.L. Van Dyk, Township Manager
Mr Johnny le Grangé, Senior Administrative Assistant
Mr Edward Shoji, Administrative Assistant (Kiosk management)
Mr E. Struckman, Works Manager

NPA Community Services Branch

Mr Chris Valentine, Deputy Director
Mnr Pieter Vorster, Natal Provincial Administration

Project Managers in Inanda

Inanda townships

Mr Gordon Haslewood, Theron, Burke & Isaacs

Mr Ian Thompson, Theron, Burke & Isaacs

Soweto/Piezangs River

Ms Heather Maxwell, BESG

Mr Sivi Gounden, Davies, Lynn & Partners

Besters Camp

Mr H. Williams, Construction Manager, Urban Foundation

Mr Paul Brink, Assistant Manager, Urban Foundation

Mr Rob Taylor, University of Natal

Goqokazi and Amatikwe

Mr Sean O'Sullivan, Van Wyk, Louw & Partners

Inanda Glebe

Ms Patricia Dindar, Inova

General discussion

Mr Joshua Nkosi, Planner, BESG

Mr James Rivett-Carnac, Appropriate Technology Information (ATI)

Mr J. Pedro Rodrigues, Durban Water and Wastes

Consultation on information sources

Mr Julian May, Data Research Africa

Mr Adrian Wilson, Policy Planning, Umgeni Water

Mr Peter Alcock, Department of Economics, University of Natal

APPENDIX A: Besters Camp

The case of the disappearing water committee

The Urban Foundation is in the process of upgrading the squatter settlements of Besters Camp, Ihlungwane, Ezimangweni and Mzomusha in the south-eastern corner of Inanda. There are an estimated 8 000 households living in this area, most of whom have only been there since a series of land invasions between 1985-9.

The project managers of the upgrade, in negotiation with communities, decided to supply water kiosks and public standpipes in the area. 10 kiosks were installed in Besters Camp, and 31 standpipes in Besters Area 4 and the other three communities.

Both kiosks and standpipes were to be controlled by the Water Committee, an elected body which would be responsible for collecting monthly levies from standpipe users and run the kiosks. According to the initial agreement with the Committee, the Urban Foundation would meter every standpipe and kiosk on a monthly basis and submit an account to the water committee. The committee would pay the account from levies charged to specific standpipe users and from the 7c per 25 litres for which water is sold from the kiosks. The Urban Foundation would then pay the NPA which supplies bulk water to the project area as a whole.

This system was seen as an improvement to the uncontrolled standpipe system in Inanda Newtown, which the NPA refused to have duplicated despite it being the community's initial preference. It was hoped that with the water committee acting as water bailiffs and through more localised metering payment and water conservation would improve.

When the system began to operate, the Water Committee, however, disappeared, as did the co-ordinating Development Committee which was negotiating with the upgrading planners. Communication between the community to date and project management subsequently broke down completely as internal conflicts in the community saw leadership rise and disappear at a fast rate.

The Urban Foundation has done monthly meter readings at the kiosks and standpipes, but no accounts have been issued to the community to date and only in Ihlungwane, a more established community, has payment been forthcoming directly to the NPA. The NPA is owed a large amount for water consumed in the area. Initially some kiosk vendors sold water without paying their accounts, but at present most kiosks function as public standpipes.

In recent negotiations aimed at breaking the deadlock in the upgrading process, low tariffs in KwaZulu were given as the main reason for resistance to paying the much higher levies and kiosk fees. The decision by the DDA (and now the NPA) not cut off water supply to the area despite community non-payment of accounts is taken by the community as an indication that water need not be paid for.

APPENDIX B: SOWETO

A community speaks on water supply

The Soweto Civic Association has received R 18,5 million from the Durban City Council's DFRDA fund for upgrading of the dense settlement in the south of the Inanda Released Area. The Built Environment Support Group (BESG) at the University of Natal and the engineering firm Davies, Lynn & Partners have been appointed to direct the *in situ* upgrade of roads, water and sanitation services, stormwater, electricity and refuse infrastructure. At present there are two kiosks to the west of the area, but people prefer to collect water at no charge from the Inanda Newtown public standpipes.

