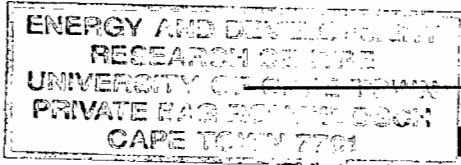


Analysis of new electrification schemes in the Western Cape

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DRAFT FINAL PROJECT REPORT

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TITLE : Analysis of new electrification schemes in the Western Cape
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EXECUTIVE SUMMARY

Project objective

The objective of this project was to examine electricity use in newly electrified, low income urban settlements by monitoring and analysing energy consumption data and relevant socio-economic information on such households in the Western Cape.

An important aim has been to understand factors which affect the movement from multiple fuel use to greater electricity consumption. The intention was also to provide detailed information which would be of use to those involved with the electrification of such areas.

Project methodology

The low income, mainly black townships of greater Cape Town provide an interesting opportunity to contrast electricity consumption in recently electrified areas, such as Khayelitsha, with more established townships, such as Langa and Gugulethu which have had electricity for over 20 years.

The methodology followed in this project was to collect and analyse information from two main sources.

Firstly, all available information was collected on electricity consumption levels of households in Langa and Gugulethu (there are currently about 8900) and in Khayelitsha (currently about 5000). This information was obtained from the distribution authorities serving these areas (The City of Cape Town and the Lingeletu West City Council).

Secondly, a survey of 108 electrified households in low income areas was carried out. 79 households in Khayelitsha were surveyed. These houses were constructed and electrified in the course of 1989 and 1990. A further 29 households in the older electrified areas of Langa and Gugulethu were also surveyed.

The houses to be surveyed were not simply chosen randomly. Rather, in each area to be surveyed, households were chosen on the basis of having high, medium and low monthly electricity consumption levels. In doing so, the basis was laid for examining the determinants of high and low consumption levels.

Khayelitsha

Khayelitsha is a newly electrified township. All of the consumers in the area have been connected in the last four years. Within Khayelitsha a number of areas have been electrified: parts of Town 1 (the initial 'core' housing area), Town 2 (the newer formal housing area), and Jonkersdam and Bongweni (the new, up-market areas).

Average consumption levels for all consumers with pre-payment meters in Khayelitsha are 175 kWh/month (summer mean), and 344 kWh/month (winter mean). The annual average level is 252 kWh/month. An examination of electricity consumption data shows a steady and consistent increase over time, presumably as newly electrified households buy electrical appliances.

There are substantial variations in average levels in different areas. For example, winter levels in Bongweni are up to 23% higher than average. Winter levels are 44% lower than average in Town 2 Village 3.

Langa and Gugulethu

These areas are representative of the older, more established low income areas in the Western Cape. Langa was proclaimed in 1922, and Gugulethu in 1948. A portion of houses in both areas were electrified in the 1960's. Levels of domestic electrification are about 60% in Langa and 80% in Gugulethu.

Households in Langa and Gugulethu are very large (average 7.7 in the sample) due to the prevalence of backyard shacks.

Average consumption levels of households in the sample in Langa and Gugulethu are 585 kWh/month (summer mean) and 644 kWh/month (winter mean). The average amount which these consumers are in arrears is about R1200.

Appliances

Ownership and daily use of electric appliances (particularly stoves) is well established in households in Langa and Gugulethu. In Khayelitsha, a wider range of appliances are used. Where electrical appliances are not used, paraffin appliances are more prevalent than gas appliances in Langa and Gugulethu. The reverse is true in Khayelitsha. Geysers are only found in newer houses in Khayelitsha.

About half of all households in Khayelitsha cook primarily with electricity. The rest are evenly spread between electric hot plates, gas stoves and a mix of the three. About one-fifth of households intend to purchase new electric stoves at some time in the future.

A closer study of those cooking primarily with gas in Khayelitsha showed that the major reason for doing so was the high cost of electric stoves. Three quarters of these households are planning to buy an electric stove in the future.

Analysis of fuel use

About one fifth of electrified households in the areas surveyed still use paraffin and gas daily. Dependence on electricity - where it is the only fuel used daily - occurs more in the older areas of Langa and Gugulethu. There is some evidence that households retain paraffin and gas appliances because of problems of reliability of electricity supply.

Wood and coal are not normally used, except for cooking traditional meals and braai-ing.

Useful energy consumption in the areas sampled is roughly equal to average useful energy consumption of households in the area of supply of the City of Cape Town electricity department. Useful energy consumption is higher in high income households.

Hire-purchase payments on electrical appliances contribute significantly to household energy costs, particularly in the newly electrified areas. In Khayelitsha, HP costs make up 45% of the average monthly energy bill. HP payments are also highest amongst high income households.

Energy costs make up between 10 and 20% of total household budgets. The percentage contribution of energy is higher for poorer households.

The affordability of electricity

Electricity was found to be the cheapest fuel, in useful energy terms, for cooking in the areas surveyed.

Consumers with credit meters are more likely to perceive electricity to be unaffordable. Many with credit meters are in arrears.

Attitudes towards electricity

Attitudes towards credit and pre-payment meters are very mixed. Pre-payment meters are mostly well liked in spite of the poor reliability experienced with early models installed in Khayelitsha. Consumers with different cash flow and income circumstances prefer different types of meters. This points towards the need for a flexible approach to the choice of meters for particular areas.

Township residents generally prefer high-mast lights over standard street lights. This is primarily due to the fact that they create a brighter, safer night environment.

The quality of the electricity service provided

The reliability of supply in the areas studied is poor. Blackouts occur frequently in some areas (up to 80% of households said 'often' in some areas). Poor reliability prevents full dependence on electricity for daily activities such as cooking.

Reliability is still a problem in Langa and Gugulethu, which is served by a well established distribution authority. Within all South African cities, low income areas have been marginalised politically and economically. Few mechanisms exist whereby residents can protest at the poor quality of services that they routinely receive. These issues will need to be addressed in the restructuring of the electricity industry on a non-racial basis.

Key determinants of increased electricity consumption levels

The use of electric stoves for cooking is the most important factor leading to higher electricity consumption levels. In Khayelitsha, about one half of households cook on electric stoves. This group had consumption levels one third higher than the average for the area. Those cooking with electric stoves had total monthly electricity consumption levels 45% higher than those cooking with gas.

Electric hot plates do not increase electricity consumption markedly, since they tend to be used with other fuels for cooking.

Geysers are also determinants of higher electricity consumption. Households with geysers have consumption levels about 50% higher than those without, in both areas.

The period of access to electricity is another important determinant of growth in consumption levels. Electricity consumption levels in households connected for a year in one part of Khayelitsha were 60% higher than households just connected.

Businesses run from home cause higher household electricity consumption. About one fifth of households in the sample run businesses from home. The extent of the increase in consumption depends on the type of business being operated.

Support for the creation of home-based micro enterprises in low-income areas will probably result in increased electricity consumption.

Household size and reported household income are in general not good indicators of electricity consumption levels, although there is some evidence that very large households use significantly more electricity.

Areas for further research

Trends in electricity consumption in new areas like Khayelitsha need to be studied over a longer period. More detailed analysis of large data sets of consumption levels would probably throw up new ways of interpreting these trends.

In addition, follow up surveys could establish links between rising consumption levels and factors such as changing patterns of appliance ownership. Further surveys could be used to explore reasons why households choose particular fuel - appliance combinations for particular energy consuming activities.

Given the importance of detailed information on the effects of electrification on low income areas in South Africa, it is suggested that such work be undertaken as a matter of priority.

Relevance of findings for the electrification of low income areas

This study has revealed a number of important issues which have general bearing on the electrification of low income areas.

A central question affecting electrification planning relates to expected electricity consumption levels. This study has provided clear quantitative evidence that consumption levels in newly electrified areas will rise with time. Further tracking of this trend is necessary, but the much higher levels of

consumption in Langa and Gugulethu suggest that it will continue. This evidence should encourage those planning electrification projects to count on higher consumption levels with time.

The key determinants of higher electricity consumption were found to be ownership and use of large electrical appliances, particularly stoves and geysers. Higher consumption levels will result from the acquisition of new appliances. This represents a win - win situation. Households will enjoy greater convenience and lower useful energy costs, and the distribution authority will enjoy a better return on its capital investment. On evidence given in this study, consumption levels after installation of a stove or geyser could rise by up to 50%.

The purchase of new appliances may cause total household energy costs (including the cost of paying for the new electrical appliances) to rise for a period. Yet the longer term benefits for the household are clear. The high levels of expenditure on HP payments for electrical appliances in Khayelitsha are evidence that the purchase of appliances is already a priority for newly electrified households.

What steps can be taken to increase market penetration of large electrical appliances? Both appliance manufacturers and electricity distribution authorities stand to gain from producing and marketing lower cost electric stoves. Non-profit schemes to market and distribute appliances have been used with much success all around the world (including in white municipal areas in the past), and need to be explored actively for use in low income areas.

As evidenced by their low incidence in Langa and Gugulethu, geysers tend to be installed at the time of construction of a new house, or not at all. Nonetheless, distribution authority schemes to assist households to install geysers may be feasible. Again, such schemes would be very much in the interest of manufacturers and distribution authorities to undertake.

Improving the reliability of the electricity service provided in low income areas should be a priority. Besides being necessary for reasons of equity – consumers have a right to equal standards of service in all areas – consumption levels will probably rise if quality improves. Many households retain, and continue to use, non-electrical appliances because of the frequency of blackouts. Dependence on electricity will rise if the service is dependable.

For similar reasons, the reliability of pre-payment meters installed in low income areas needs to be improved. The results of this study in Khayelitsha indicate that these meters are mostly liked, despite their dismal reliability record in the area.

Introducing innovative appliance marketing schemes and improving the quality of supply in low income areas can only be undertaken by professionally run, service- oriented distribution authorities. Very few township areas -- and certainly not Khayelitsha, Langa or Gugulethu -- have such authorities. The distribution sector of the South African electricity supply industry has evolved within the paradigm of apartheid. Fundamental restructuring will be necessary to create a more workable situation.

Electrification in South Africa has reached a stage where it is seen as a necessary strategy for increasing living standards and promoting economic growth. It is to be hoped that the information gained from micro-level studies such as this one will help to maximise the benefits of the electrification process.

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CHAPTER ONE

INTRODUCTION

Project objective

The objective of this project was to examine electricity use in newly electrified, low income urban settlements by monitoring and analysing energy consumption data and relevant socio-economic information on such households in the Western Cape. An important aim has been to understand factors which affect the movement from multiple fuel use to greater electricity consumption.

The intention was to provide detailed information which would be of use to those involved with the electrification of such areas.

Project methodology

The low income, mainly black townships of greater Cape Town provide an interesting opportunity to contrast electricity consumption in recently electrified areas such as Khayelitsha, with more established townships such as Langa and Gugulethu which have had electricity for over 20 years.

The methodology followed in this project was to collect and analyse information from two main sources.

Firstly, all available information was collected on electricity consumption levels of households in Langa and Gugulethu (there are currently about 8900) and in Khayelitsha (currently about 5000). This information was obtained from the distribution authorities serving these areas (The City of Cape Town and the Lingeletu West City Council). This information was organised and analysed using

the Quattro Pro spreadsheet package.

Secondly, a survey of 108 electrified households in low income areas was carried out. 79 households in Khayelitsha were surveyed. These houses were constructed and electrified in the course of 1989 and 1990. A further 29 households in the older electrified areas of Langa and Gugulethu were also surveyed.

The houses to be surveyed were not simply chosen randomly. Rather, in each area to be surveyed, households were chosen on the basis of having high medium and low monthly electricity consumption levels. In doing so, the basis was laid for examining the determinants of high and low consumption levels.

The survey questionnaire was designed and piloted in both areas, prior to being finalised. It was based on a number of similar household energy questionnaires. A copy of the questionnaire used is provided in appendix 1.

The interviews with households were carried out by final year social anthropology students at the University of Cape Town. All are first language Xhosa speakers.

The information collected in the questionnaires was coded and organised using the Quattro Pro package. All of the figures presented were compiled using the graph building facilities of Quattro Pro.

Context

This study is intended to inform current debates on the viability and effect of the electrification of low income areas. Levels of electrification in South Africa are likely to increase rapidly over the next few years. Accelerated electrification initiatives will be launched, especially in urban townships.

The staff of distribution authorities, who will be charged with these tasks, are in need of information about the effect of electrification on such areas. In particular, information is needed about trends in electricity consumption levels. Higher levels

of consumption imply better returns on the capital invested in the development of electrical infrastructure and effect the viability of schemes. Insights into the key determinants of higher electricity consumption can be used to target marketing and educational programmes. This project intends to meet some of these needs.

It is important to note that this study examines energy use amongst electrified households only. As will be discussed in later sections of the report, this group represent a small section of the greater population of low income areas. The results of the study are therefore relevant only to a relatively small, more affluent section of township residents and excludes shack settlements.

This study draws heavily on similar studies carried out previously at the Energy Research Institute. In particular, the work of Viljoen (1989) had indicated the importance of looking at multiple fuel use, including amongst households with access to electricity. The detailed household survey thus looked at total household energy use.

In collating and discussing the material below, no particular attempt has been made to develop a general transition model to explain electricity consumption in newly electrified areas. As will be seen, fuel use in these households is dependant on a range of inter-related factors.

Structure of the report

In the chapter following this introduction, low income areas in the Western Cape, particularly Langa and Gugulethu and Khayelitsha, are described. The extent and operation of electricity supply systems in these areas are included in this description.

In chapter three, electricity consumption information for the two areas is presented. Consumption levels of all consumers in selected areas is shown, and contrasted with levels of the households surveyed.

In chapter four, basic socio-economic information on Langa and Gugulethu and Khayelitsha is presented and discussed.

In chapter five, appliance ownership and appliance use for key activities is analysed.

In chapter six, the use of all fuels in the households surveyed is examined.

In chapter seven, key determinants of electricity consumption levels are investigated.

In chapter eight, the attitudes of households surveyed to their electricity service are studied.

A concluding chapter draws together the findings of this project. The implications for the electrification of low income areas are discussed.

CHAPTER TWO

LOW INCOME AREAS IN THE WESTERN CAPE

2.1 INTRODUCTION

This chapter describes the character and origins of low income areas in the Western Cape. The provision of electricity in the two broad areas studied, Langa and Gugulethu and Khayelitsha, is also described.

2.2 THE CHARACTER AND ORIGINS OF LOW INCOME AREAS

For the purposes of this project, low income areas in the Western Cape are defined as those areas in which African people have lived. These areas include the formal townships of Langa, Gugulethu, Nyanga, Crossroads and Khayelitsha, as well as a large number of informal housing areas. These are shown on a map, figure 2.1.

The settlement of African people in the Western Cape has been through a number of stages. African people living in various parts of the city were forcibly removed to Ndabeni (1901) and later to Langa (1922). Population growth led to severe overcrowding and eventually the construction of new housing in Nyanga and Gugulethu. This was carried out by the City Council of Cape Town between 1948 and 1972.

The Coloured Labour Preference Policy, applied increasingly after 1964, led to the cessation of construction of family housing for African people after 1972.

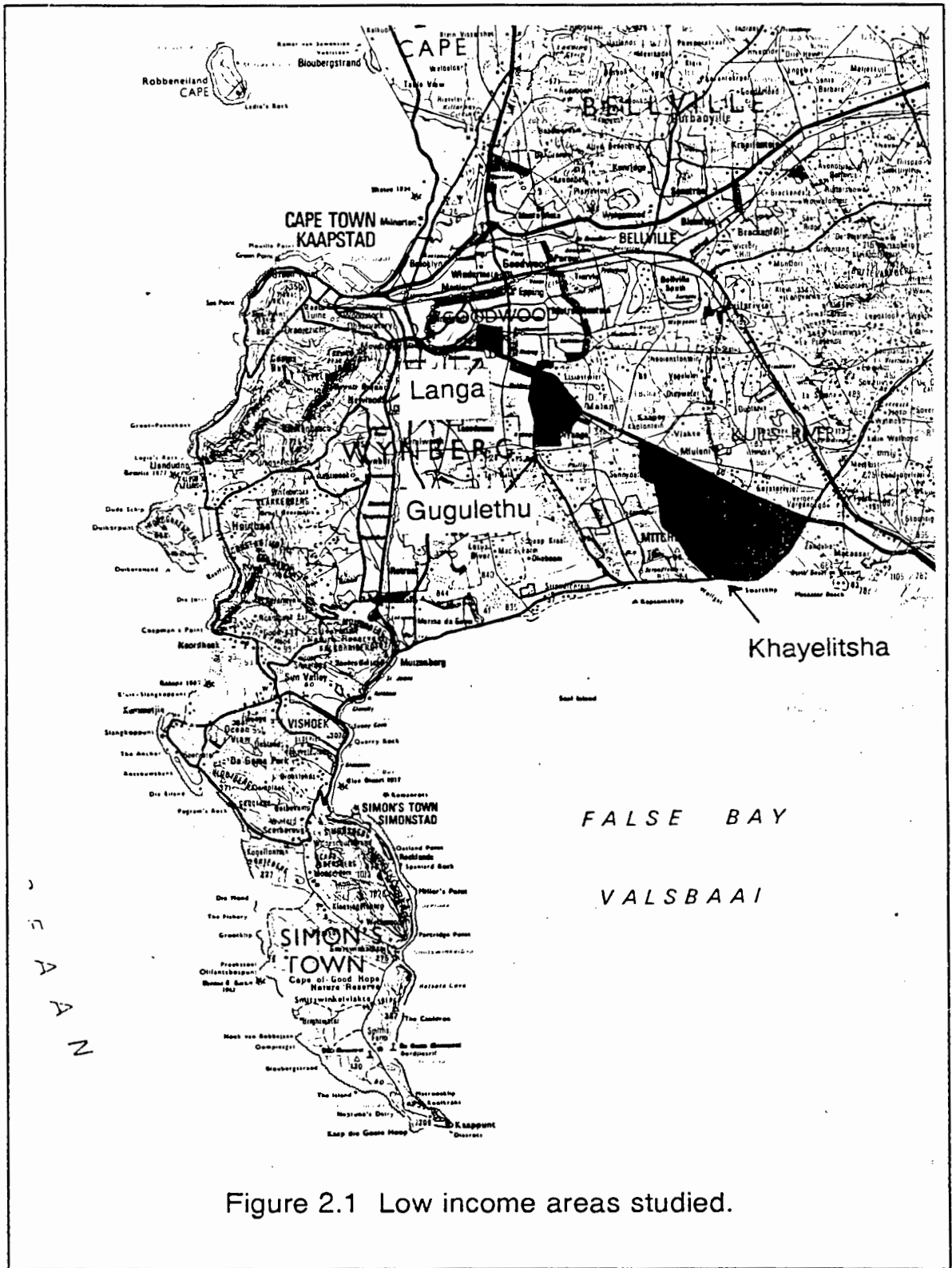


Figure 2.1 Low income areas studied.

The repeal of the Coloured Labour Preference Policy and the system of influx control in 1986 has led to a more tolerant attitude. New land for formal settlement by Africans was made available in Khayelitsha in 1983.

Statistical information on the population of these areas is notoriously unreliable. The denial of urban status to African people in the Western Cape by official policy has caused this problem. Thomas estimated that the population of the Western Cape (planning region 39) in 1987 was 2.3 million people. Of these, about 780 000 (29%) were African (Dewar et al,1991:5).

The slow pace of housing construction, and the high cost of completed units has led to severe housing shortages in all areas. Shacks have been constructed on the properties of most formal houses in townships, as well as in a large number of free standing squatter camps.

This project is concerned with the use of electricity in low income formal housing areas. None of the squatter camps have electricity. Focus is thus directed to two broad areas where some households have access to electricity: Langa and Gugulethu, and Khayelitsha.

2.2.1 Langa and Gugulethu

Langa and Gugulethu are representative of the 'older generation' of low income areas in the Western Cape. Langa grew rapidly after its creation, particularly with the construction of single sex hostels and small box-like housing units. These units were available on a rental basis only. No permanent forms of tenure were permitted.

Gugulethu was founded after 1948 to house an overflow of people from Langa and an emergency camp in Nyanga. Small family units were also constructed by the Council for rental. A standard design, 'NE 51/6' was used: three roomed, cold running water, no ceilings, no internal doors, no internal plastering, and no kitchen sink.

From the outset the available formal housing was inadequate. By 1977 there were an estimated 51 000 people living in informal shelters in the Gugulethu area. Squatter communities grew up at Modderdam, Unibel, Werkgenot, and Crossroads. These communities were subject to frequent demolition. In the 1980's more squatter camps were created at Nyanga Bush and KTC.

In the formal housing areas, overcrowding has reached very high levels. Most properties have a number of backyard shacks. Migrant hostels are also severely overcrowded.

2.2.2 Khayelitsha

By 1983 it was clear to the state that allocation of additional land for African settlement was unavoidable. Khayelitsha was created on a 3200 hectare site at the periphery of the city. Residents of informal areas were pressured to move to the new area.

In 1985 the first 5000 'core' housing units were constructed in Town 1, Villages 1 to 4. Thereafter settlement was permitted on serviced sites in Site C, and Site B. Formal housing was developed in Town 2, Villages 1, 3 and 4, between 1986 and 1990 by private developers. These houses range from four room units to larger family homes.

The areas of Jonkersdam, Bongweni and Tembani in Khayelitsha were a more upmarket development. Private developers constructed housing here between 1989 and 1991. A number of site and service schemes are currently being developed in Town 2 Village 2a and 2b, as well as new areas in Town 3.

The total population of Khayelitsha is hard to estimate, since there is a continual influx of people to the area. Thomas estimated that the African population of the greater Cape Town metropolitan area had grown to 925 000 by 1990 (Urban Problems Research Unit, 1990:16). The population of Khayelitsha in 1991 was thus probably in the region of 400 000.

2.3 ELECTRICITY SUPPLY IN LOW INCOME AREAS

The areas of supply of different distribution authorities in the Western Cape are shown in figure 2.2.