During the public participation process around the upgrade people were queried on their attitudes towards different services options. Four different options were presented, consisting of different combinations of water, sanitation, refuse, electricity and street cleaning systems. For each option the projected monthly services cost was calculated, with the lowest service option costing R22.50 per month in service charges and the most expensive R39.30. Since the capital grant is sufficient to provide the highest level of service of house connections and water-borne sewerage, the consultants argued that affordability of monthly services charges would be the deciding issue since no operation and maintenance subsidies will be provided.

The response of the community was overwhelmingly for individual yard connections and water-borne sewerage. People had the following problems with the existing kiosk system:

- water from kiosk is too expensive (it is unjust to charge the poor so much for water),
- inconvenient operating hours (only open during operating hours),
- people do not want to share taps, and
- people do not want to carry water so far.

In terms of paying for the different services, the response was that the more expensive option of yard connections is just as expensive as the lower service options, i.e. people who can not pay R15 a month can also not afford to pay R39 a month. Affordability of service charges was an issue for the consultants but not for the community, who argued against considering the calculated service charges of chosen levels of service as criteria for the following reasons:

- water can be obtained free of charge from Inanda Newtown's public standpipes;
- in the NPA-administered areas of Inanda Newtown and Ntuzuma to the south people paid R12.00 per month instead of a required economical fee of R30.40 in Soweto for the same services;
- people who do not pay service charges in Ntuzuma have not been cut off after nearly two years of payment boycotts; and
- water must be provided as a basic right, and people who can not afford to pay should be subsidised.

A more moderate approach was that the community will collectively pay the amount of the more expensive service options and will look after those who can not afford to pay. The general response to the consultants was that the best level of infrastructure should be provided and that the planners should not worry about services affordability - the community will sort that out later.

APPENDIX C: WATER COMMITTEES

Cato Crest: failure due to lack of community co-operation

At Cato Crest 250 households have their water metered in bulk by Durban Corporation, which issues an account to the water committee in the area. The water committee then divides the billed amount through the number of households and obtains from each household its share of the costs.

Payment has been erratic and last year water was cut off due to non-payment of arrears. At first the crisis was solved when the water committee managed to convince more households to pay their share of the costs, but in November 1992 water to the area was cut on request of the water committee. According to the committee efforts to persuade all households to pay failed and refusal by some to pay soon led to refusal by everyone to pay.

The community now has to rely on water supplies from friendly neighbouring communities, from public facilities and from private black market vendors who deliver water in trucks at very high prices. Until political conflict between advocates of non-payment (i.e. free water) and more conservative groupings in the community is resolved, it is unlikely that water supply will be resumed to the area.

Valley Trust: reduced success due to lack of discipline from water utility

In the Valley Trust area water is supplied through a coupon-based water committee system. The water committee has entered into an agreement with Umgeni Water in which it undertakes to pay a monthly bulk account for the area. The committee controls the price of water and directs where standpipes should be made available. Umgeni Water has subsidised the cost of initial infrastructure.

The committee sells water coupons (at shops and central points) which entitles the holder to 25l of water from any of the public standpipes. The coupons are presented to a water attendant at the standpipe who dispenses the paid for quantity of water. At the end of every week the secretary of the water committee compares the number of coupons collected by the attendant with the meter reading of the standpipe.

The system has had a good cost recovery record over the last ten years and has been extended considerably. The system is now large enough to incorporate individual connections, where the water bailiff will fill up yard tanks on presentation of coupons. Past success is attributed to high levels of community organisation and cohesion, and the strong commitment of a few capable individuals to running the water committee.

Failure by Umgeni Water to cut off water on non-payment of accounts last year has, however, reduced willingness to pay for water in the area. An important feature of this project was the amount of time and funds spent on training members of the water committee, since the success of the system depends to a large extent on these individuals. It was found that this community-based system is furthermore expensive to operate due to the large amount of small money transactions.

Soweto: envisaged success in drawing on lessons from other systems

In the DFR-funded in-situ upgrade project in Soweto, Inanda, a system of water supply is proposed which would combine popular features of public standpipes with the cost recovery potentials of water committees, but at block rather than community-wide level.

According to current thinking, the community would be divided in wards of 25 households, each ward with a communal standpipe. The standpipe would have a simple locking mechanism, with each of the 25 households having a key. In each ward a water committee would be formed which would enter into a legal agreement with the Residence Association for the provision of water at a stipulated tariff and for educational programmes in water management.

The bulk utility supplier (probably the NPA) would sell water to the larger Residence Association, which in turn reads the individual meters of each ward and renders accounts. In the case of non-payment, supply to a ward is turned off by the Residence Association's water bailiffs.

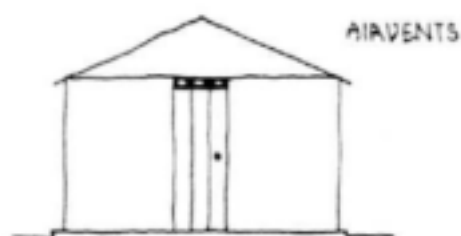
From the Residence Association the ward committee would receive guidelines on how to manage the communal standpipe, but each ward would decide on how the monthly bill will be paid. Possible options include:

- all households in the ward pay a flat rate, or
- some households pay less and some more depending on family size and income.

Wards will also be encouraged to start revolving credit funds to assist households in periods of unemployment.

It is envisaged that the Residence Association will employ a small staff to manage and maintain all the services within the area themselves, becoming a local authority structure in their own right over time.

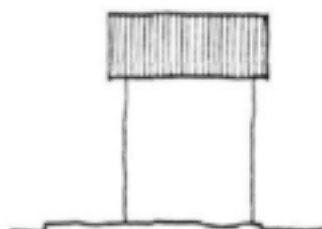
APPENDIX D: TECHNICAL KIOSK DETAILS



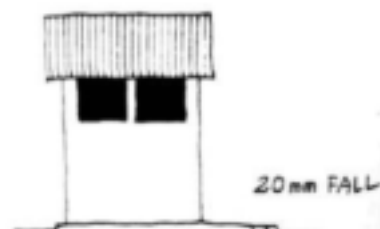
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FRONT ELEVATION



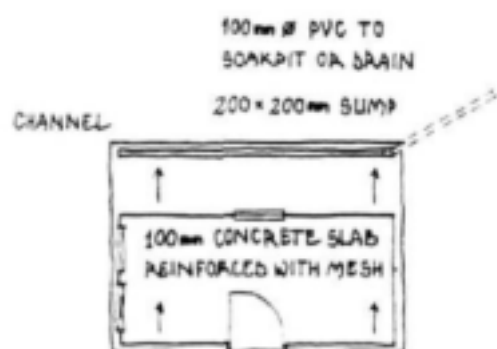
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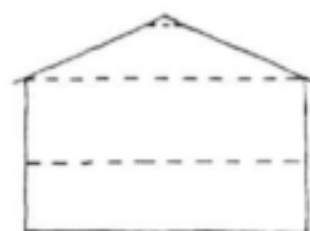
SIDE 1 ELEVATION