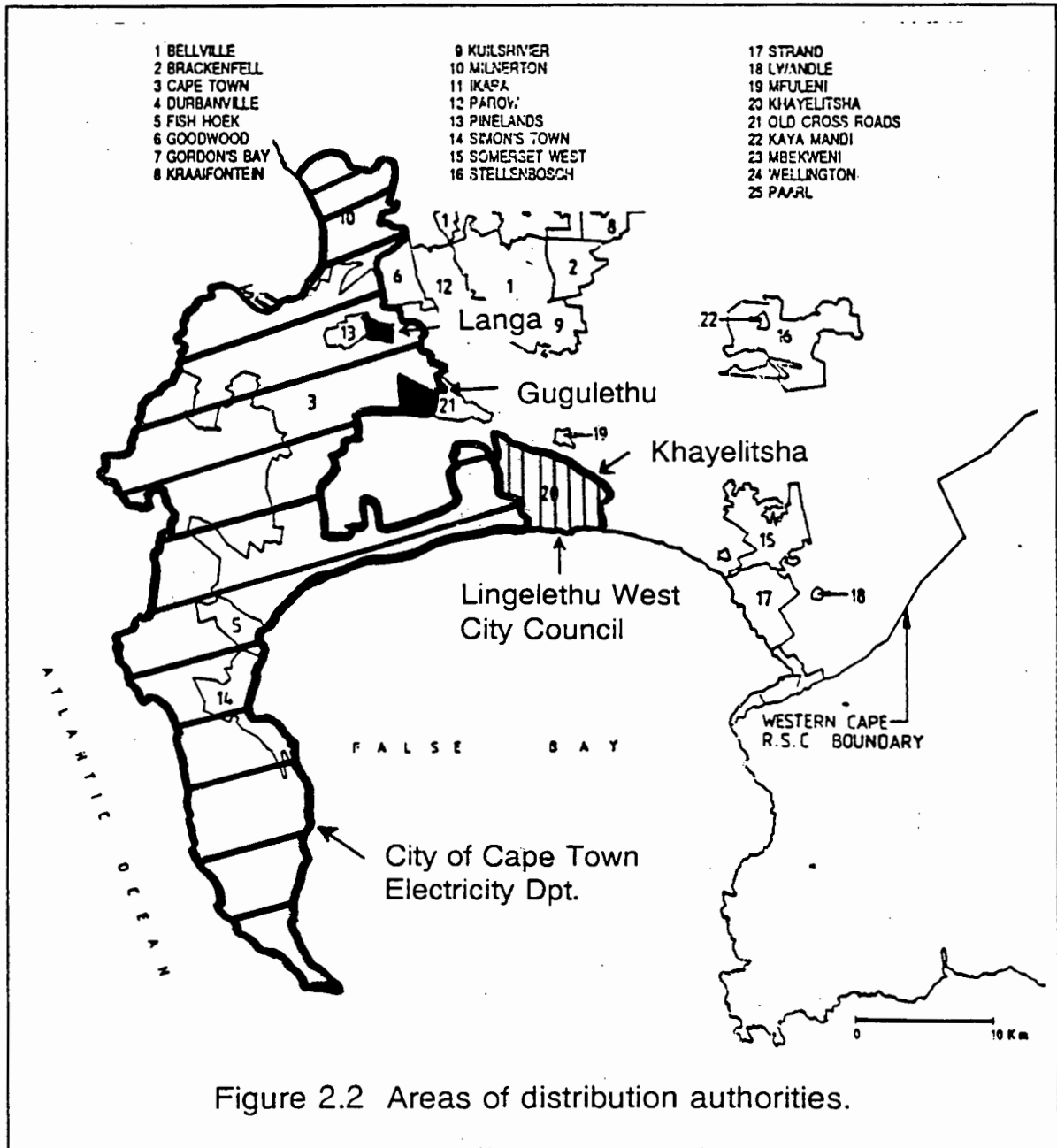


Figure 2.2 Areas of distribution authorities.

The City of Cape Town is by far the largest authority in the area. Figure 2.3 shows the numbers of consumers served by each.

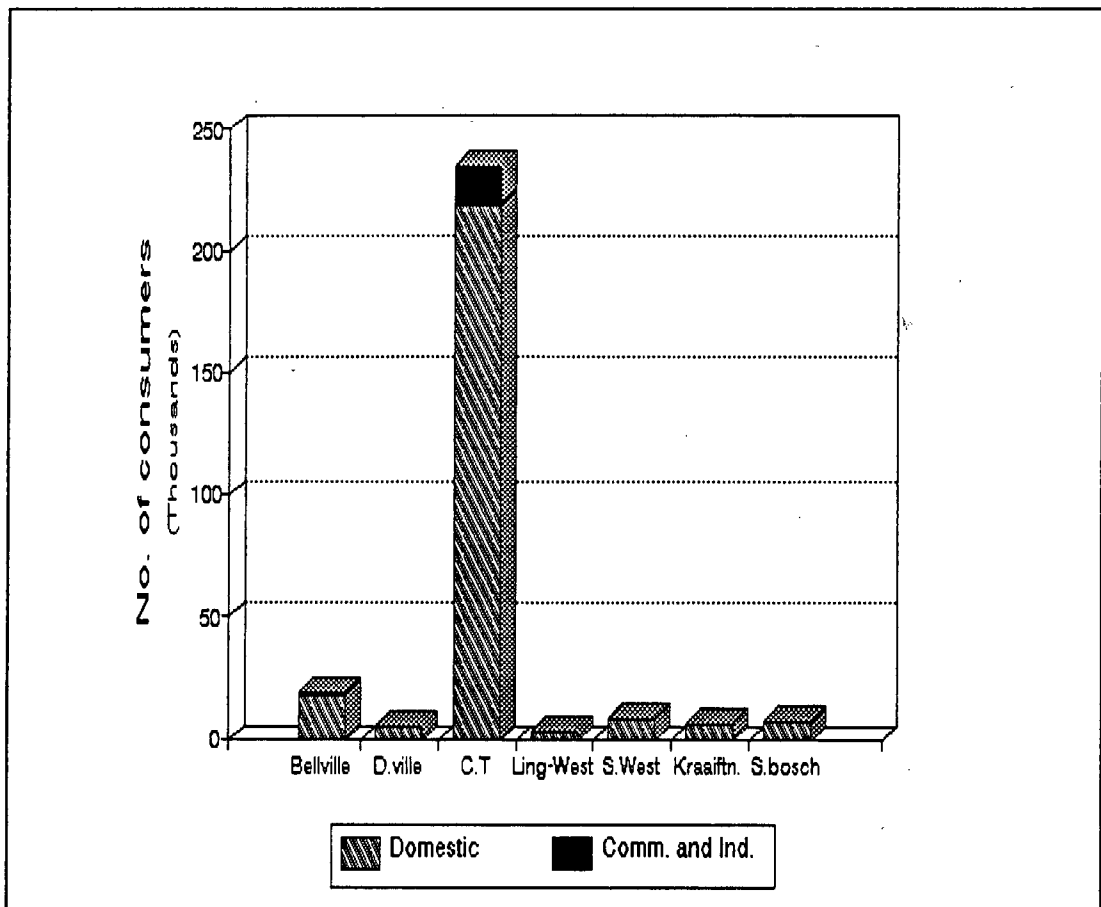


Figure 2.3 Supply authorities.

Estimates of the extent of electricity provision in different areas is shown in table 2.1.

Table 2.1 Extent of electricity provision.

AREA	NO. FORMAL HOUSES	NO. FREE-STANDING SHACKS	NO. WITH ACCESS	% WITH ACCESS
Khayelitsha Town 1	5000	0	723	14
Khayelitsha Town 2 Village 1	667	0	667	100
Khayelitsha Town 2 Village 2	0	3900	0	
Khayelitsha Town 2 Village 3	2027	0	2027	100
Khayelitsha Town 2 Village 4a	219	0	219	100
Khayelitsha Town 2 Village 4b	94	0	94	100
Khayelitsha Town 2 Village 4c	0	500	0	0
Khayelitsha Jonkersdam	382	0	382	100
Khayelitsha Bongweni	300	0	300	100
Khayelitsha Tembani	123	0	123	100
Khayelitsha Site C	0	7060	0	0
Khayelitsha Site B	0	18500	0	0
Khayelitsha Greenpoint	0	2000		
Langa	3500	0	2200	63
Gugulethu	8300	0	6700	81
KTC	0	6000	0	0
Tambo Square	0	480	0	0
Nyanga	2600	4601	2400	33
New Crossroads	1700	0	700	41
Crossroads	1700	6375	100	1
Phillipi	350	0	350	100
South peninsula	0	785	0	0
Kraaifontein	0	340	0	0
Milnerton	0	1500	0	0
Somerset West	0	700	0	0
Khayamandi	150	420	150	26

Source: individual local authorities

2.3.1 Electricity Provision in Langa and Gugulethu

Electricity is provided in Langa and Gugulethu by the City of Cape Town electricity department. The department is the licensed supplier of electricity to these areas, although they fall within the area of jurisdiction of the Ikapa Town Council, a black local authority (BLA).

The area of supply of the department is much larger than the municipal area of the City of Cape Town. It includes the areas of jurisdiction of a number of smaller white municipalities, such as Milnerton, Fish Hoek and Simonstown.

The department buys all its electricity in bulk from Eskom. It owns generating stations, but these are very seldom operated. It also has a pumped storage facility at Steenbras. It purchased about 320 million kWh/month in 1988/89. Its maximum demand during that year was about 590 MW.

The surplus (profit) generated by the electricity department in 1989 was R40.5 million. This represented a surplus on trading of 11% (Cape Town, 1990:4).

The department is one of the largest distribution authorities in the country. It had 234 546 consumers in 1989. Of these, 93.2% were domestic. Of the total electrical energy sold, 44.8% was consumed by domestic users. The rate of new connections is currently about 4000 per year. This represents an increase of about 2% per annum.

Langa

There are currently approximately 2200 electricity consumers in Langa. This represents about 60% of the 3500 formal houses in the area. Some houses without electricity were disconnected after running up arrears. In other cases electricity is not available due to the supply network not having been extended into that area. Electrified houses are fully wired and have credit meters.

Gugulethu

About 6700 of the 8300 formal houses (81%) in Gugulethu are electrified.

Levels of arrears on the payment of electricity accounts in Langa and Gugulethu (discussed in chapter three) are very high. This problem has been exacerbated by the department's failure to implement creative strategies to deal with the problem. Consumers are not disconnected unless they have not paid for over a year. By this time many have run up impossibly high arrears. The installation of pre-payment meters has not yet been actively pursued.

2.3.2 Electricity Provision in Khayelitsha

Electricity is provided in Khayelitsha by the Lingeletu West City Council Electrical Department. The Development Co-ordination Directorate of the Cape Provincial Administration (CPA) is responsible for the electrification of new areas.

Internal (medium and low voltage) electricity networks in formally planned new areas (as opposed to new informal shack settlements) are designed by consultants and installed by private contractors, under the supervision of the CPA. These networks are paid for by developers, and eventually by home buyers.

The development of the bulk (high voltage) networks is handled by the CPA. Capital is usually provided by the National Housing Fund. The bulk electrical network built thus far in Khayelitsha has cost approximately R35 million. This amount is supposedly repayable by the Council.

The Council is responsible only for the ongoing maintenance and operation of the electrical networks. Its Electrical Department was established in 1988. The total staff complement at the end of 1990 was 35 people.

The electrical department is understaffed and under-equipped. As a result very little attention is given to planning and organisational development. The Council has had a vacancy for the post of City Electrical Engineer for a number of years.

The Council buys all of its electricity in bulk from Eskom. The supply is fed in through two points. The trend in bulk supply is shown in figure 2.4. In 1990, energy consumed was about 2 million kWh/month (about 0.6% of Cape Town's consumption). The maximum demand drawn was about 6MVA (about 1% of Cape Town's).

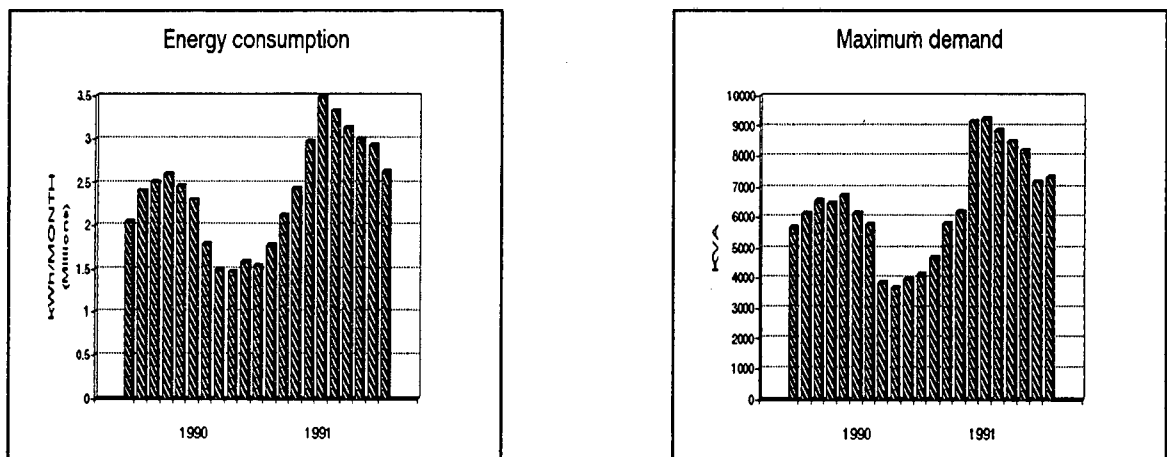


Figure 2.4 Bulk electricity supply to Khayelitsha.

At the end of October 1991, the total number of consumers served by the department was about 5000. Of these, about 820 have conventional credit meters. Of the 820 with conventional meters, at least half are non-residential users, mostly schools, clinics and churches in areas where domestic supplies are not provided.

The consumer base in the area is growing very rapidly. As an indication, the total numbers served increased from about 4000 in November 1990 to about 5000 in November 1991 -- an increase of 25% in one year.

Based on the assumption that 4.5 people live in each electrified household, some 20 700 people live in electrified homes. Using a population estimate of 400 000, this would imply that about 5% of the population of the area have access to electricity.

Khayelitsha Town 1

Most houses in Town 1 were not electrified at the time of their construction in the 1985. 723 of the 5000 houses (about 15%) in the area have subsequently been electrified. Houses are generally fully wired, and have 60 amp supplies with pre-payment meters

The Council has been unable to raise R16 million to electrify the rest of the area, despite the fact that it would probably be profitable for it to do so. In terms of the current system of local government, the Council is supposed to finance all capital development itself. Its past record of re-paying loans to central government is very poor. It is thus not able to obtain further development finance.

Khayelitsha Town 2 (Villages 1, 3 and 4a)

Houses in these areas were electrified at the time of their construction. There are currently 667 consumers in Village 1, 2027 in Village 3, and 219 in Village 4a. Household supplies are from 10 amps upwards. Individual homes were fully wired with plug points in each room and light fixtures in the ceilings. Only some houses have geysers and stove points. All houses have pre-payment meters.

At the outset in 1989, Larry Barnett International (LBI) meters were installed. After repeated meter failures led to all these meters being replaced with Angcontech (now AEG) minicon pre-payment meters.

Jonkersdam and Bongweni

Houses in these areas were also electrified at the time of their construction. Some 400 homes in the area have credit meters. Another 405 houses (182 in Jonkersdam, 100 in Bongweni, and 123 in Tembani) have pre-payment meters. All houses have geysers.

2.3 CONCLUSION

The descriptions of Langa and Gugulethu and of Khayelitsha provided in this chapter provide the context for the chapters which follow. The emphasis of this project was on understanding electricity consumption in new low income areas in the Western Cape. Later sections thus focus on Khayelitsha. The information on Langa and Gugulethu is used to contrast these findings and to give some indication of long term trends.

CHAPTER THREE

ELECTRICITY CONSUMPTION IN LOW INCOME AREAS OF THE WESTERN CAPE

3.1 INTRODUCTION

In this chapter information is provided on monthly electricity consumption levels in households in the areas surveyed. Seasonal variation, and summer and winter means are shown for the different areas.

Information is presented on consumption of all pre-payment meter consumers in Khayelitsha. Next, consumption levels of households actually surveyed are compared to consumption levels from all consumers in each area. In Langa and Gugulethu, consumption levels of households sampled are analysed.

The information presented here was obtained from records of the City Council of Cape Town (for Langa and Gugulethu), and from the Lingeletu West City Council (for Khayelitsha).

3.2 KHAYELITSHA

Information on electricity consumption in Khayelitsha is readily available. Monthly electricity consumption of pre-payment meter users is recorded and computed automatically by the operating system.

Information on electricity consumption levels in each of the areas in which households were surveyed is provided below. This information is for those using pre-payment meters only. The following information is provided for each area:

-
- The seasonal variation in monthly household consumption. Monthly means for the period November 1990 through to September 1991 are shown. The number of consumers in all of these areas was rising over the period shown. The mean in each month is therefore the average monthly consumption of only those connected at the time. The scale in graph is kept the same for purposes of comparison.
 - The frequency distribution, mean and median of monthly household consumption in summer (the average of November and December 1990, and January 1991).
 - The frequency distribution, mean and median of monthly household consumption in winter (the average of May, June and July 1991). The number of consumer in each sample in winter is higher than that in summer. This reflects the increase in the number of consumers over time.

3.2.1 Town 1

Figure 3.1 provides information on monthly consumption levels in Town 1. The seasonal effect on consumption is fairly large. The summer mean was 147 kWh/month. The winter mean was 222 kWh/month. The difference between the winter and summer means was only 75 kWh/month.

In December 1990 there were approximately 544 consumers. By June 1991 there were approximately 614 consumers (an increase of 13%).

Based on the summer and winter means, consumption levels in Town 1 are amongst the lowest in Khayelitsha (second only to Town 2 Village 3).

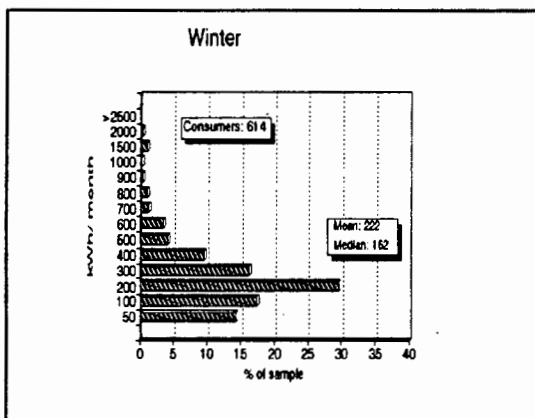
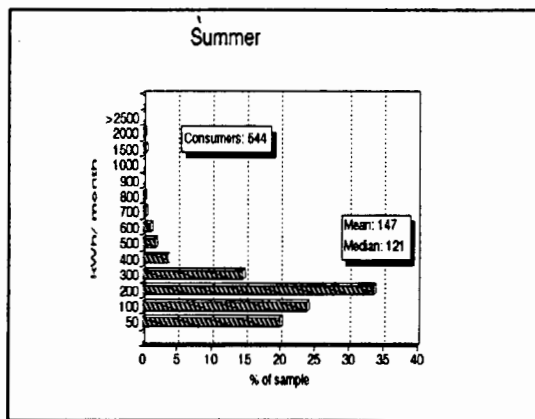
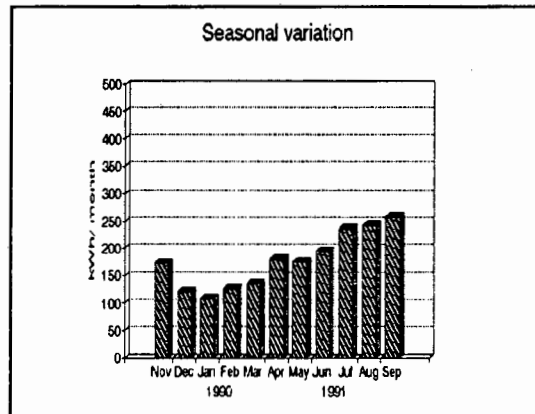


Figure 3.1 Town 1.

3.2.2 Town 2 Village 1

Figure 3.2 provides information on monthly consumption levels in Town 2 Village 1. The seasonal effect on consumption is fairly pronounced. The summer mean was 246 kWh/month. The winter mean was 351 kWh/month. The difference between the winter and summer means was 105 kWh/month.

In December 1990 there were approximately 341 consumers. By June 1991 there were approximately 560 consumers (an increase of 64%).

Based on the summer and winter means, consumption levels in Town 2 Village 1 are close to the average for the whole of Khayelitsha.

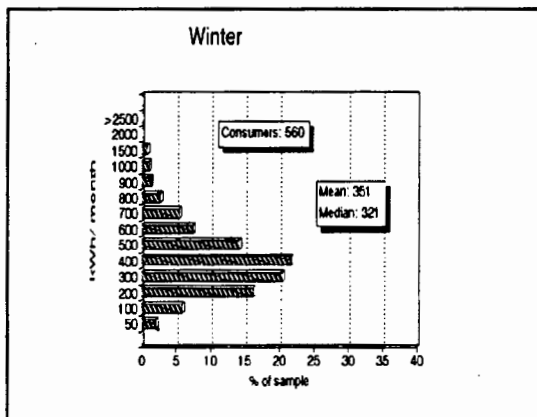
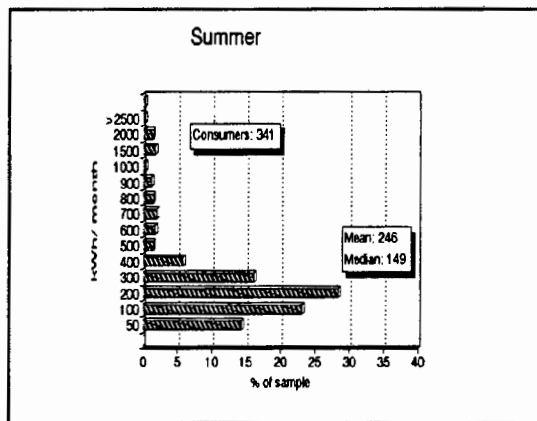
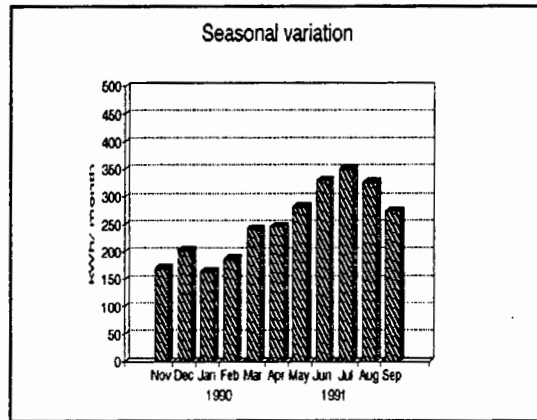


Figure 3.2 Town 2 Village 1.

3.2.3 Town 2 Village 3

Figure 3.2 provides information on monthly consumption levels in Town 2 Village 3. The seasonal effect on consumption is noticeable but not very significant. The summer mean was 136 kWh/month. The winter mean was 194 kWh/month. The difference between the winter and summer means was only 58 kWh/month.

Town 2 Village 3 has seen the greatest increase in the number of consumers over the last two years. In December 1990 there were approximately 749 consumers. By June 1991 there were approximately 1533 consumers (an increase of 105%).

Based on the summer and winter means, consumption levels in Town 2 Village 3 are the lowest in Khayelitsha.

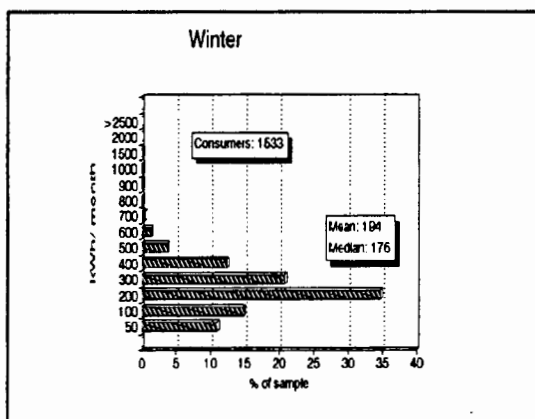
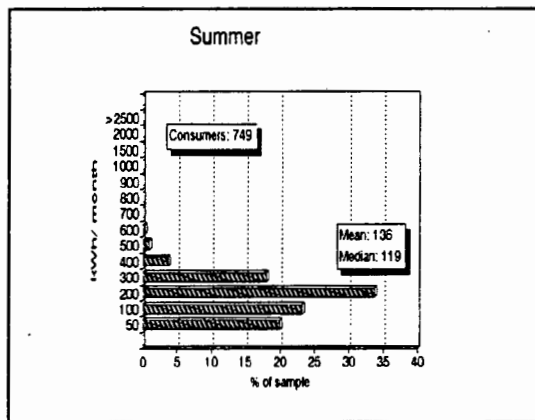
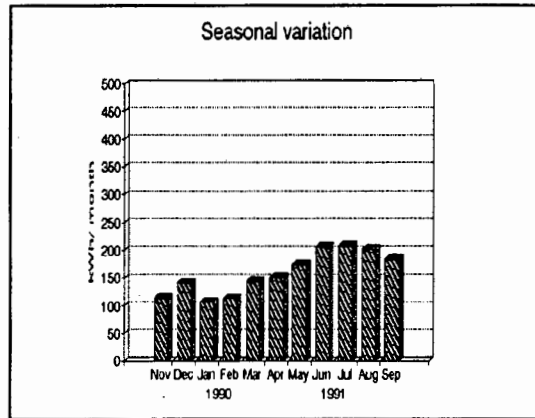


Figure 3.3 Town 2 Village 3.

3.2.4 Town 2 Village 4a

Figure 3.4 provides information on monthly consumption levels in Town 2 Village 4a. The seasonal effect on consumption is marked, reflecting the fact that households in this area are wealthier, with more appliances. The summer mean was 261 kWh/month. The winter mean was 399 kWh/month. The difference between the winter and summer means was 138 kWh/month.

In December 1990 there were approximately 121 consumers. By June 1991 there were approximately 208 consumers (an increase of 72%).

Based on the summer and winter means, consumption levels in Town 2 Village 4a are the second highest in Khayelitsha (behind Bongweni).

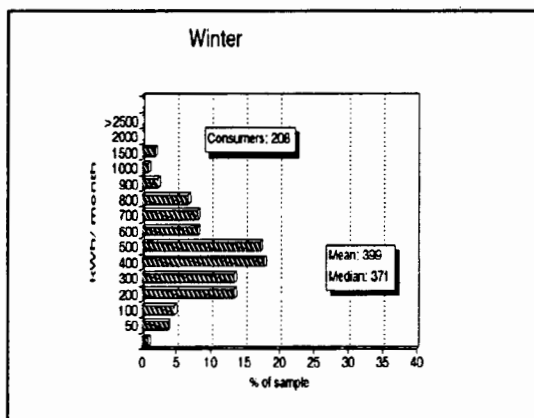
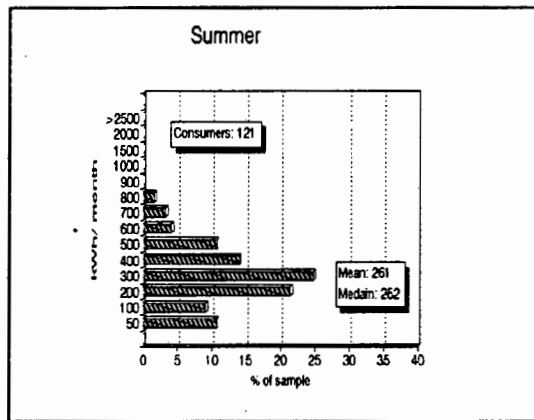
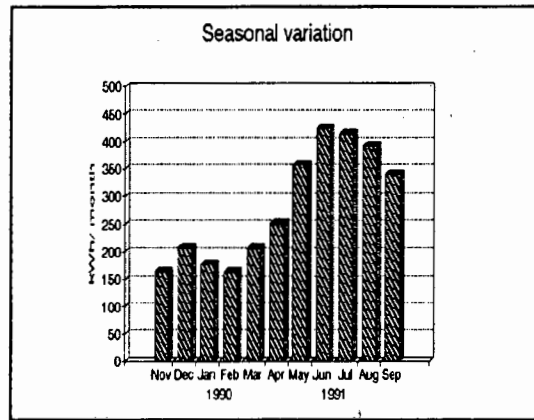


Figure 3.4 Town 2 Village 4a.

3.2.5 Jonkersdam

Figure 3.5 provides information on monthly consumption levels in Jonkersdam. The summer mean was 198 kWh/month. The winter mean was 279 kWh/month. The difference between the winter and summer means was 91 kWh/month.

The number of consumers in Jonkersdam has increased rapidly from a low base. In December 1990 there were approximately 37 consumers. By June 1991 there were approximately 108 consumers (an increase of 192%).

Based on the summer and winter means, consumption levels in Jonkersdam are middle of the range in Khayelitsha.

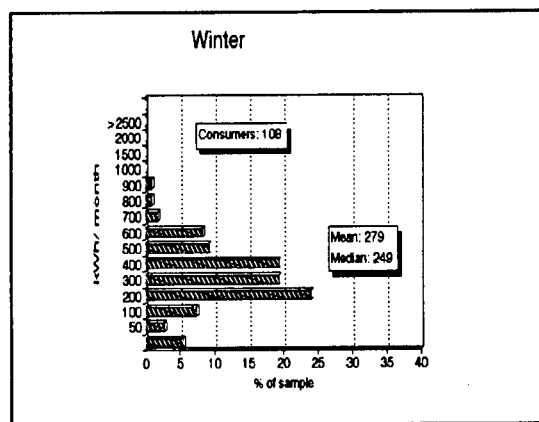
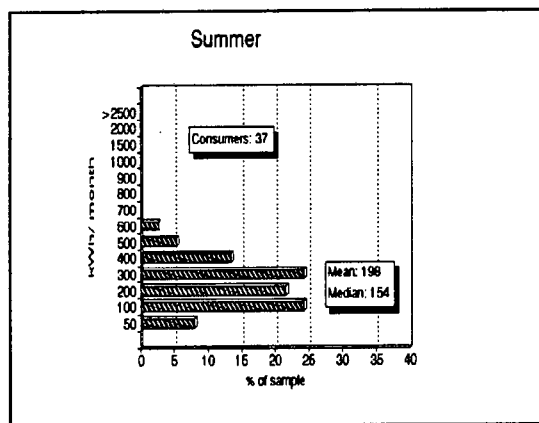
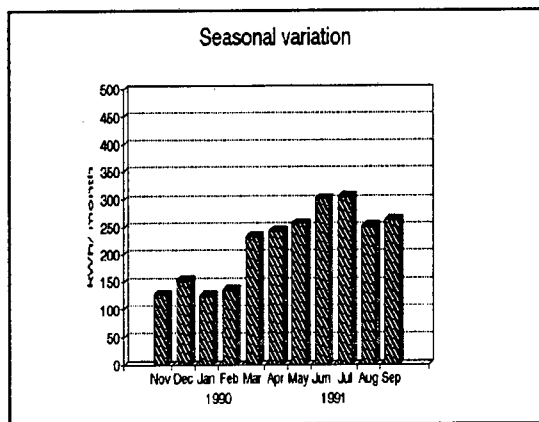


Figure 3.5 Jonkersdam.

3.2.6 Bongweni

Figure 3.6 provides information on monthly consumption levels in Bongweni. Seasonal variation was marked. The summer mean was 291 kWh/month. The winter mean was 423 kWh/month. The difference between the winter and summer means was 132 kWh/month.

In December 1990 there were approximately 74 consumers. By June 1991 there were approximately 95 consumers (an increase of 28%).

Based on the summer and winter means, consumption levels in Bongweni are the highest in Khayelitsha.

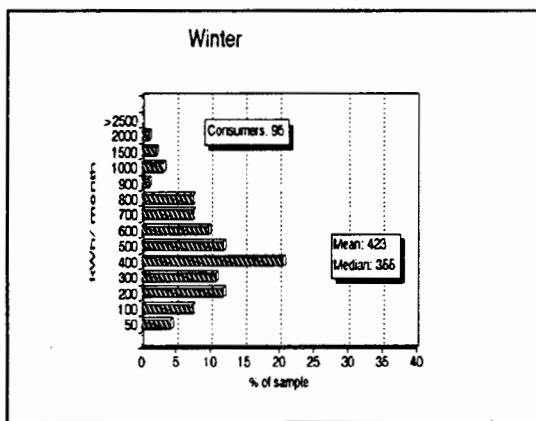
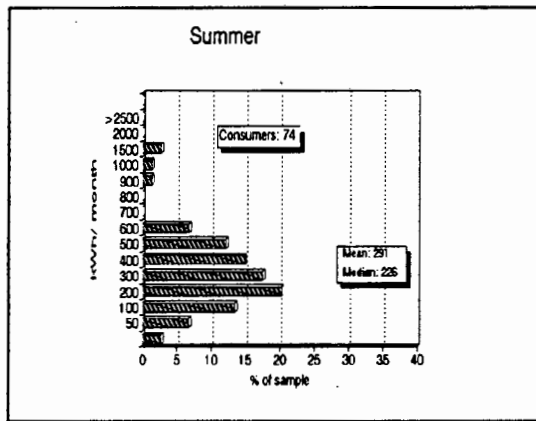
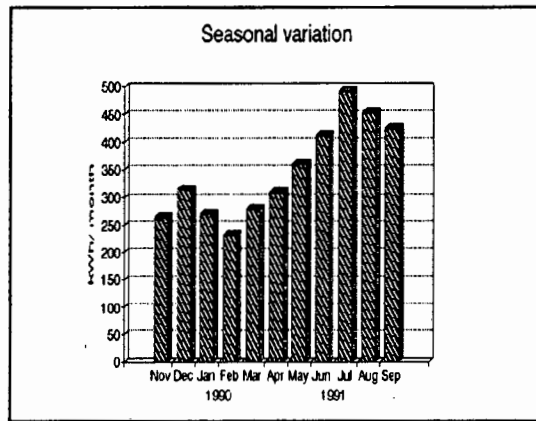


Figure 3.6 Bongweni.

3.2.7 All areas in Khayelitsha

Figure 3.7 provides information on average monthly consumption levels amongst all pre-payment meter consumers in Khayelitsha. The summer mean was 175 kWh/month. The winter mean was 344 kWh/month. Seasonal variation is thus noticeable: the difference between the summer and winter means was 169 kWh/month.

Growth in the total numbers of consumers is high: from 1865 in December 1990 to 3115 in June 1991 (an increase of 67%).

The annual mean for all pre-payment meter users was 252 kWh/month.

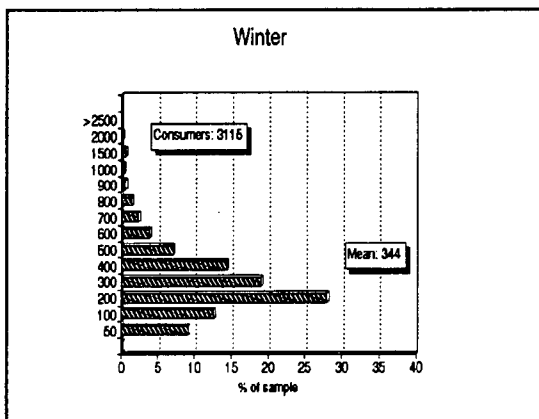
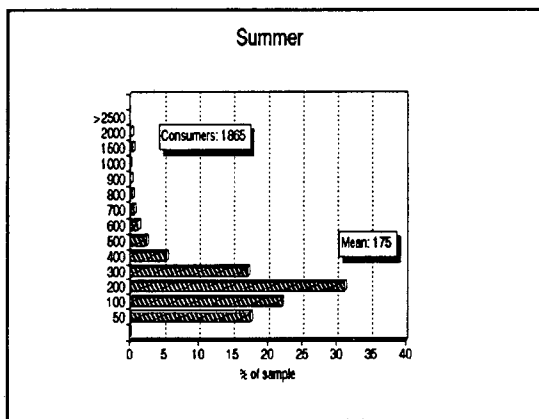
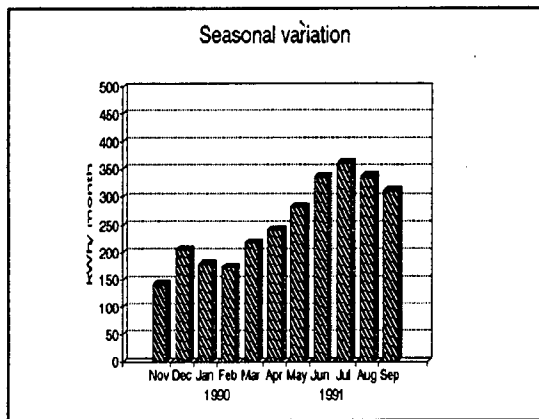


Figure 3.7 All Khayelitsha.

Figure 3.8 compares the mean monthly summer and winter electricity consumption of all the areas examined above. There is substantial variation between the areas. For example, the winter mean in Bongweni was 23% higher than the Khayelitsha winter mean. The winter mean in Town 2 Village 3 average was 44% less than the Khayelitsha winter mean.

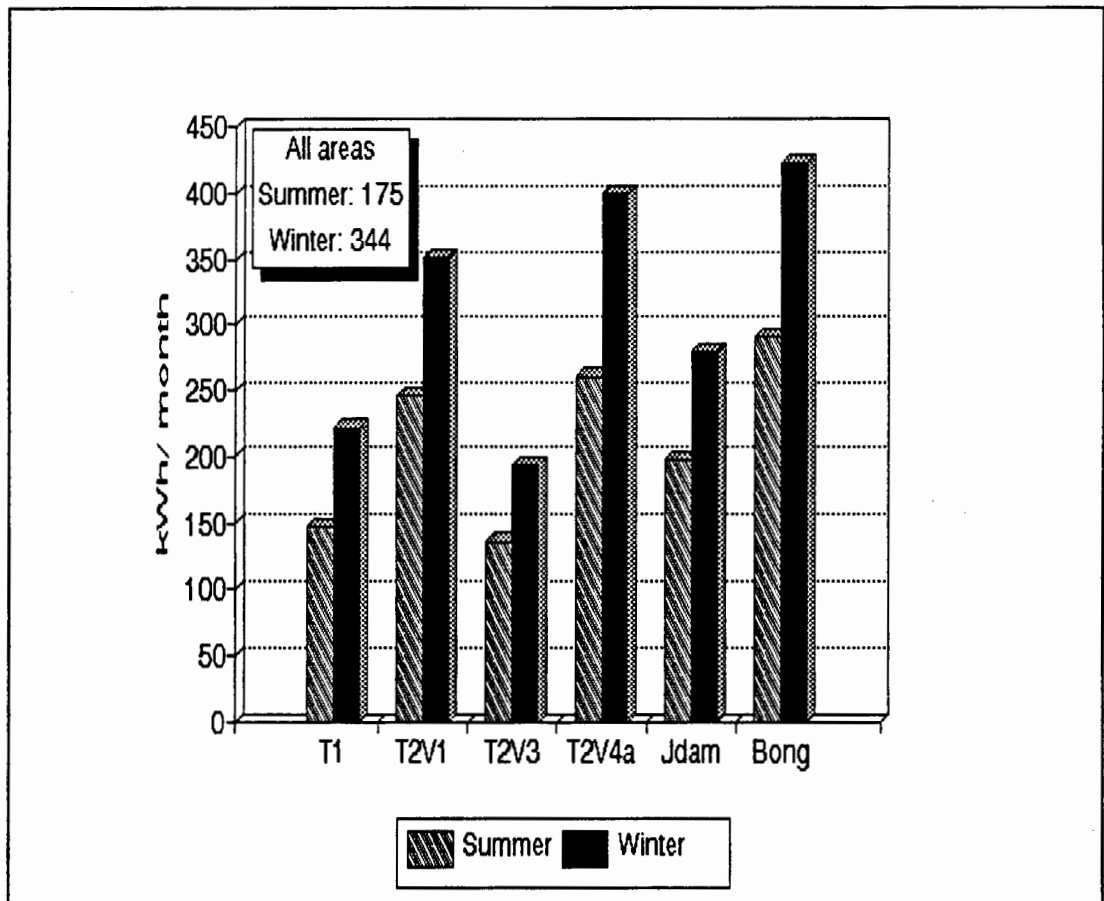


Figure 3.8 All Khayelitsha.

3.3 LANGA AND GUGULETHU

Information on electricity use in Langa and Gugulethu is very hard to come by. The City of Cape Town electricity department does not maintain separate records on consumers in the area. It is therefore not possible to report on the average electricity consumption levels.

Arrears on electricity payments in these areas is very high. The total debt on electricity in Langa and Gugulethu as at February 1992 was R10.8 million (Cape Times, 1992). Using a the total of 8900 consumers in this area, as discussed in chapter two, the average amount of arrears is R1213.

3.4 ELECTRICITY CONSUMPTION IN THE SURVEY SAMPLE

The sample of households to be surveyed was chosen on the basis of information from electricity consumption records. A range of households were chosen from each of the areas noted above. The households were selected on the basis of being high electricity consumers (above 250 kWh/month), medium consumers (150 - 250 kWh/month) or low consumers (less than 150 kWh/month) within each area.

In Jonkersdam and Bongweni, one third of those selected had pre-payment meters. The remainder have credit meters.

In Langa and Gugulethu, households were chosen on the same basis, as high medium and low consumers of electricity.

The electricity consumption information of the households surveyed, as obtained from electricity department records, is shown in Table 3.1. In some cases, the number of months of consumption information is less than others. For example, only four months of data was available for credit meter users in Jonkersdam and Bongweni.

Table 3.1 Electricity consumption information.

No.	NAME	ADDRESS	AREA	1991								1990								
				SEP	AUG	JUL	JUN	MAY	APR	MAR	FEB	JAN	DEC	NOV	OCT	SEP	AUG	JUL	JUN	MAY
71	Mr Qubile	J263	Town 1	199	232	285	365	298	198	232	199	266	266	266	199	232	132	185		
70	I.Gom	J190	Town 1	266	324	264	258	0	133	351	332	332	332	399	332	266	399	266		
73	Mrs Mabele	J229	Town 1	264	132	264	132	265	198	198	132	132	133	132	198	132	133	133		
72	Mhlasela	J179	Town 1	198	259	66	199	265	266	66	266	133	266	0	266	266	0	0		
69	Z.Nonde	Z47	Town 1	0	0	133	0	133	0	0	0	0	0	0	133	0	0	0		
66	R.Khau	Z118	Town 1	205	198	158	198	151	198	165	132	132	132	199	33	0	66	0		
65	Mrs Wana	Z46	Town 1	166	232	199	133	166	133	133	133	133	133	100	0	0	100	66		
68	N.Vuma	Z97	Town 1	198	166	66	196	199	132	213	166	199	132	66	266	199	0	0		
67	G.Mtyando	Z52	Town 1	200	199	266	200	200	200	200	0	200	266	133	133	133	133	133		
104	S. Venifolo	J212	Town 1	133	266	166	200	266	198	133	166	200	133	198	99	0	0	0		
84	W.Sibiya	Z7322	Town 2 Village 1	132	561	330	265	330	330	363	450	0	0	0	0	0	198	165		
82	N.Ntloko	Z7345	Town 2 Village 1	198	264	363	200	0	0	0	0	0	0	0	0	0	0	99		
83	M.Peterson	Z7319	Town 2 Village 1	120	199	199	135	133	266	266	133	133	266	133	233	266	199	279		
85	A.Qhagayi	Z7307	Town 2 Village 1	550	596	563	464	490	366	297	198	397	66	465	0	0	0	0		
108	A. Mashiya	4 Nkenjane St	Town 2 Village 1	66	46	112	132	198	264	198	133	0	0	100	0	0	0	0		
105	G.Nosango	3 Ngawalazi St	Town 2 Village 1	532	798	862	664	798	498	531	528	133	0	0	0	0	0	264		
86	N.Kwinana	Z7316	Town 2 Village 1	100	252	198	132	165	132	165	53	225	132	126	92	66	145	33		
78	J.Mbokotho	Z7339	Town 2 Village 1	165	343	284	166	192	299	265	365	0	0	0	0	0	0	99		
77	V.Gae	Z7371	Town 2 Village 1	665	466	333	532	266	465	497	399	133	0	0	0	0	0	0		
80	M.Tabile	Z7306	Town 2 Village 1	530	466	431	432	465	464	332	331	332	399	399	0	0	0	266		
79	J.Dumse	Z7305	Town 2 Village 1	0	0	33	33	66	332	331	264	0	0	0	0	0	0	0		
74	N.Mayembani	Z7667	Town 2 Village 1	265	0	132	66	0	132	66	100	133	66	33	99	66	0	132		
81	M.Sibeko	Z7395	Town 2 Village 1	258	297	398	332	264	198	198	264	132	0	0	66	331	265	66		
76	L.Sihawu	Z7394	Town 2 Village 1	265	199	265	265	285	265	332	331	0	0	0	0	0	0	0		
75	N.Bulawa	Z9001	Town 2 Village 1	400	558	719	355	399	0	0	0	0	333	0	0	333	333	333		
36	Mr Ngqombo	19622	Town 2 Village 3	517	443	668	478	465	311	0	279	159	199	298	266	378	365	731		
37	Mrs Sigoba	21632	Town 2 Village 3	199	266	66	199	266	132	166	0	0	0	0	0	0	0	0		
34	Priscilla	19726	Town 2 Village 3	33	33	66	198	0	0	0	0	132	99	132	132	33	0	66		
35	Mrs Sibeko	22293	Town 2 Village 3	0	133	122	66	232	0	66	66	66	0	0	0	0	133	133		
40	Mr Monki	19506	Town 2 Village 3	232	198	364	365	332	198	0	298	199	266	266	133	266	133	266		
41	Mr Nkala	19706	Town 2 Village 3	258	897	199	200	464	0	466	0	0	199	585	0	258	133	233		
38	Mrs Mbolekwa	19197	Town 2 Village 3	99	132	132	132	66	132	132	66	0	332	66	66	66	66	0		
39	Mrs Gqodi	19405	Town 2 Village 3	133	133	66	133	299	66	66	66	33	66	0	0	0	0	0		
29	S.Motsamai	19722	Town 2 Village 3	180	200	133	66	133	0	0	0	266	66	166	0	180	120	0		
28	L.Noyi	19716	Town 2 Village 3	865	265	133	366	499	0	332	0	266	133	333	133	133	200	0		
64	S.Baartman	22731	Town 2 Village 3	0	0	0	99	165	265	133	199	199	133	0	0	0	0	0		
30	K.Zenzile	19620	Town 2 Village 3	266	0	132	132	66	99	33	99	132	33	66	0	0	0	0		
33	T.Mangxola	19709	Town 2 Village 3	266	399	266	266	332	266	266	133	265	332	198	0	332	132	132		
32	B.Mhlalo	19723	Town 2 Village 3	99	66	400	466	199	266	333	199	0	266	166	133	299	133	265		
31	E.Lowu	21618	Town 2 Village 3	133	199	199	199	99	0	133	0	0	166	0	0	0	0	0		
57	Mrs Mpinana	18948	Town 2 Village 4a	400	400	200	400	198	165	132	99	133	0	0	0	0	0	0		
58	N. Lalela	19109	Town 2 Village 4a	355	351	396	378	358	211	271	198	132	410	231	0	463	411	530		
56	P.Mpekula	18979	Town 2 Village 4a	464	332	399	399	266	399	332	266	200	532	266	266	399	333	532		
54	T.Ntsendwane	19112	Town 2 Village 4a	432	297	429	363	431	330	530	297	133	266	198	198	264	231	330		
55	Mrs Mentisi	18927	Town 2 Village 4a	357	462	1027		576	676	278	0	66	371	384	310	318	451	160		
62	N.Mazwi	18977	Town 2 Village 4a	66	99	132	199	231	290	264	430	297	132	331	397	366	100	198		
63	Ntswendana	18929	Town 2 Village 4a	304	397	783	664	399	398	0	0	66	133	0	199	66	66	0		
61	Mrs Ndude	18984	Town 2 Village 4a	96	99	165	237	224	66	0	0	0	0	66	0	199	332	629		
59	A. Manaiwa	18899	Town 2 Village 4a	623	669	730	491	548	496	771	233	0	0	0	0	0	0	0		
60	N.Ngodongwa	19119	Town 2 Village 4a	266	266	266	200	400	0	0	0	0	0	0	0	399	332	266		
18	E.Mapete	31106	Jonkersdam	199	0	33	0	99	0	66	0	66	0	132	66	199	0	0		
98	K.Welman	53 Saturn Cres	Jonkersdam	529	783	687	554													
99	Nolitha	7 Galaxy Cres	Jonkersdam	407	429	502	395													
19	M.Mdzula	31083	Jonkersdam	133	66	200	0	0	400	66	0	0	200	200	0	0	0	0		
22	N.Dubisiko	31054	Jonkersdam	333	333	799	532	266	266	0	133	0	0	0	0	0	0	0		
21	F.Matshaya	31102	Jonkersdam	33	259	199	499	132	366	66	133	66	0	0	0	0	133	132		
20	P.Cwele	31168	Jonkersdam	166	252	265	265	232	199	165	132	0	0	0	0	0	0	0		
100	N.Mbenenge	73 Saturn Cres	Jonkersdam	434	584	640	513													
96	Mrs Khwinana	5 Starlight Rd	Jonkersdam	910	1102	1021														
95	Miss Vasi		Jonkersdam																	
103	M.Somphali	42 Saturn Cres	Jonkersdam	186	480	1130														
97	Mrs Mavumbe	107 Saturn Cres	Jonkersdam	1074																
107	S. Sibodho	52 Saturn Cres	Jonkersdam	357	550	659	669													
102	Lily	11 Galaxy Cres	Jonkersdam	732	924	908	866													
101	Vuyiswa	59 Galaxy Cres	Jonkersdam	466	795	700	517													
88	B.Blackbeard	2 Tangana Dve	Bongweni	282	291	256	375													
87	M.Mbanga	43 Luvoyo Dve	Bongweni	981	1232	1152														
93	Mr Mwanda	15 Iplikoko Dve	Bongweni																	
92	Miss Toni	12 Ngwenya St	Bongweni	862	956	899	850													
91	D.Zethu	17 Iplikoko St	Bongweni	743	1002	1527														
109	X.Mvango	15 Idaliya St	Bongweni	448	566	412	477													
106	Z. Bevuvu	7 Tangana Rd	Bongweni	331	922	788	1100													
94	T.Mtsila	12 Kwezi St	Bongweni	985	832	605	726													
90	N.Mtsi	6 Kwezi Rd	Bongweni	1037	1433	1696														
25	N.Moni	18485	Bongweni	653	731	796	666	266	599	0	466	333	333	333	332	332	466	599		