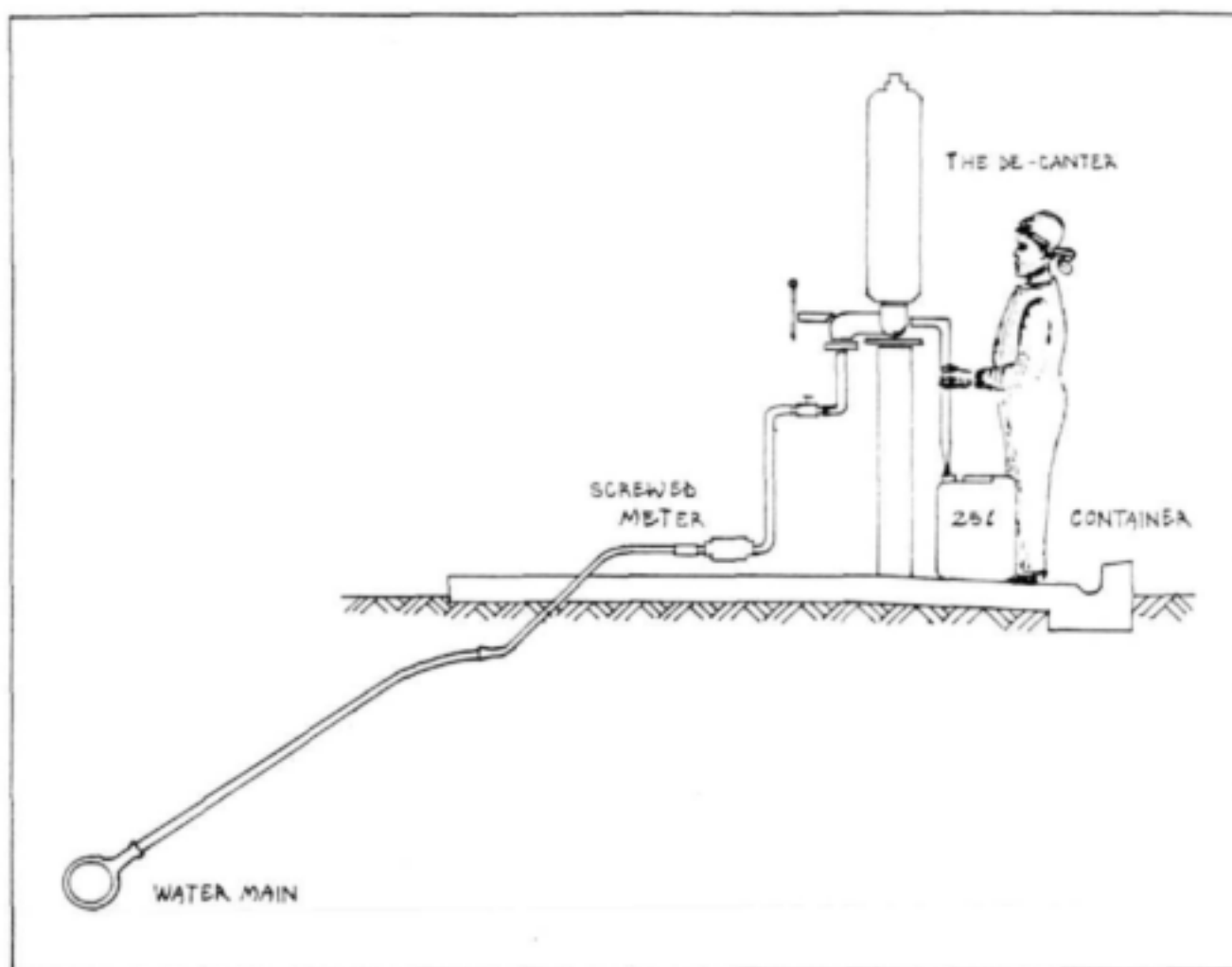
SIDE 2 ELEVATION



PLAN



SECTION



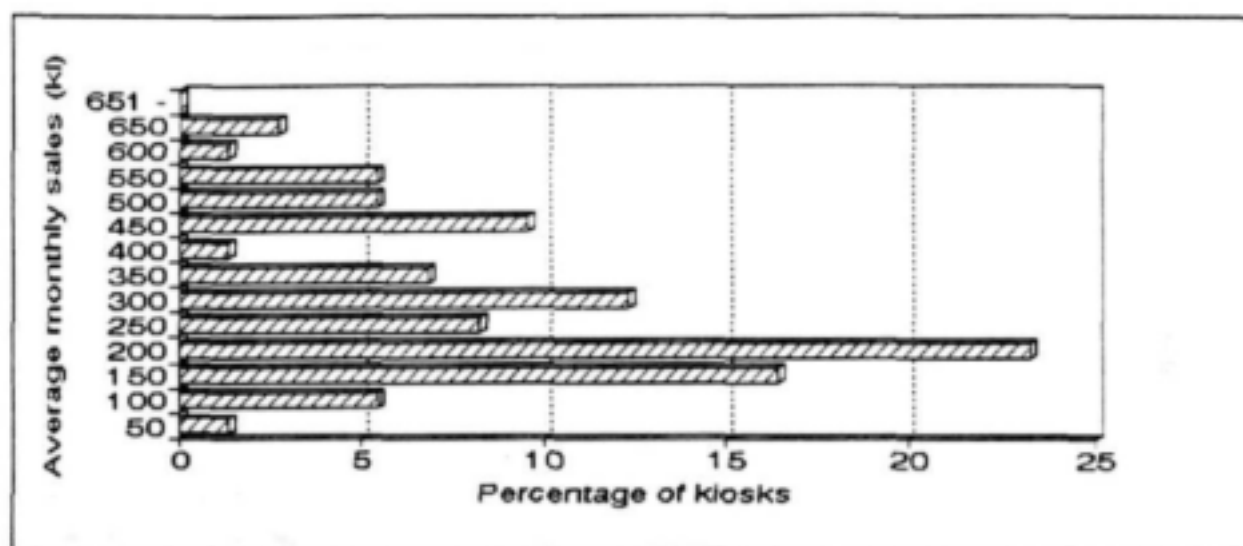
APPENDIX E: WATER SALES FROM KIOSKS

Meter readings for the period March 1992 to February 1993 have been obtained for the 73 kiosks which were metered over this period in Inanda. Analysis of these readings have shown that:

Water sales