No.	NAME	ADDRESS	AREA	1991							1990									
				SEP	AUG	JUL	JUN	MAY	APR	MAR	FEB	JAN	DEC	NOV	OCT	SEP	AUG	JUL	JUN	MAY
23	J.Wondo	18669	Bongweni	320	200	832	299	326	266	112	0	266	0	199	333	133	0	0		
89	W.Mpini	3 Ngwenya St	Bongweni	411	681	596	445													
27	C.Mose	18616	Bongweni	66	66	0	390	231	465	266	332	266	0	0	0	0	199	0		
26	E.Liwani		Bongweni	1272		1332		1665	999	0	666	0	0							
44	C.Tetyana	Zone 11 No. 6	Langa					625	539	701	676	676	948	506	794	714	1190			
43	Y Myeni	30 Church St	Langa					313	253	106	218	218	220	82	360	350				
42	N Magodla	51 Jungle Walk	Langa					406	346	399	400	372	405	274	365	352	488			
45	T.Nienetya	25 Moshesh Ave	Langa						374	300	435	254	315	243	356	337	462	468	380	390
52	Edwin	25 Sigcawu St	Langa						189	159	247	275	256	200	217	254	281	258	300	297
53	Sylvia	4 Rose-Innes St	Langa						164	99	83	160	124	173	184	494	28	93	230	260
46	M.Mbitzela	6 Haarlem Ave	Langa					400	344	425	384	335	544	320	478	366	513	482	667	275
17	Ndobini	10 Mdoiomba St	Langa																	
13	P.Mathole	2 Mqhayi Rd	Langa						711	765	1011	570	508	780	880	956	959	703	750	840
12	H.Mabe	26 Sigcawu St	Langa						594	524	446	487	283	519	477	522	650	760	500	631
11	B.Mhlawuli	14 Sandile Ave	Langa						689	576	430	645	250	344	305	410	416	332	335	674
16	J.Sitsila	1 Rose-Innes St	Langa						337	344	320	356	247	394	375	486	677	752	500	375
15	Thembeke	25 Jungle Walk	Langa						847	864	788	1001		978	823	402	1345	220	900	888
14	S.Xhamalashhe	27 Jungle Walk	Langa						422	400	312	380	334	377	401	504	526	494	601	463
3	M.Qobo	NY91:2	Gugulethu						293	326	283	314	234	234	238	258	191	350	350	324
2	L.Sangela	NY89:18	Gugulethu						357	320	310	564	350	322	312	383	365	308	400	400
1	N.Jack	NY53:72	Gugulethu						467	513	457	662	400	318	388	494	1064	500	450	513
48	V.Tshabe	NY138 no. 40	Gugulethu						577	1534		514	986	600	570	641				
47	N. Tsoli	NY57 no.22	Gugulethu						1773	1000	2805	728	2015		980	88	1154			
10	V.Lethabiko	NY56:128	Gugulethu						334	375	420	513	362	363	366	453	477	460	400	124
51	B.Bam	Ny108 no 51	Gugulethu						639	1107	1064	1295	1148	600	624	730	760			
50	B.Mngxunya	NY49 No 39	Gugulethu						1986	2000	1710	704	2150	1600		1917				
49	T.Ndimande	NY119 No. 6	Gugulethu						2129	2407	2207	2604	1721	1700		1967				
6	N.Gobo	NY78:7	Gugulethu						685	632	619	748	760	602	826	1182		760	700	700
5	A.Kgati	NY83:5	Gugulethu						536	460	418	696	504	475	546	577	580	640	600	616
4	A.Mbinda	NY89:40	Gugulethu						284	351	332	351	200	196	236	259	263	340	200	300
9	N.Mqala	NY89:82	Gugulethu						438	398	540	146	700	611	1021	1097		720	700	480
8	A.Makhuluma	NY53:8	Gugulethu						285	255	214	266								
7	S.Sontica	NY84:29	Gugulethu						317	299	261	222	351	320	360	376	393	450	400	351

3.4.1 The Khayelitsha sample

Figure 3.9 shows seasonal variation in the average monthly consumption of households in the sample in Khayelitsha. Also shown on the same graph is the seasonal trend for all consumers. There is a fair degree of correspondence between the sample and the larger group. Consumption levels in the sample are higher in the winter months of 1991.

The difference between the summer mean (175 kWh/month) and the winter mean (441 kWh/month) is 266 kWh/month. This is 57% higher than the difference for all consumers in Khayelitsha. Thus the seasonal effect is more pronounced in the sample than in the whole group of consumers.

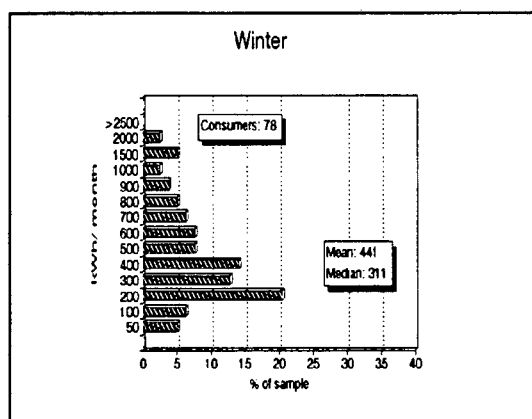
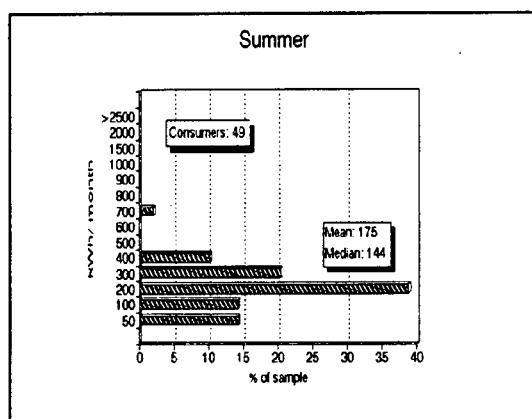
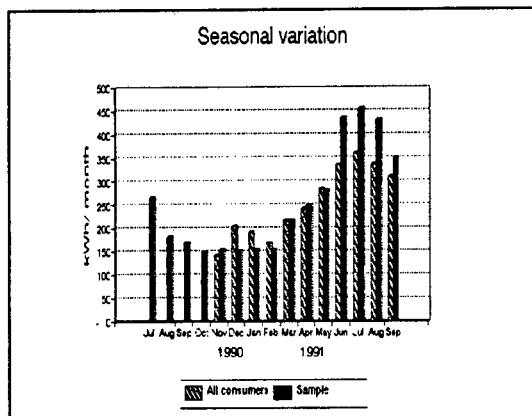


Figure 3.9 Sample Khayelitsha.

Figure 3.10 compares average consumption in areas sampled to averages of those households surveyed. Correspondence is poorest in Jonkersdam and in Bongweni. In both of these areas the sample includes households with credit meters, who are not included in the larger data set.

The winter mean of all households in the Khayelitsha survey sample is 28% higher than the larger data set, at 441 kWh/month.

The summer mean of all households in the Khayelitsha sample is exactly equal to that of all pre-payment meter users, at 175 kWh/month. This is coincidental.

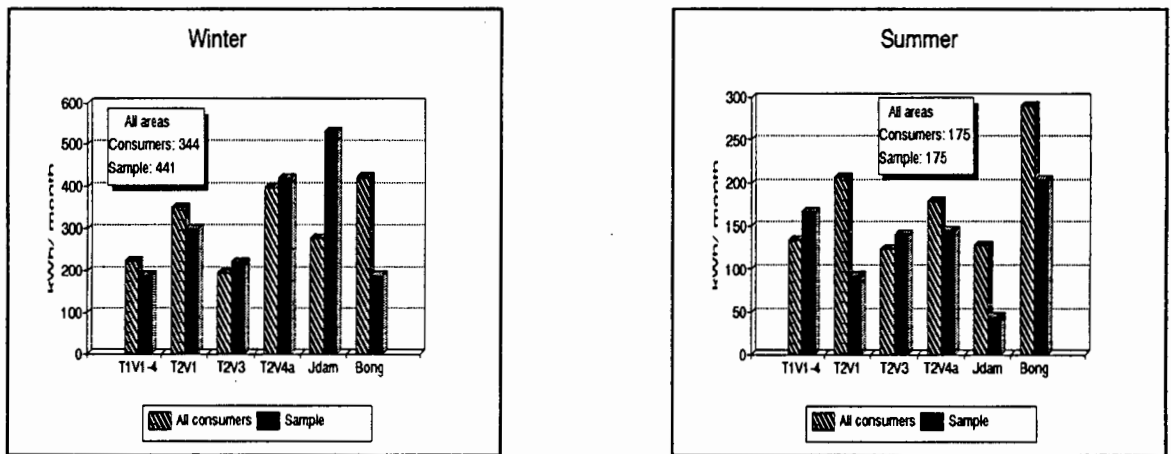


Figure 3.10 Average monthly consumption.

3.4.2 The Langa and Gugulethu survey sample

Figure 3.11 shows seasonal variation in the average monthly consumption of households in the sample. There is no easily discernable seasonal effect. The winter mean of 644 Kwh/ month and the summer mean of 585 kWh/month differ by 59 kWh/ month.

The higher number of consumers in summer (28 as opposed to 22) do not reflect new connections. Rather, information on consumption levels in winter was only available for 22 consumers.

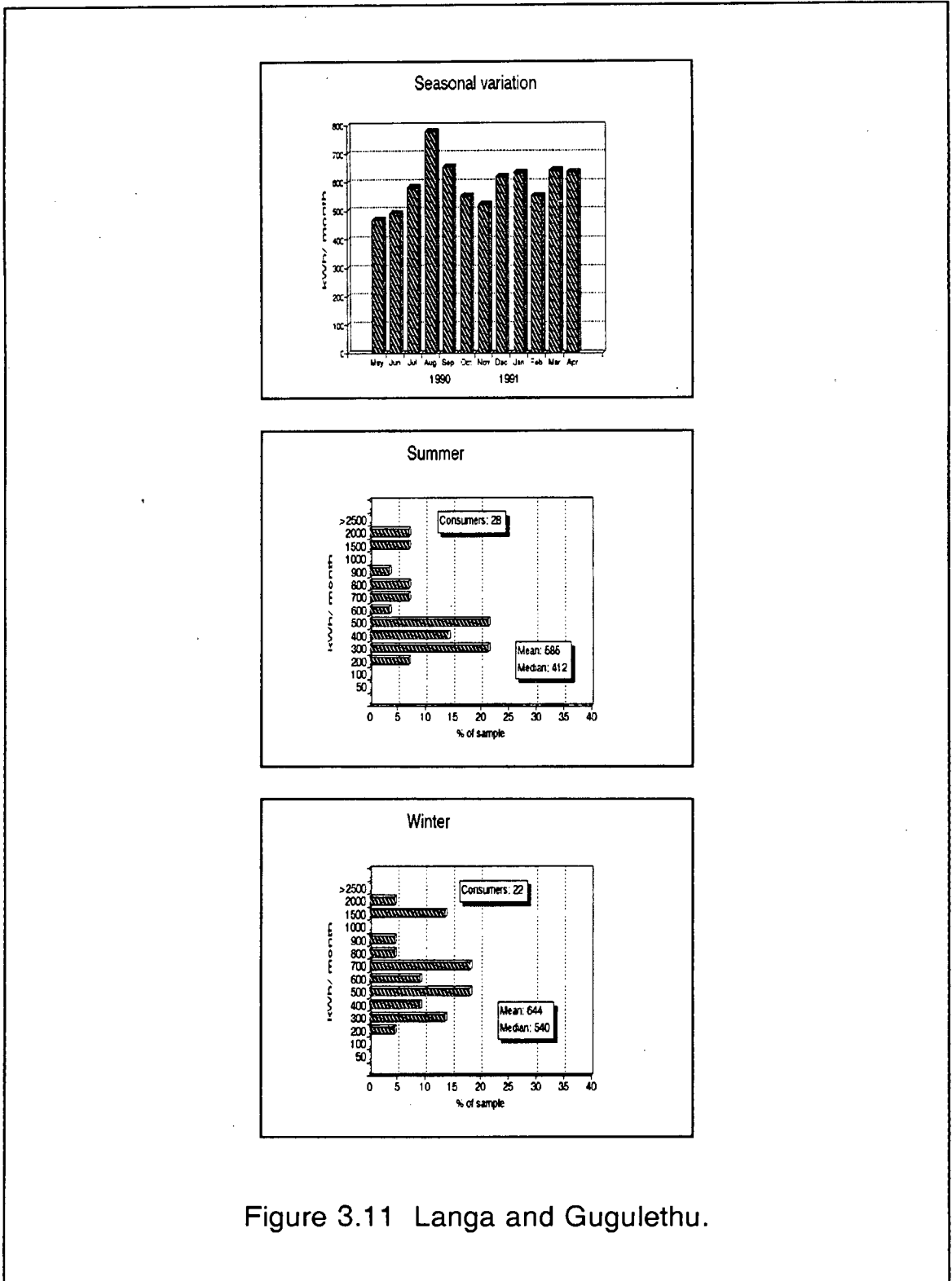


Figure 3.11 Langa and Gugulethu.

3.5 CONCLUSIONS

The main points emerging from this chapter can be summarised as follows:

- Average consumption levels for all consumers with pre-payment meters in Khayelitsha are 344 kWh/month (winter mean) and 175 kWh/month (summer mean).
- The annual mean for all pre-payment meter users is 252 kWh/month.
- There are substantial variations in average levels in different areas. For example, winter levels in Bongweni are up to 23% higher than average. Winter levels are 44% lower than average in Town 2 Village 3.
- Average consumption levels of households in the sample in Khayelitsha are 441 kWh/ month (winter mean) and 175 kWh/month (summer mean).
- The average amount which consumers in Langa and Gugulethu are in arrears is R1123.
- Average consumption levels of households in the survey sample in Langa and Gugulethu are 644 kWh/ month (winter mean) and 585 kWh/month (summer mean).

CHAPTER FOUR

SOCIO-ECONOMIC INFORMATION

4.1 INTRODUCTION

This chapter deals with socio-economic information collected in the areas surveyed. The intention is to provide background information on the areas, for use in later chapters. The following aspects are examined:

- Household sizes, and their composition
- Education levels
- Employment
- The time lived in the house (occupancy)
- Income levels
- Expenditure levels

The above information is presented for different areas in Khayelitsha, and in Langa and Gugulethu.

The names and addresses of the households surveyed are shown on Table 4.1. Also shown are the names of the interviewers.

Table 4.1 Details of households surveyed.

No	NAME	ADDRESS	AREA	INTERVIEWER
1	N.Jack	NY53:72	Gugulethu	Noxolo Bulani
2	L.Sangela	NY89:18	Gugulethu	Noxolo Bulani
3	M.Qobo	NY91:2	Gugulethu	Noxolo Bulani
4	A.Mbinda	NY89:40	Gugulethu	Noxolo Bulani
5	A.Kgati	NY83:5	Gugulethu	Noxolo Bulani
6	N.Gobo	NY78:7	Gugulethu	Noxolo Bulani
7	S.Sontica	NY84:29	Gugulethu	Noxolo Bulani
8	A.Makhuluma	NY53:8	Gugulethu	Noxolo Bulani
9	N.Mqala	NY89:82	Gugulethu	Noxolo Bulani
10	V.Lethabiko	NY56:128	Gugulethu	Noxolo Bulani
11	B.Mhlawuli	14 Sandile Ave	Langa	Veronica Lefuma
12	H.Mabe	26 Sigcawu St	Langa	Veronica Lefuma
13	P.Mathole	2 Mqhayi Rd	Langa	Veronica Lefuma
14	S.Xhamalashé	27 Jungle Walk	Langa	Veronica Lefuma
15	Thembeke	25 Jungle Walk	Langa	Veronica Lefuma
16	J.Sitsila	1 Rose-Innes St	Langa	Veronica Lefuma
17	Ndobini	10 Mdolomba St	Langa	Veronica Lefuma
18	E.Mapete	31106	Jonkersdam	Fundiswa Tshongwana
19	M.Mdzula	31083	Jonkersdam	Fundiswa Tshongwana
20	P.Gcwele	31168	Jonkersdam	Fundiswa Tshongwana
21	F.Matshaya	31102	Jonkersdam	Fundiswa Tshongwana
22	N.Dubisiko	31054	Jonkersdam	Fundiswa Tshongwana
23	J.Wondo	18669	Bongweni	Busiswe Dlulane
24	D.Fink	18517	Bongweni	Busiswe Dlulane
25	N.Moni	18485	Bongweni	Busiswe Dlulane
26	E.Liwani		Bongweni	Busiswe Dlulane
27	C.Mose	18616	Bongweni	Busiswe Dlulane
28	L.Noyi	19716	Town 2 Village 3	Linda Qambata
29	S.Motsamai	19722	Town 2 Village 3	Linda Qambata
30	K.Zenzile	19620	Town 2 Village 3	Linda Qambata
31	E.Louw	21618	Town 2 Village 3	Linda Qambata
32	B.Mhlalo	19723	Town 2 Village 3	Linda Qambata
33	T.Mangxola	19709	Town 2 Village 3	Anthony Mehlwana
34	Priscilla	19726	Town 2 Village 3	Anthony Mehlwana
35	Mrs Sibeko	22293	Town 2 Village 3	Anthony Mehlwana
36	Mr Ngqombo	19622	Town 2 Village 3	Anthony Mehlwana
37	Mrs Sigoba	21632	Town 2 Village 3	Anthony Mehlwana
38	Mrs Mbolekwa	19197	Town 2 Village 3	Anthony Mehlwana
39	Mrs Gqodi	19405	Town 2 Village 3	Anthony Mehlwana
40	Mr Monki	19506	Town 2 Village 3	Anthony Mehlwana
41	Mr Nkala	19706	Town 2 Village 3	Anthony Mehlwana
42	N Magodla	51 Jungle Walk	Langa	Fundiswa Tshongwana
43	Y Myeni	30 Church St	Langa	Fundiswa Tshongwana
44	C.Tetyana	Zone 11 No. 6	Langa	Fundiswa Tshongwana
45	T.Ntenetya	25 Moshesh Ave	Langa	Fundiswa Tshongwana
46	M.Mbizela	6 Haarlem Ave	Langa	Fundiswa Tshongwana
47	N. Tsoli	NY57 no.22	Gugulethu	Busiswe Dlulane
48	V.Tshabe	NY138 no. 40	Gugulethu	Busiswe Dlulane
49	T.Ndimande	NY119 No. 6	Gugulethu	Busiswe Dlulane
50	B.Mngxunya	NY49 No 39	Gugulethu	Busiswe Dlulane
51	B.Bam	Ny108 no 51	Gugulethu	Busiswe Dlulane
52	Edwin	25 Sigcawu St	Langa	Veronica Lefuma
53	Sylvia	4 Rose-Innes St	Langa	Veronica Lefuma

No.	NAME	ADDRESS	AREA	INTERVIEWER
54	T.Ntsendwane	19112	Town 2 Village 4a	Mlandeli Mkonto
55	Mrs Mentisi	18927	Town 2 Village 4a	Mlandeli Mkonto
56	P.Mpekula	18979	Town 2 Village 4a	Mlandeli Mkonto
57	Mrs Mpinana	18948	Town 2 Village 4a	Mlandeli Mkonto
58	N. Lalela	19109	Town 2 Village 4a	Mlandeli Mkonto
59	A. Manaiwa	18899	Town 2 Village 4a	Mlandeli Mkonto
60	N.Ngodongwan	19119	Town 2 Village 4a	Mlandeli Mkonto
61	Mrs Ndude	18984	Town 2 Village 4a	Mlandeli Mkonto
62	N.Mazwi	18977	Town 2 Village 4a	Mlandeli Mkonto
63	Ntswendana	18929	Town 2 Village 4a	Mlandeli Mkonto
64	S.Baartman	22731	Town 2 Village 3	Anthony Mehlwana
65	Mrs Wana	Z46	Town 1	Sipho Mashiya
66	R.Khau	Z118	Town 1	Sipho Mashiya
67	G.Mtyando	Z52	Town 1	Sipho Mashiya
68	N.Vuma	Z97	Town 1	Sipho Mashiya
69	Z.Nonde	Z47	Town 1	Sipho Mashiya
70	I.Gom	J190	Town 1	Sipho Mashiya
71	Mr Qubile	J263	Town 1	Sipho Mashiya
72	Mhlasela	J179	Town 1	Sipho Mashiya
73	Mrs Mabele	J229	Town 1	Sipho Mashiya
74	N.Mayembani	27667	Town 2 Village 1	Linda Qambata
75	N.Bulawa	29001	Town 2 Village 1	Linda Qambata
76	L.Sihawu	27394	Town 2 Village 1	Linda Qambata
77	V.Gae	27371	Town 2 Village 1	Linda Qambata
78	J.Mbokotho	27339	Town 2 Village 1	Linda Qambata
79	J.Dumse	27305	Town 2 Village 1	Zolile Siswana
80	M.Tabile	27306	Town 2 Village 1	Zolile Siswana
81	M.Sibeko	27395	Town 2 Village 1	Zolile Siswana
82	N.Ntloko	27345	Town 2 Village 1	Zolile Siswana
83	M.Peterson	27319	Town 2 Village 1	Zolile Siswana
84	W.Sibiya	27322	Town 2 Village 1	Zolile Siswana
85	A.Qhagayi	27307	Town 2 Village 1	Zolile Siswana
86	N.Kwinana	27316	Town 2 Village 1	Zolile Siswana
87	M.Mbanga	43 Luvoyo Dve	Bongweni	Linda Qambata
88	B.Blackbeard	2 Tangana Dve	Bongweni	Linda Qambata
89	W.Mpini	3 Ngwenya St	Bongweni	Busiswe Dzulane
90	N.Mtsi	6 Kwezi Rd	Bongweni	Noxolo Bulani
91	D.Zethu	17 Ipikoko St	Bongweni	Noxolo Bulani
92	Miss Toni	12 Ngwenya St	Bongweni	Anthony Mehlwana
93	Mr Mwanda	15 Ipikoko Dve	Bongweni	Anthony Mehlwana
94	T.Mtsila	12 Kwezi St	Bongweni	Zolile Siswana
95	Miss Vasi		Jonkersdam	Anthony Mehlwana
96	Mrs Khwinana	5 Starlight Rd	Jonkersdam	Sipho Mashiya
97	Mrs Mavumbe	107 Saturn Cres	Jonkersdam	Sipho Mashiya
98	K.Welman	53 Saturn Cres	Jonkersdam	Sipho Mashiya
99	Nolitha	7 Galaxy Cres	Jonkersdam	Veronica Lefuma
100	N.Mbenenge	73 Saturn Cres	Jonkersdam	Linda Qambata
101	Vuyiswa	59 Galaxy Cres	Jonkersdam	Veronica Lefuma
102	Lily	11 Galaxy Cres	Jonkersdam	Veronica Lefuma
103	M.Somphali	42 Saturn Cres	Jonkersdam	Busiswe Dzulane
104	S. Venifolo	J212	Town 1	Sipho Mashiya
105	G.Nosango	3 Ngawalazi St	Town 2 Village 1	Zolile Siswana
106	Z. Bevu	7 Tangana Rd	Bongweni	Zolile Siswana
107	S. Sibotho	52 Saturn Cres	Jonkersdam	Sipho Mashiya
108	A. Mashiya	4 Nkenjane St	Town 2 Village 1	Zolile Siswana
109	X.Mvango	15 Idaliya St	Bongweni	Busiswe Dzulane

4.2 HOUSEHOLD SIZE AND COMPOSITION

4.2.1 Average household size

The 'household' was defined in this survey as the group of people using the same source of electricity. People living in backyard shacks on the property were thus included if they used electricity supplied to the main house. Figure 4.1 shows the average household size in the areas surveyed. Also shown are the number of people living in backyard shacks who are not part of the household.

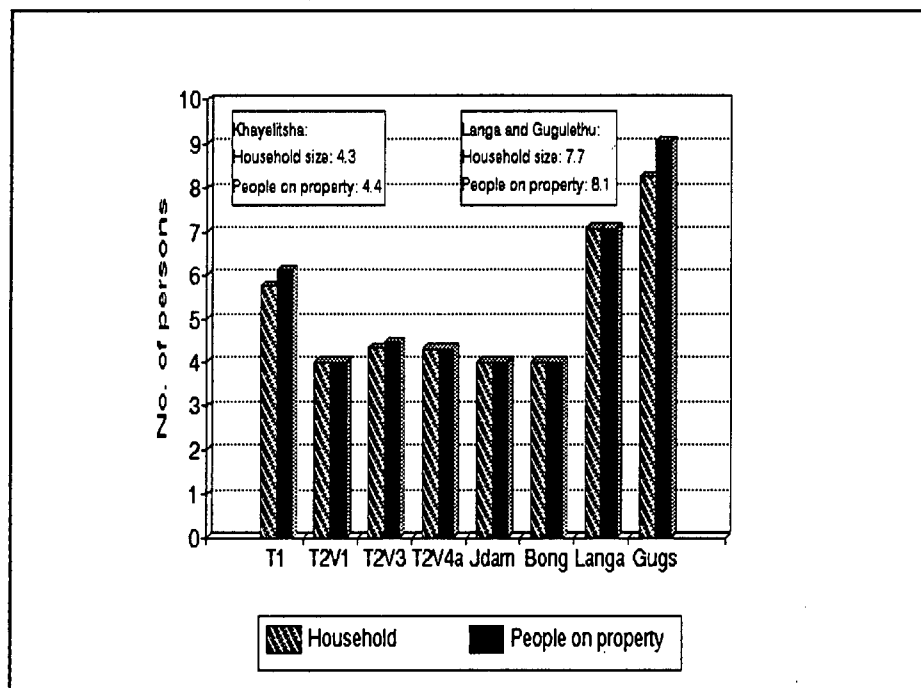


Figure 4.1 Average household size.

Household sizes in Khayelitsha are smaller than in Langa and Gugulethu. Within Khayelitsha, household sizes are larger in the older areas of Town 1. This phenomenon is probably caused by the housing shortages in the Cape Town area. Many people arriving in the city from rural areas stay initially with families in established areas.

4.2.2 Average number of adults

Figure 4.2 shows the average number of adults per household in the areas surveyed. 'Adults' are all those born before 1973 (ie. older than 18 in 1991). Apart from in Khayelitsha Town 2 Village 4a and Bongweni, most houses are home to extended families (with more than two adults).

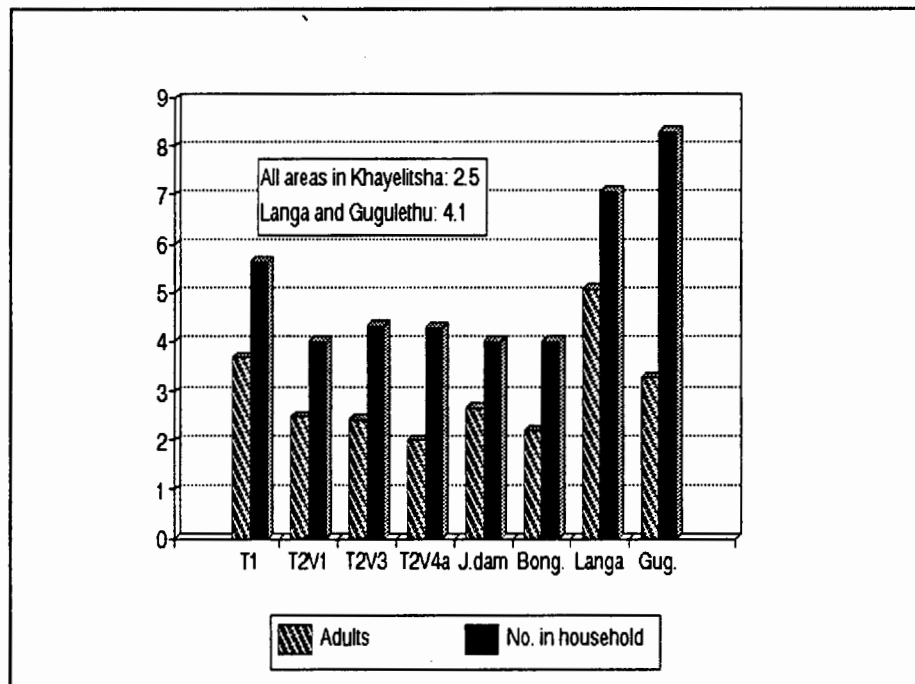


Figure 4.2 Average number of adults per household.

4.2.3 Average age of adults

Figure 4.3 shows the average age of adults in the household surveyed.

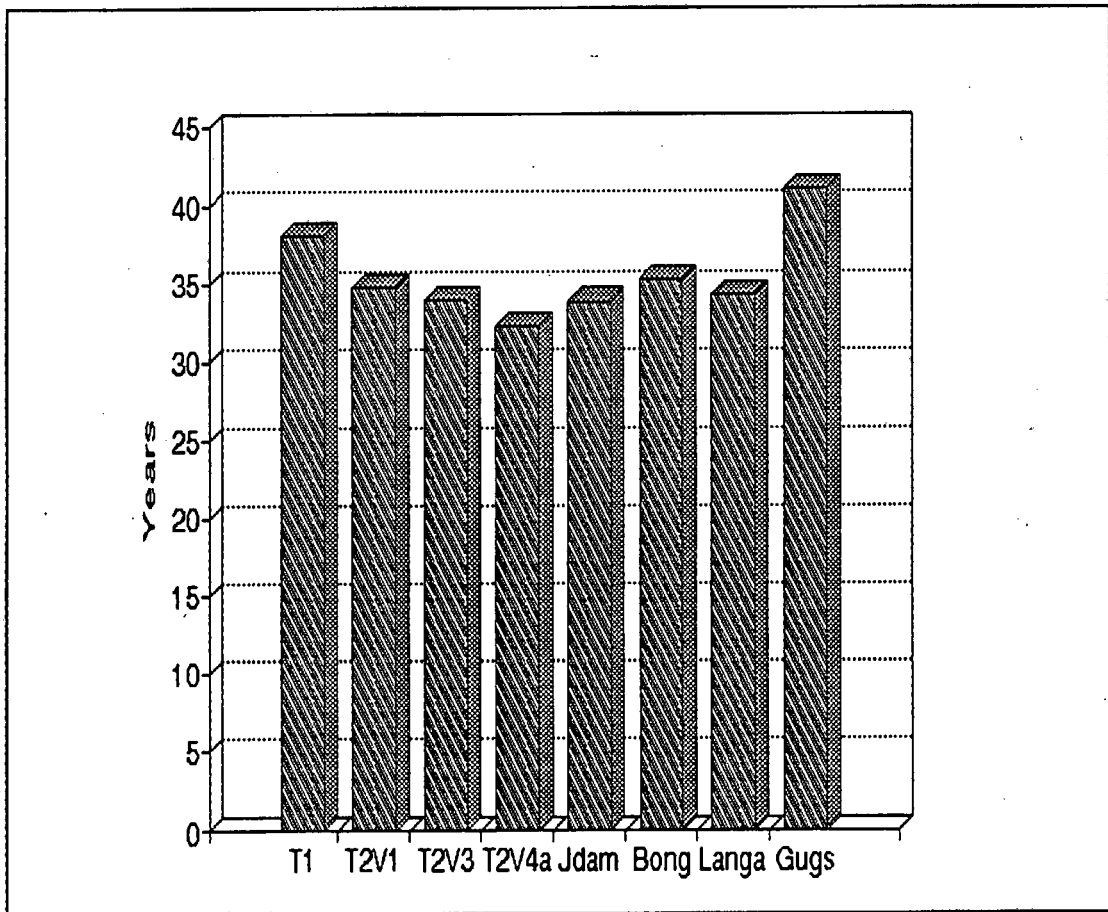


Figure 4.3 Average age of adults.

4.2.4 Sex of household heads

Figure 4.4 shows the average number of households headed by women and by men in the areas surveyed. The figures for households being headed by women are very high, and may be subjectively reported.

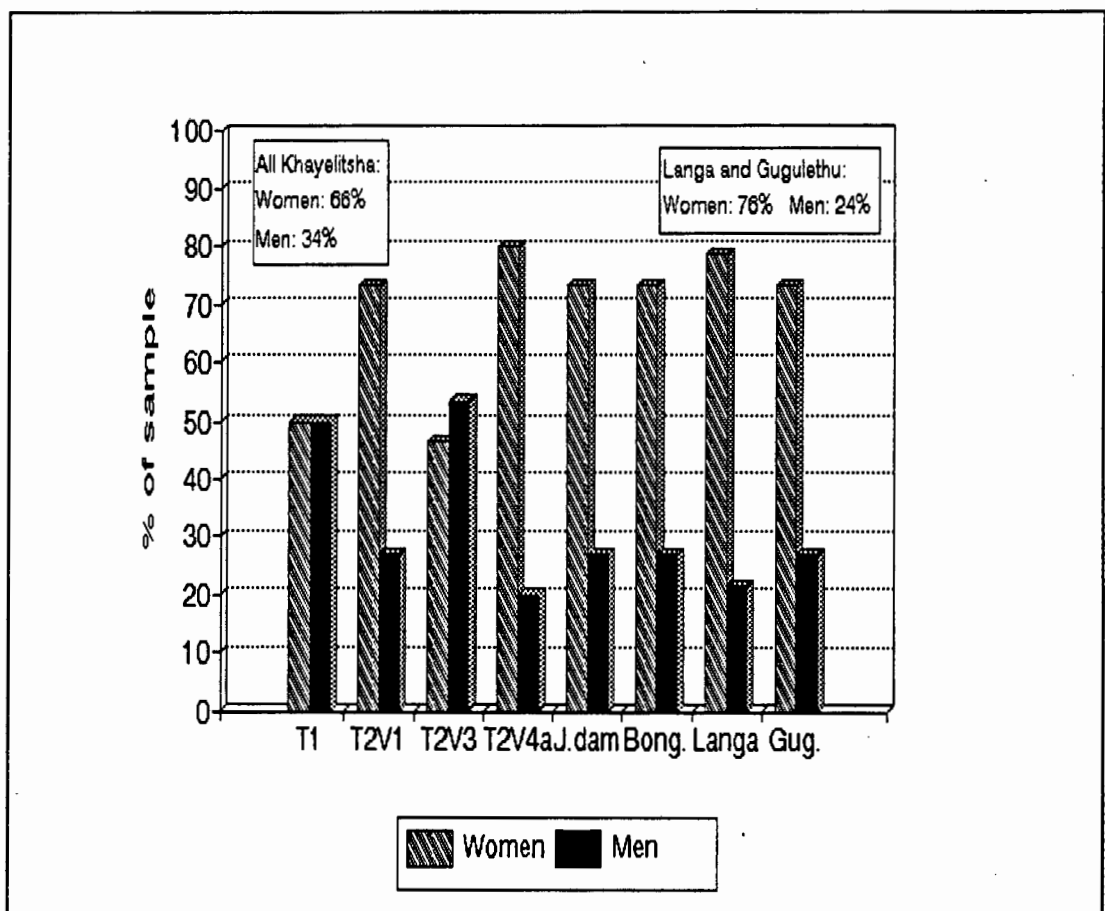


Figure 4.4 Sex of household head.

4.3 EDUCATION LEVELS

Figure 4.5 indicates the average number of years of schooling of adults in the in the areas surveyed. This is one measure of the levels of education in households interviewed.

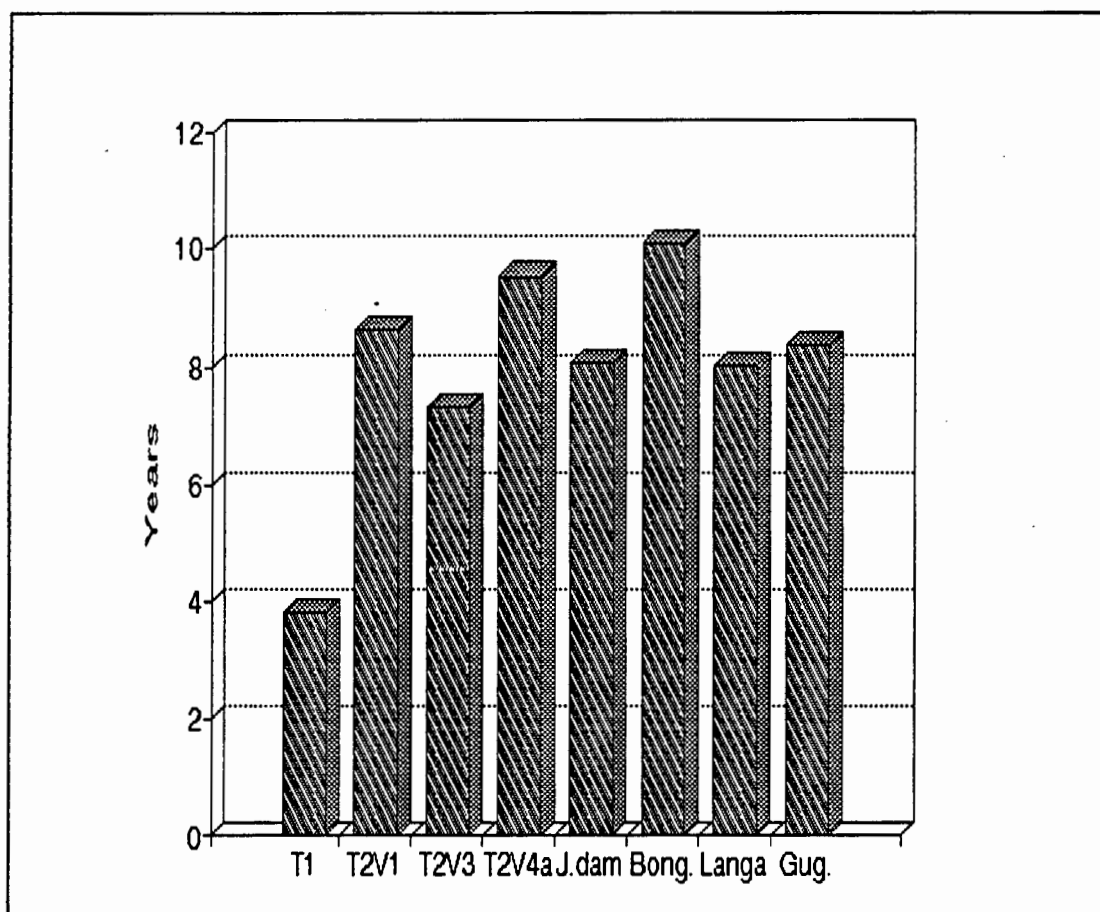


Figure 4.5 Average number of years schooling of adults.

4.4 EMPLOYMENT

Figure 4.6 indicates the average levels of employment in the areas surveyed. Levels are higher in the newer areas of Khayelitsha.

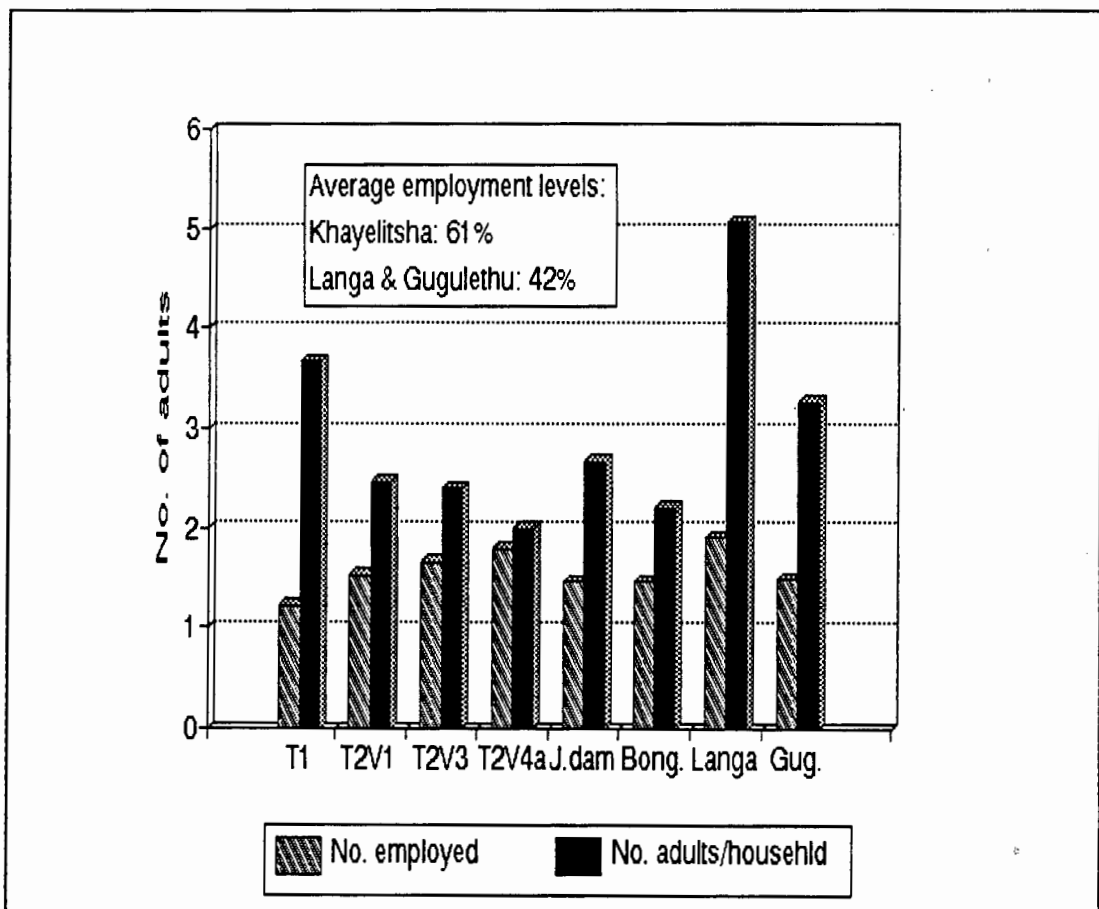


Figure 4.6 Average employment for adults.

4.5 OCCUPANCY

Figure 4.7 shows the number of years that household surveyed have lived at their present address. Langa and Gugulethu are of course old, established townships, whereas Khayelitsha has only been in existence for about 6 years.