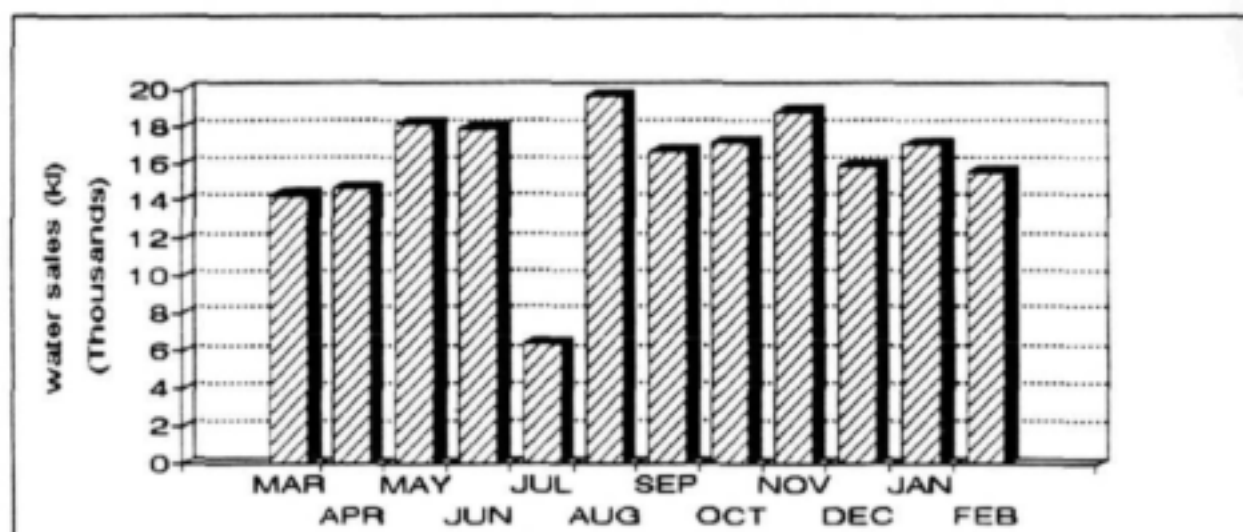
Average monthly sales from individual kiosks is 167kl of water, with a range between 59kl and 634kl (see Figure VII).

Figure VII : Average monthly water sales from kiosks



Total water sales from all metered kiosks over the period is shown on Figure VIII. A seasonal variation in consumption can be observed between the wet summer and dry winter months.