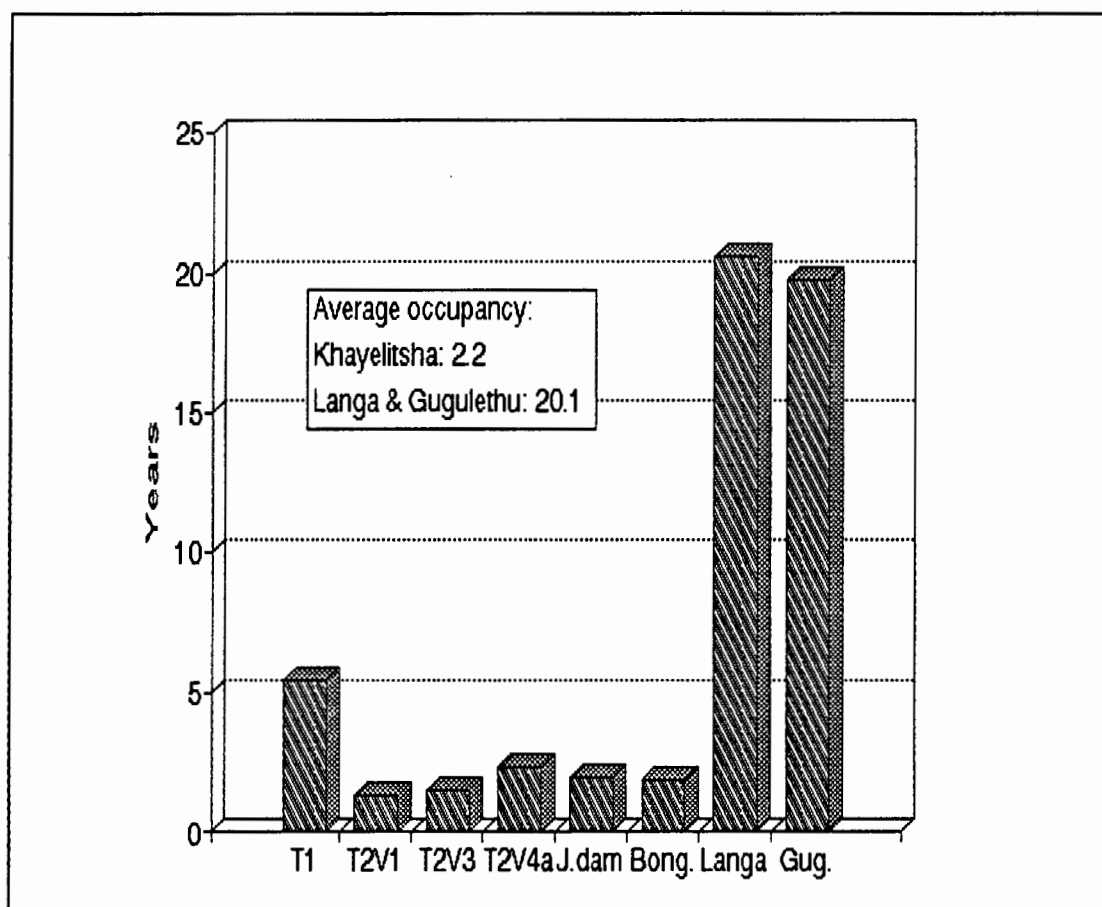


Figure 4.7 Years lived at present address.

4.6 INCOME AND EXPENDITURE

Figure 4.8 is a scatter plot of total household expenditure and total household income. A regression analysis indicates that the two amounts are not especially well correlated (R squared of 0.153). This suggests that the information provided is not particularly accurate.

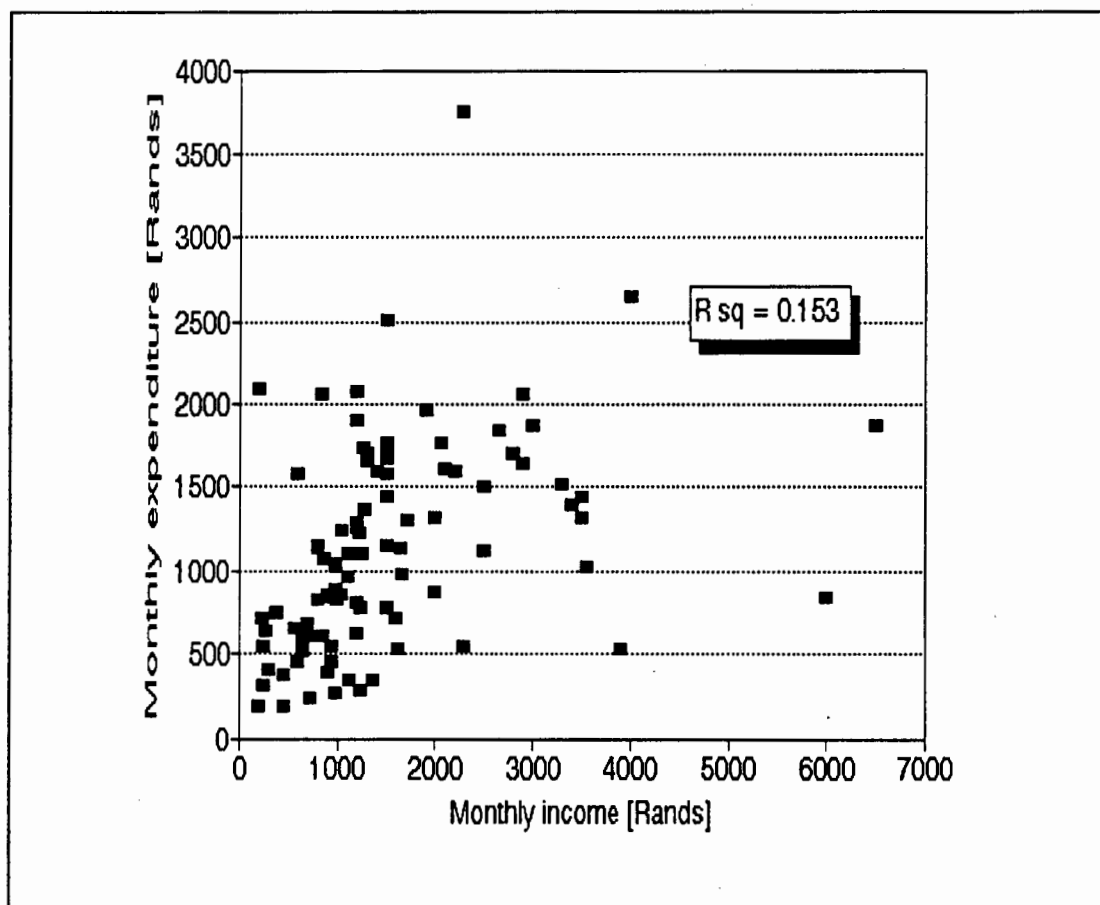


Figure 4.8 Monthly income vs expenditure (all 96 households).

Figure 4.9 provides similar information, with averages taken in the areas surveyed. Agreement between income and expenditure is particularly poor in Khayelitsha Town 2 Village 4a and in Langa.

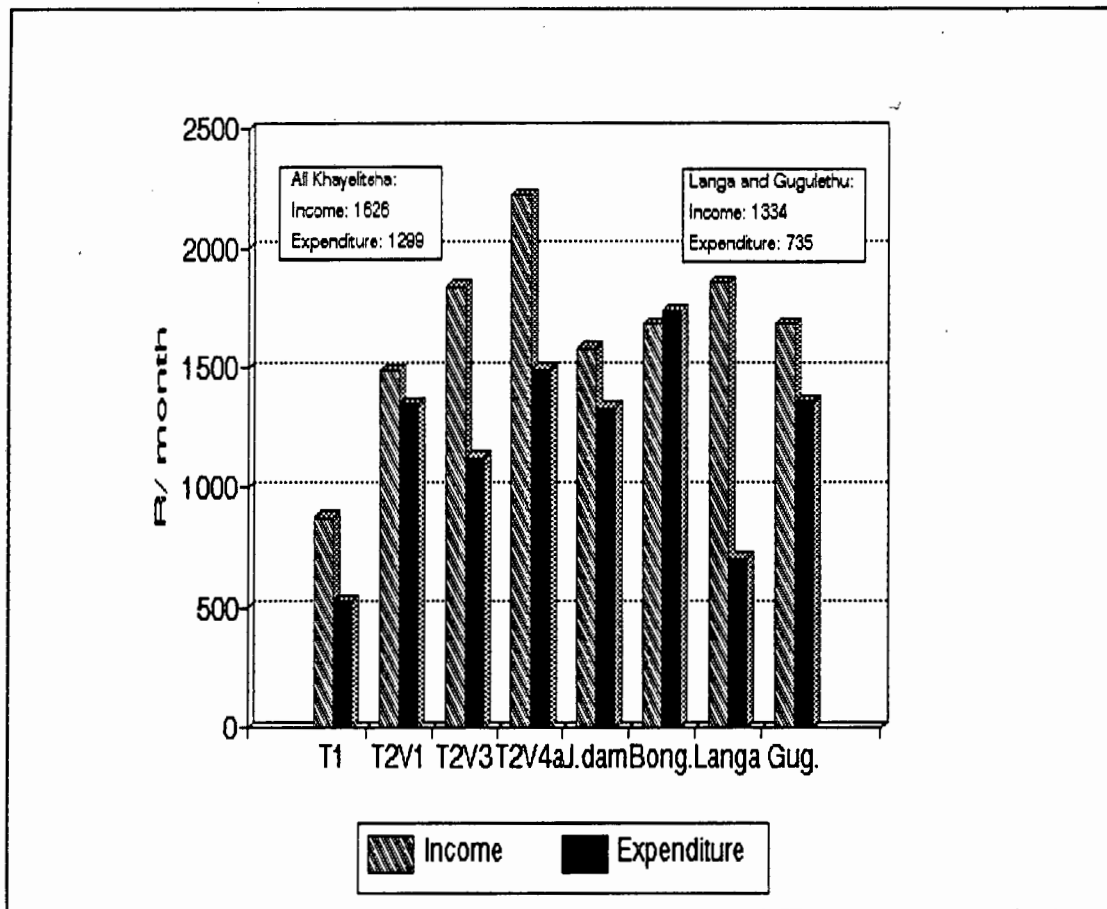


Figure 4.9 Average income and expenditure.

Figure 4.10 provides aggregated frequency distribution diagrams for income levels in Khayelitsha and Langa and Gugulethu. Incomes in Langa and Gugulethu were broadly less than those in Khayelitsha. 78% of the whole sample had incomes below R2000 per month. 83% of those in the older areas, and 75% of those in Khayelitsha, fell below this mark. The mean and median in Langa and Gugulethu were R1283 and R1120 respectively. The mean and median in Khayelitsha were R1611 and 1234 respectively.

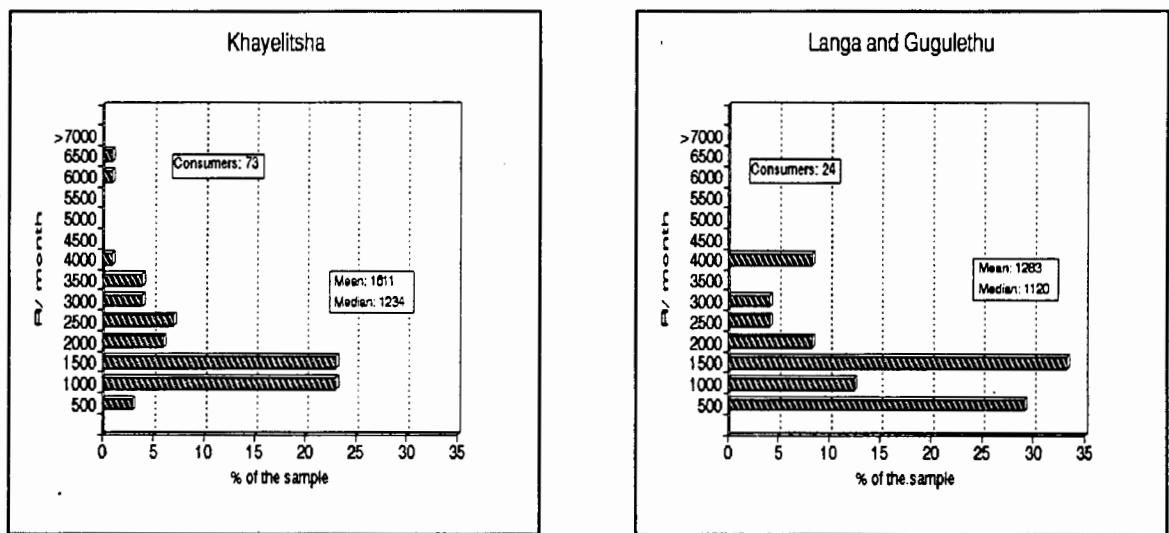


Figure 4.10 Frequency distributions of income levels.

4.7 CONCLUSION

The foregoing information was presented in order to characterise the two areas to be studied. The points with relevance to future sections are the following:

- Households in Langa and Gugulethu are nearly twice the size as in Khayelitsha.
- Households in Langa and Gugulethu have been at their present addresses for far longer than those in Khayelitsha.
- Household incomes are lower in Langa and Gugulethu than in Khayelitsha.

CHAPTER FIVE

APPLIANCES

5.1 INTRODUCTION

Appliance ownership and use in the 108 households surveyed are examined in this chapter. The following aspects are explored:

- Appliance ownership (electrical, gas, paraffin and others).
- Appliance use for major energy consuming activities (cooking, space heating and water heating).

5.2 APPLIANCE OWNERSHIP

5.2.1 Electrical appliances

Figure 5.1 shows the percentage of the 79 households in Khayelitsha and the 29 households in Langa and Gugulethu which own particular electrical appliances. Appliances are classed in categories: those used for cleaning; food preparation; heating, cooling and lighting; and leisure.

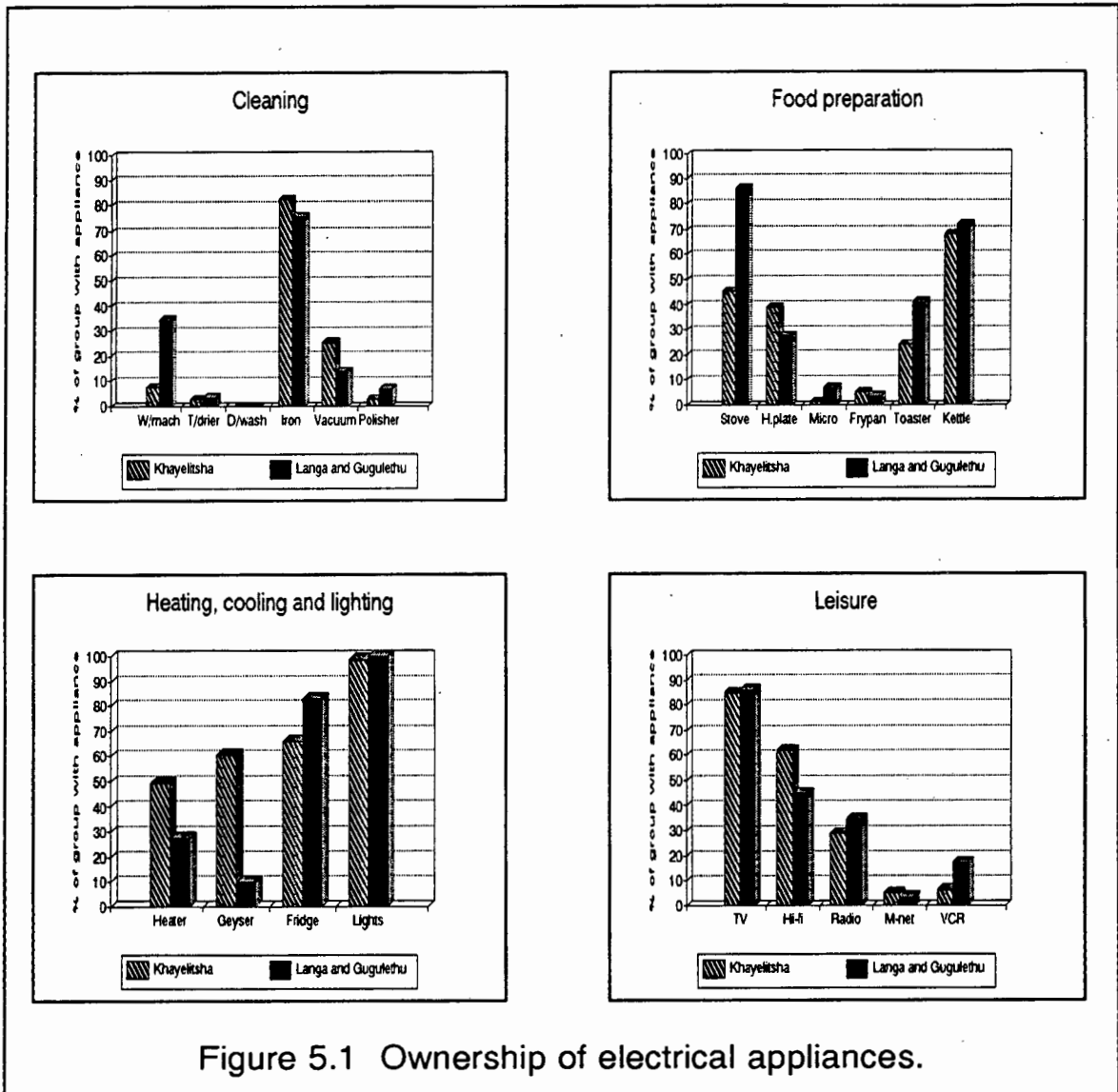


Figure 5.1 Ownership of electrical appliances.

The following points of interest can be made:

- 86% of households sampled in Langa and Gugulethu own electric stoves. In Khayelitsha, only 46% have stoves, and 39% have electric hot plates (some households in Khayelitsha own both).
- 60% of homes in Khayelitsha have geysers. These are mostly houses in Town 2 Village 4a, Town 2 Village 3, Bongweni and Jonkersdam, where geysers were installed at the time of construction of the house. In Langa and Gugulethu only 10% of households have geysers.
- Fridges are owned by a majority of households (Khayelitsha 66%, Langa and Gugulethu 83%), as are television sets (Khayelitsha 85%, Langa and Gugulethu 86%).
- A notable number of households (34% of the sample) in Langa and Gugulethu own washing machines.
- A notable number of households (25% of the sample) in Khayelitsha own vacuum cleaners.

Figure 5.2 shows the particular appliances bought first by those houses surveyed. Thus, for example, of the 29 households in Langa and Gugulethu, 64% recall buying an electric stove first when they gained access to electricity. Another 18% bought fridges.

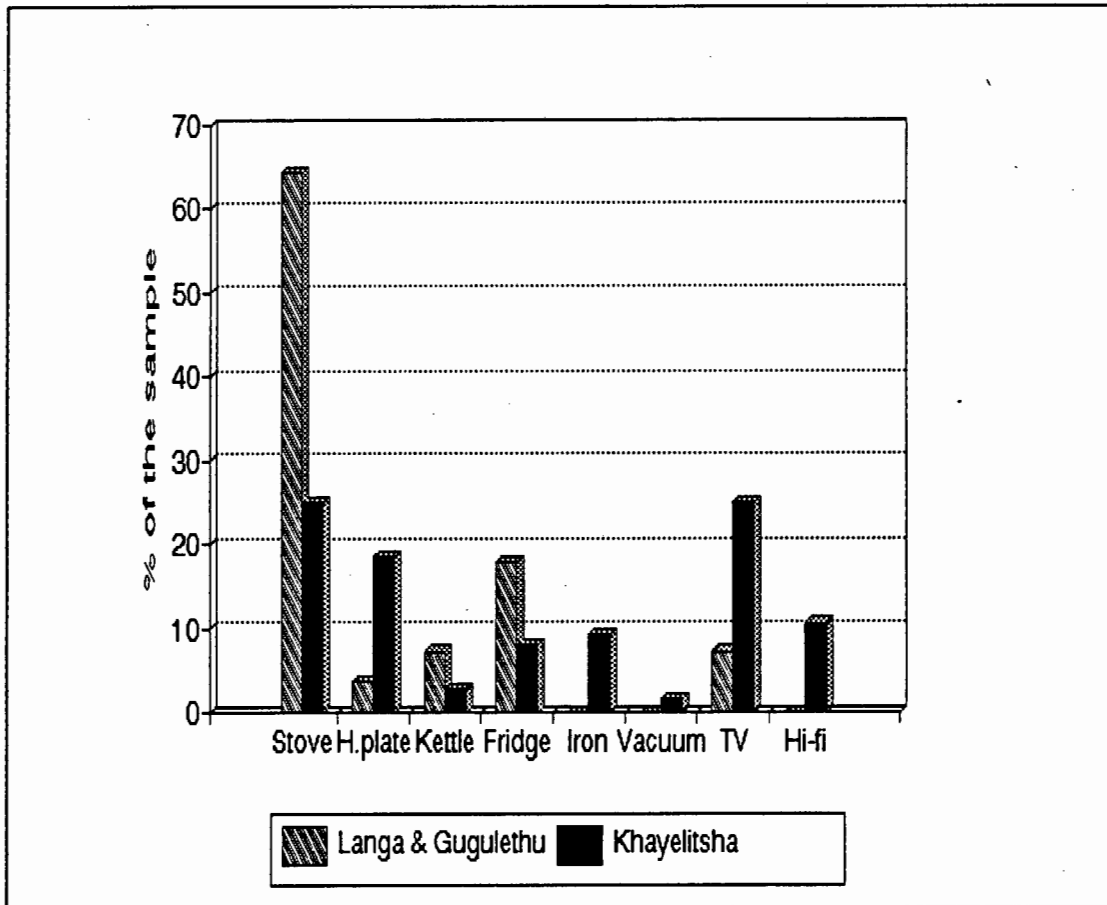


Figure 5.2 Electrical appliances bought first.

Of the 79 households in Khayelitsha, 25% recall buying a stove first. An equal number bought television sets first, while 18% bought hot plates.

Figure 5.3 shows the particular appliances bought most recently by those houses surveyed. Fridges were bought recently by 30% of those in Langa and Gugulethu. 20% of those in Khayelitsha and 19% of those in Langa and Gugulethu bought television sets. As will be seen in chapter six, expenditure on hire purchase payments for electrical appliances is also much higher in Khayelitsha than in Langa and Gugulethu.

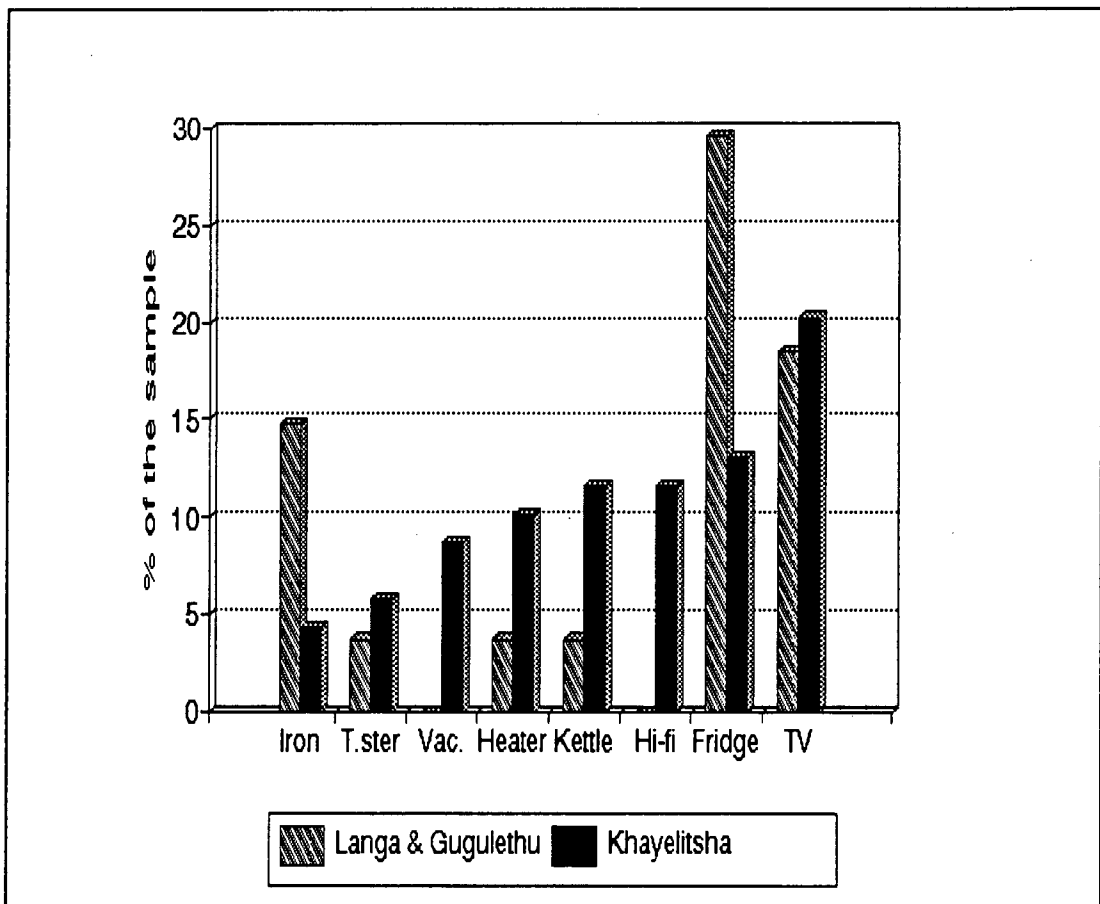


Figure 5.3 Electrical appliances bought last.

Figure 5.4 shows the particular appliances which households plan to buy next. 19% of those in Langa and Gugulethu and 22% of those in Khayelitsha intend to buy a stove. This would imply that significant increases in electricity consumption might be expected in both areas in future. Interestingly, 13% of those in Langa and Gugulethu and 17% of those in Khayelitsha are planning to buy washing machines.

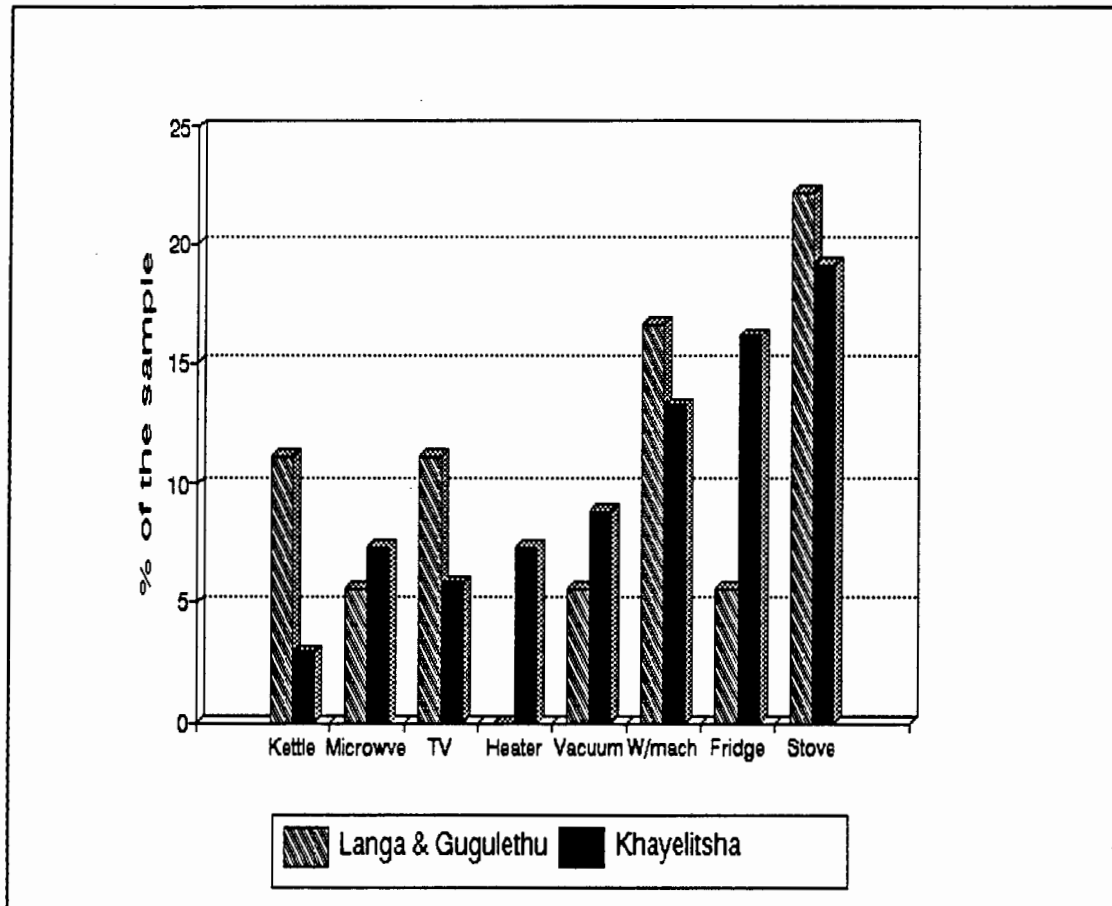


Figure 5.4 Electrical appliances planning to buy.

5.2.2 Gas appliances

Figure 5.5 shows the percentage of the sample in each area which owns gas stoves and gas fridges. Gas stoves are particularly prevalent in Khayelitsha, where they are owned by 47% of all households. In Langa and Gugulethu they are owned by 17% of households. The reasons why these appliances are used is discussed in section 5.3.1.

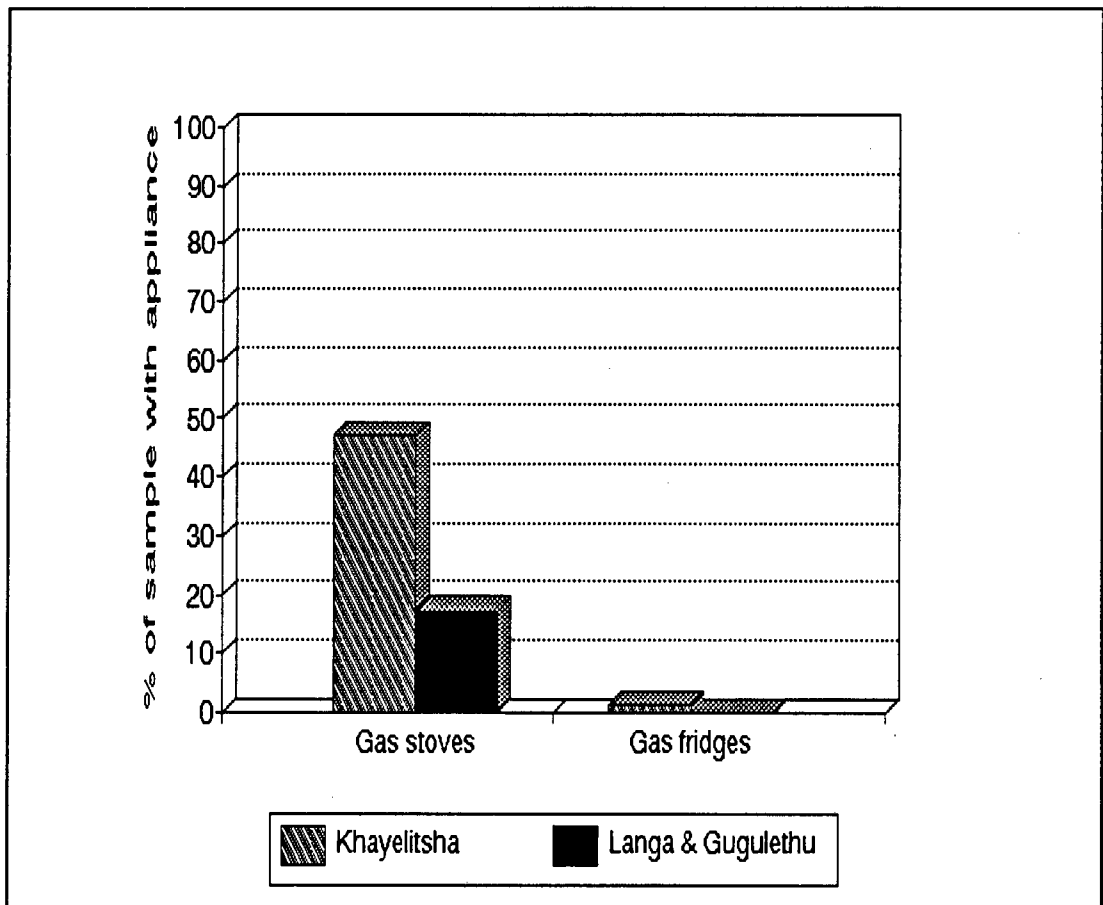


Figure 5.5 Ownership of gas appliances.

5.2.3 Paraffin appliances

Figure 5.6 shows the percentage of the sample in each area which owns paraffin (primus) stoves, lamps and paraffin heaters. Primus stoves are owned by 15% of those in Khayelitsha and by 28% of those in Langa and Gugulethu. Paraffin heaters are owned by 38% of households in Khayelitsha and 59% of those in Langa and Gugulethu

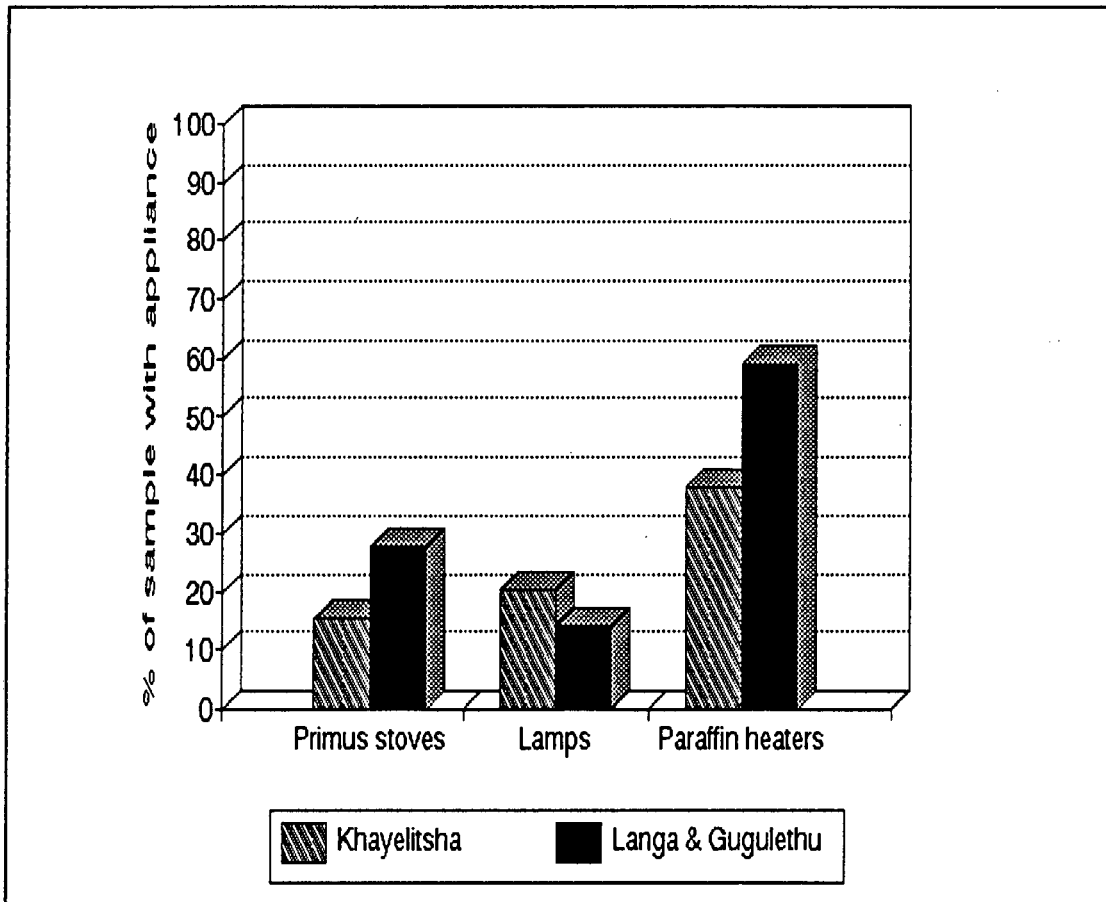


Figure 5.6 Ownership of paraffin appliances.

5.2.4 Other appliances

The numbers of households owning appliances using other fuels (such as coal and wood stoves) is not significant. In the entire sample, one household in Jonkersdam owned a fireplace (Jetmaster type) heater. One household, in Gugulethu, owned a coal stove.

Wood was is used by many households for cooking traditional meals (on open fires), and for occasional braais.

One household, in Langa, used car batteries to power a television set and a hi-fi. The household head worked at garage and could charge batteries for free.

5.3 APPLIANCES USED FOR MAJOR ENERGY CONSUMING ACTIVITIES

5.3.1 Cooking

Figure 5.7 consolidates some of the information on appliance ownership presented above. The percentage of the sample in Langa and Gugulethu and in Khayelitsha which owns particular appliances used for cooking is shown. Figure 5.8 shows the primary appliance used for cooking. In cases where a combination of appliances is used on a daily basis, households are placed in a category 'mix'.

The distinction between appliances owned and those primarily used is drawn because some appliances owned are in fact used only in case of blackouts.

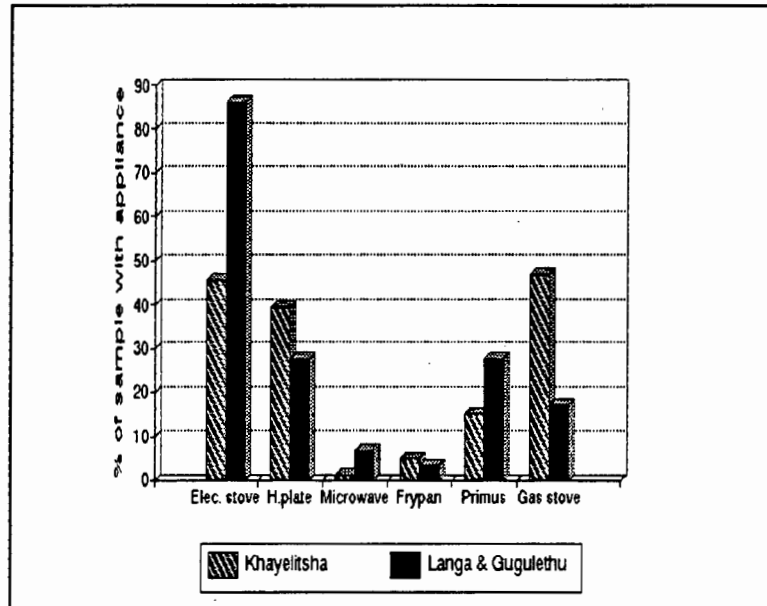


Figure 5.7 Cooking appliances owned.

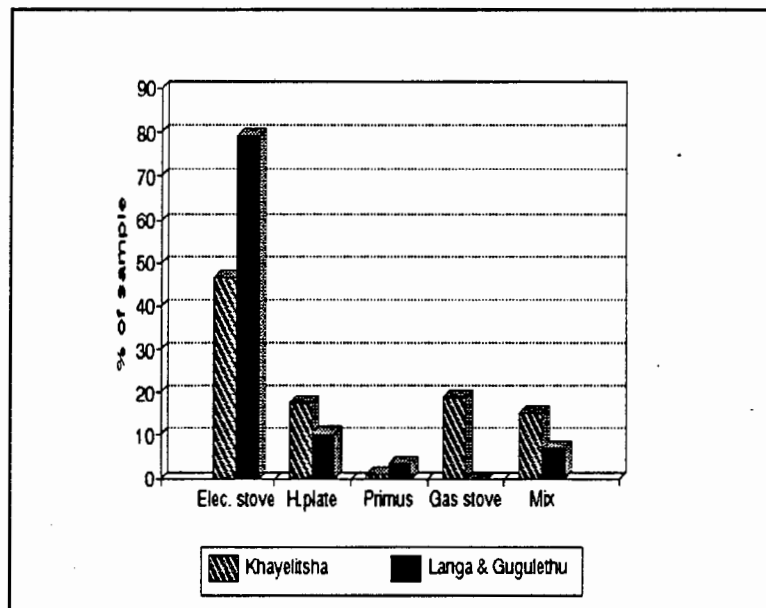


Figure 5.8 Primary appliance used in cooking.

In Langa and Gugulethu, electric stoves are owned by the majority of households (86%). 79% of all households use electric stoves as their primary means of cooking. Another 7% fall into the category 'mix'. 10% use electric hotplates daily. 3% cook primarily with primus stoves. Gas stoves are not used daily by any household in Langa and Gugulethu surveyed, even though they are owned by 17% of households.

In Khayelitsha, all those households which own electric stoves (46%), in fact use them as their primary means of cooking. Whilst gas stoves are owned by 47% of households, only 18% use them primarily for cooking. 18% use primarily hot plates, while 16% use a mix of appliances on a daily basis.

Figure 5.9 shows the results of a closer investigation into the use of gas stoves in Khayelitsha. The responses of those households primarily using gas to the question: "reason for using gas, not electricity" were categorised. It was found that 75% of these households use gas primarily because they cannot afford an electric stove. Another 25% believe gas to be cheaper to cook with gas than with electricity. It was also found that 71% of these households indicated that they plan to purchase electric stoves at some time in the future.

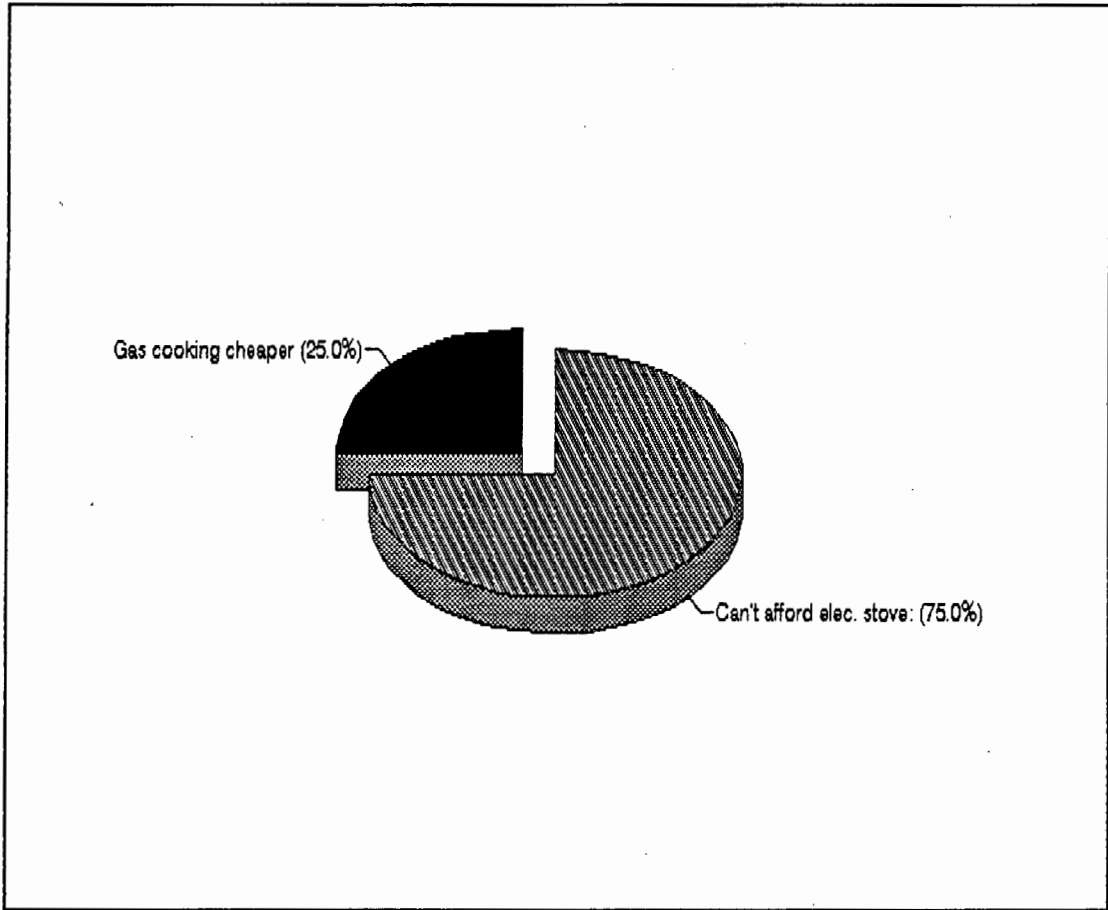


Figure 5.9 Reasons for using a gas stove.

Table 5.1 indicates the actual costs per unit of useful energy obtained when cooking with different appliances and fuels, in the two areas. In order to arrive at the figures shown, average appliance efficiencies were used, as specified in Table 5.2. The information on costs for useful energy is shown graphically in figure 5.10.

Electricity is shown to be the cheapest fuel for cooking (either on a full stove or a hot plate) in both Langa and Gugulethu and Khayelitsha.

Table 5.1 Energy costs of cooking appliances.

Fuel	Unit	Khayelitsha	Langa & Gugulethu
COSTS			
Elec. unit charge	c/kWh	15.0	10.53
Monthly charge	R	-	3.00
Ave. elec. cost	c/kWh	15.0	11.2
Gas	R/kg	1.8	2.40
Paraffin	R/l	1.0	1.1
NET ENERGY COST			
Electricity	c/MJ	4.2	3.1
Gas	c/MJ	3.8	4.9
Paraffin	c/MJ	2.7	3.0
USEFUL ENERGY COST IN APPLIANCE			
Electric stove	c/MJ	5.2	3.9
Electric hot plate	c/MJ	5.2	3.9
Gas stove	c/MJ	5.3	7.0
Primus	c/MJ	5.4	5.9

Table 5.2 Conversion efficiencies for cooking appliances.