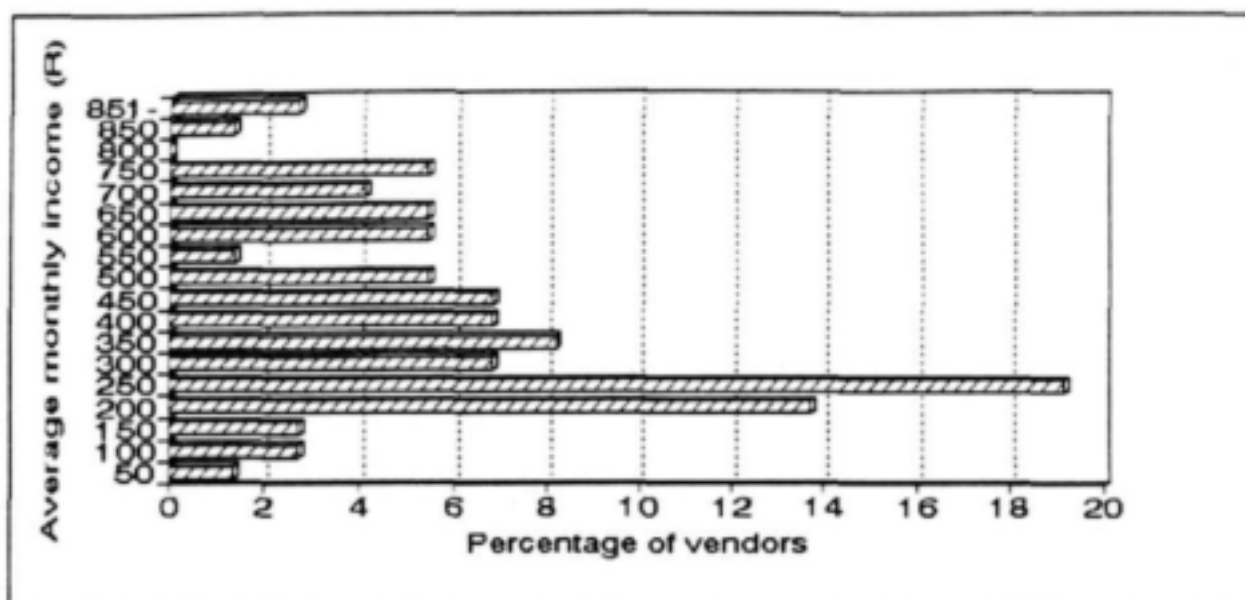
Figure VIII : Total water sales from metered kiosks



Income from the sale of water

Monthly income from the sale of water varied greatly between kiosks, as it is linked to the sales volume (shown in Figure VII). The average for the area was R374 per month, with high value of R888 and a low value of R83 per month income. From this monthly income salaries to attendants has to be subtracted (see Figure IX).

Figure IX : Average income per vendor earned from the sale of water



Total (billed) income to the NPA from the sale of water from the kiosks for the year was R 115 219.80, and to vendors was R 268 846.20 (revenue minus payment to NPA).

APPENDIX F: INANDA WATER CONSUMPTION

Monthly water accounts from Umgeni Water to the NPA (bulk) and total of monthly NPA accounts to kiosk operators.

Table 9 : Monthly water accounts for Inanda Released Area 33

Month	Inanda bulk water consumption (kl)	Metered water consumption from Inanda kiosks (kl)	Remainder: unmetered kiosks, public standpipes and yard taps (kl)
March 1992	167 558	14 189	153 369
April	202 839	14 474	188 365
May	173 513	18 147	155 366
June	343 484	17 894	325 590
July	217 386	6 344	211 642
August	173 197	19 664	153 533
September	236 877	16 642	220 235
October	229 362	17 125	212 237
November	270 293	18 792	251 501
December	231 729	15 876	215 853
January 1993	131 813	17 071	114 742
February	209 276	15 565	193 711
TOTAL	2 587 925	163 350	2 424 575

■ Using a population estimate of 335 000, average monthly household water consumption for the area as a whole is 3.54 kl, or 21 litres per person per day.

■ If an estimated 115 000 people use the metered kiosks as their only source of formal water supply, their average monthly household water consumption is 0.66 kl, or 4 litres per person per day.

■ Households using public standpipes and yard taps use an estimated monthly average of 8.4 kl water or 51 litres per person per day, more than twelve times the consumption level of the informal areas relying on kiosks as their only source of formal water supply.