Appliance	Efficiency (%)
Electric stove	80
Electric hot plate	80
Gas stove	70
Primus	50

Source: Bennett (1977)

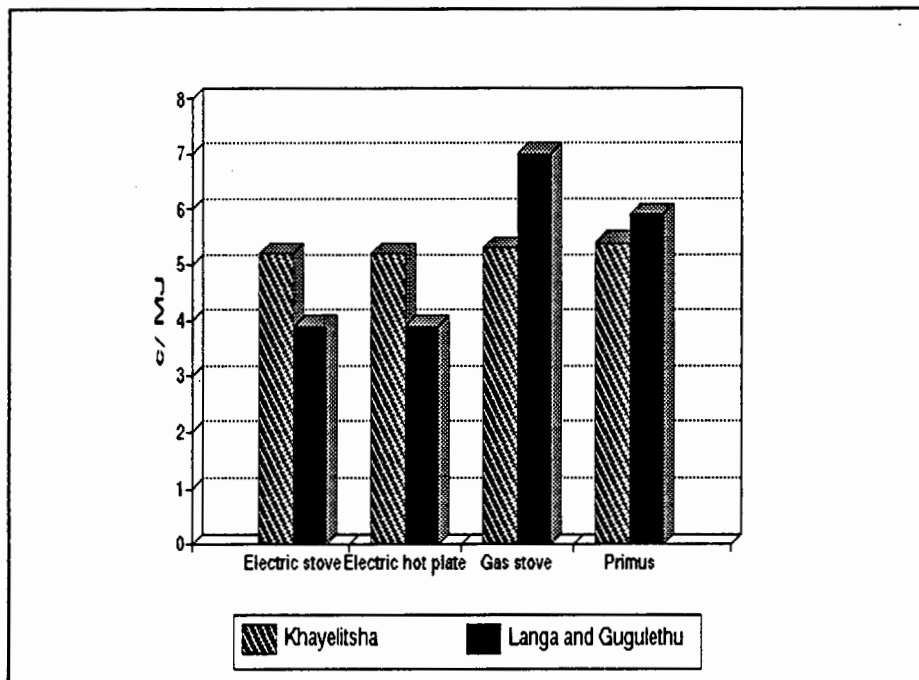


Figure 5.10 Useful energy costs for cooking appliances.

5.3.2 Space heating

Figure 5.11 shows the information on appliances owned for space heating. Electric bar heaters are marginally more popular than paraffin heaters in Khayelitsha (44% to 38%), but less popular in Langa and Gugulethu (28% to 59%). Some households (6 in Khayelitsha and 1 in Langa, have both types of heaters.

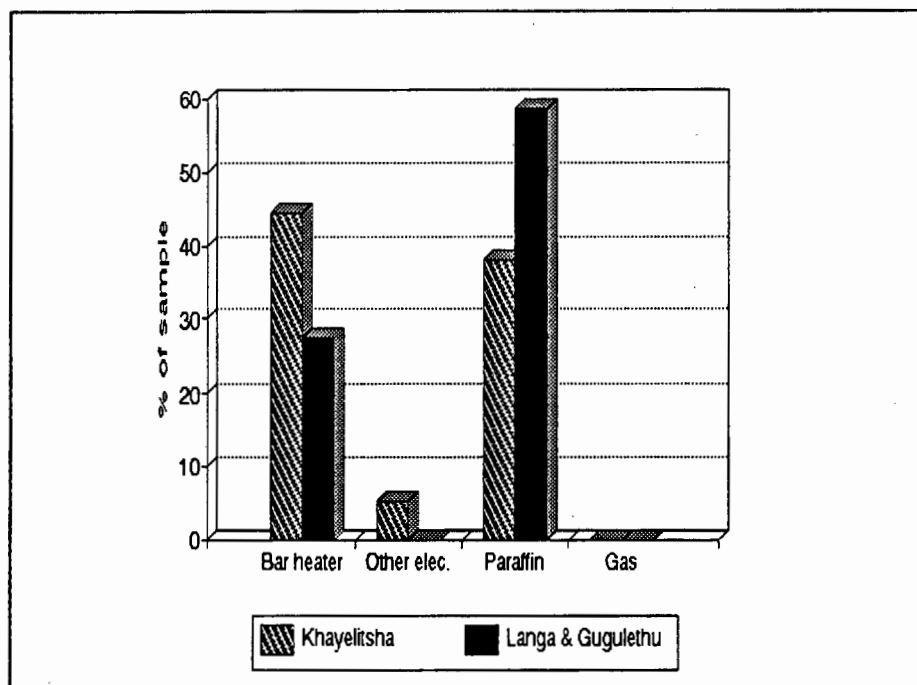


Figure 5.11 Ownership of space heating appliances.

5.3.3 Water heating

Categories on appliance ownership for water heating are split into 'electric geysers' and 'others'. If a home has no geyser, it is assumed that a range of other appliances (stoves, kettles, etc) are used to heat water. Figure 5.12 shows the percentage of households in each area that have geysers.

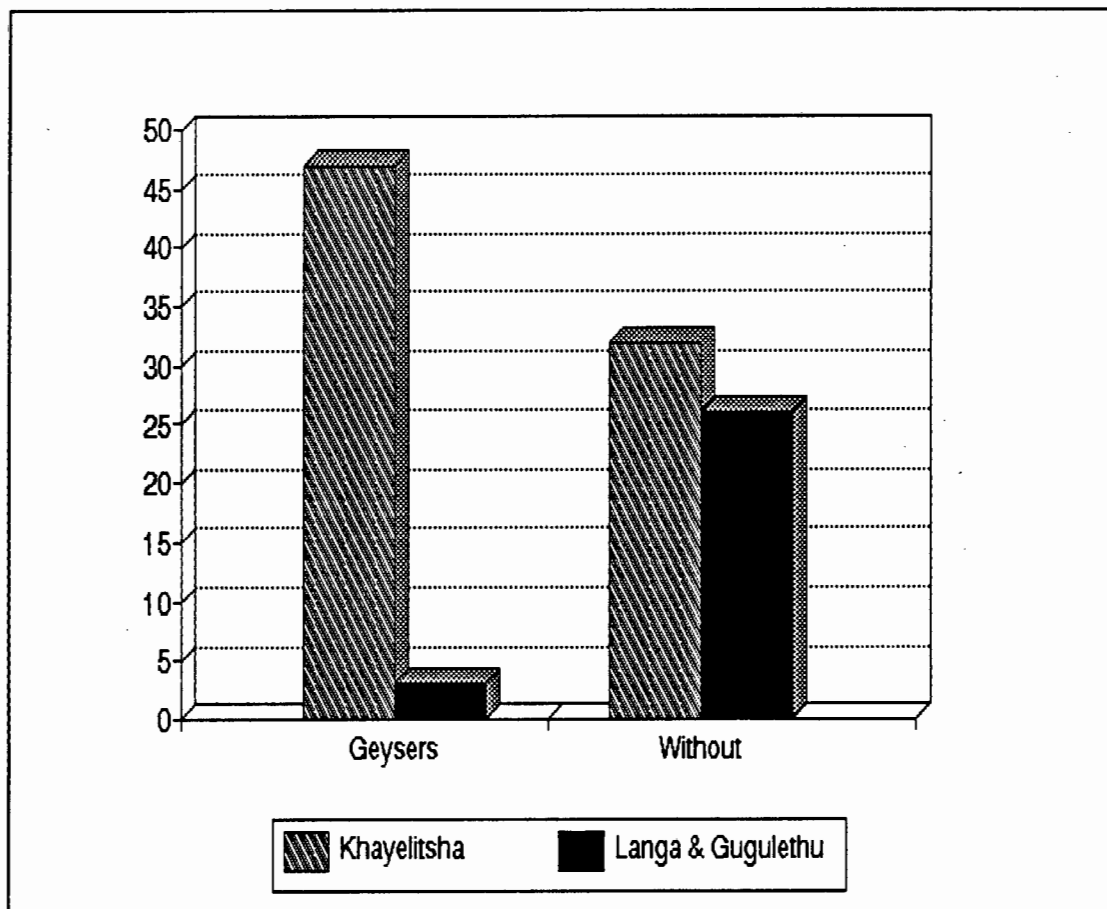


Figure 5.12 Ownership of geysers.

5.4 CONCLUSION

The main points of this chapter are the following:

- Electric lights are used by all households in the survey sample.
- Where electrical appliances are not used, paraffin appliances are more prevalent than gas appliances in Langa and Gugulethu. The reverse is true in Khayelitsha.
- Ownership of electric stoves is much more widespread in Langa and Gugulethu than in Khayelitsha.
- About one-fifth of households in both areas intend to purchase new electric stoves at some time in the future.
- Geysers are only found in newer houses in Khayelitsha.
- Cooking with electricity on a daily basis is well established in most households in Langa and Gugulethu. In Khayelitsha, a wider range of appliances are used for cooking. About half of all households cook primarily with electricity. The rest are evenly spread between electric hot plates, gas and a mix of the three.
- A closer study of those cooking primarily with gas in Khayelitsha showed that the major reason for doing so was the high cost of electric stoves. Three quarters of these households are planning to buy an electric stove in the future.
- On a useful energy basis, electricity was seen to be the cheapest fuel for cooking.

CHAPTER SIX

THE USE OF FUELS

6.1 INTRODUCTION

This chapter examines fuel use in the 108 households sampled in Langa, Gugulethu and Khayelitsha. The fuels examined are electricity, gas, paraffin, wood, coal, car batteries and candles. Information is provided on the following aspects of fuel use:

- The frequency with which each fuel is used.
- The contribution of fuels to energy consumption levels.
- The contribution of fuels to energy costs.

The above information is presented for different groups within the sample. Throughout the chapter comparisons are drawn between households in Khayelitsha and households in Langa and Gugulethu.

6.2 THE FREQUENCY OF FUEL USE

The frequency with which particular fuels are used by all the households sampled is shown in Figure 6.1. The categories specified in the questionnaire were 'daily', 'seldom' and 'never'.

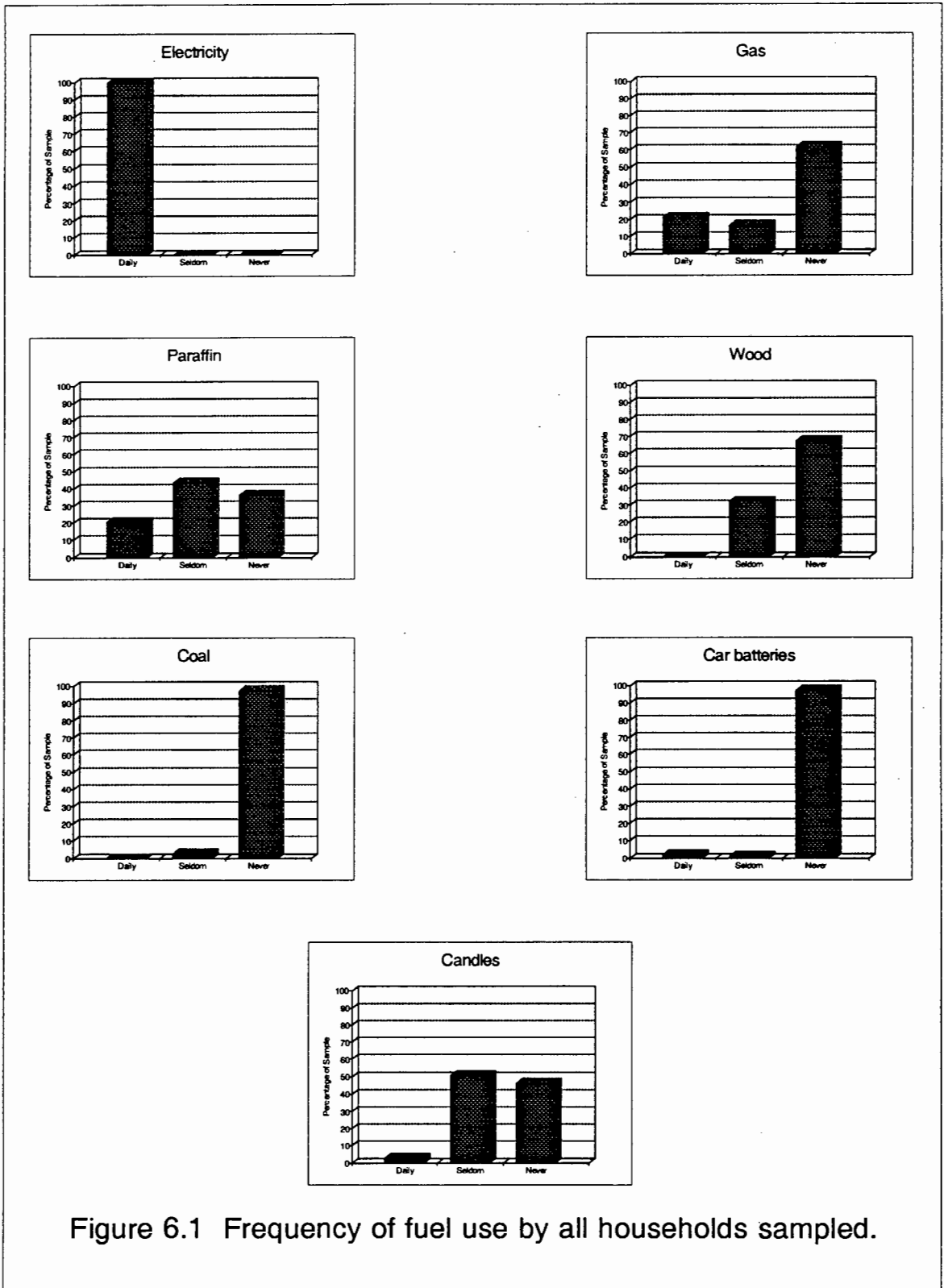


Figure 6.1 Frequency of fuel use by all households sampled.

Electricity is used by 100% of respondents on a daily basis.

Gas is used daily by 20% of respondents, primarily for cooking. 36% of respondents never use gas.

Paraffin is used seldom by 44% of households sampled, and by 20% on a daily basis. Daily users of paraffin are primarily using the fuel for space heating.

Wood is only used seldom, primarily for the preparation of traditional meals, and for braai-ing.

Coal is not used by most respondents. A few respondents use coal for space heating in winter.

Car batteries are used by a very small group of respondents, primarily for powering light appliances.

Candles are used seldom by 51% of respondents, usually in the event of power failures (blackouts). 3% of households sampled use candles daily, primarily in unelectrified backyard shacks.

Figure 6.2 shows the proportions of the sample using combinations of fuels on a daily basis. 67% use only electricity daily. 12% use both electricity and gas daily. 10% use electricity and paraffin daily.

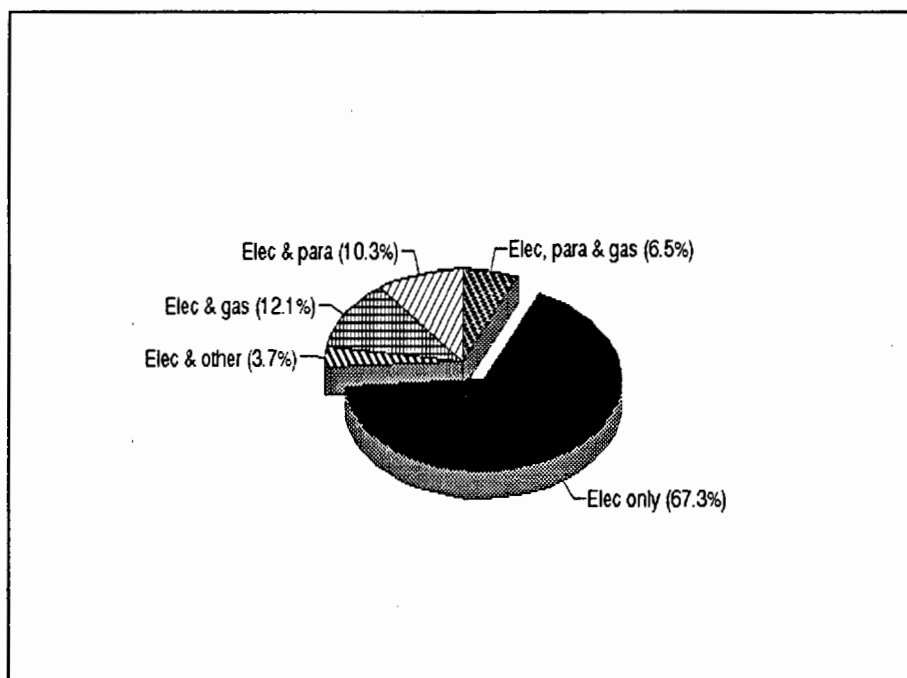


Figure 6.2 Proportion of all samples using fuel combinations daily.

Two thirds of the sample are thus entirely dependant on electricity. The remainder use multiple fuels on a daily basis.

Figure 6.3 compares fuels used daily in Langa and Gugulethu to those used daily in Khayelitsha. Gas is used by 27% of households in the newer area, but by only 7% in the older areas. Conversely, paraffin is used more in the older areas (24%) than in Khayelitsha (18%). Candles are used daily in Langa and Gugulethu only, where backyard shacks are more prevalent.

Figure 6.4 compares combinations of fuels used daily in the two different areas. Sole dependence on electricity in Langa and Gugulethu is higher (72%) than in Khayelitsha (64%). Electricity dependence thus increases with time, as might be expected as households switch to the use of electrical appliances. Nonetheless, the persistence of multiple daily fuel use in the older areas (which have been electrified for many years) is significant.

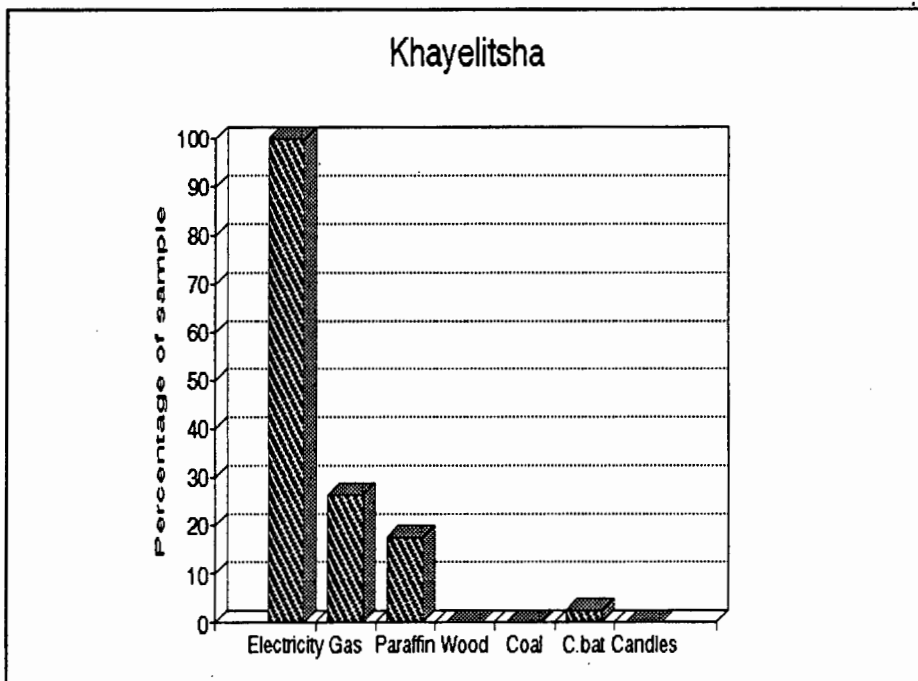
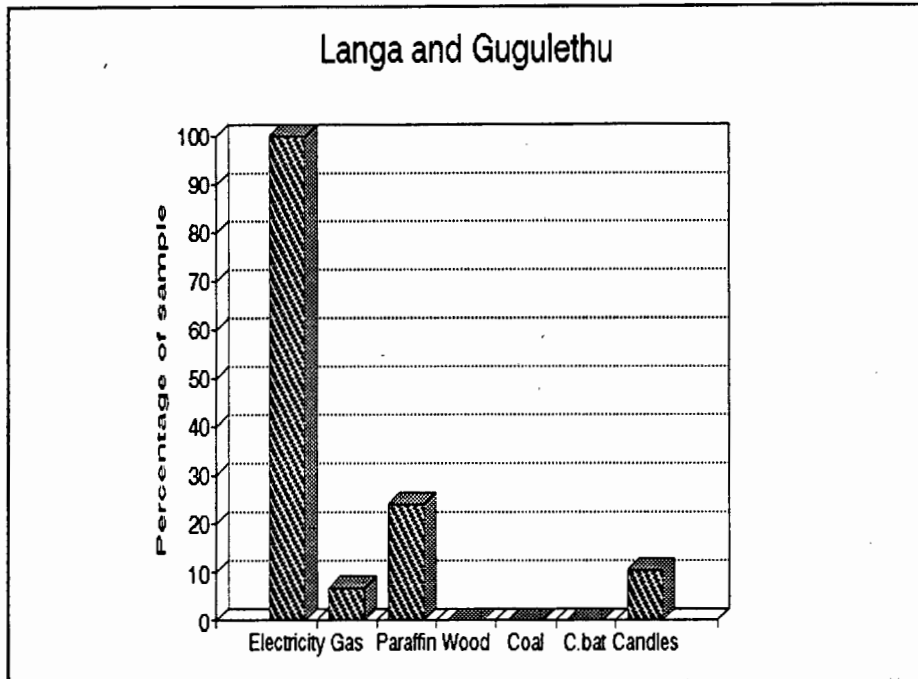


Figure 6.3 Fuels used daily.

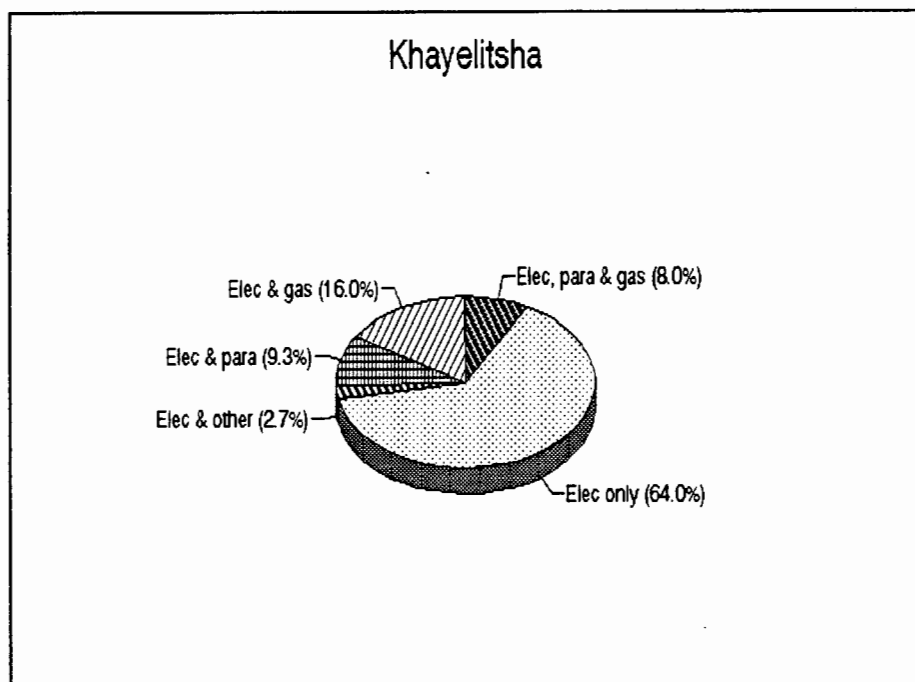
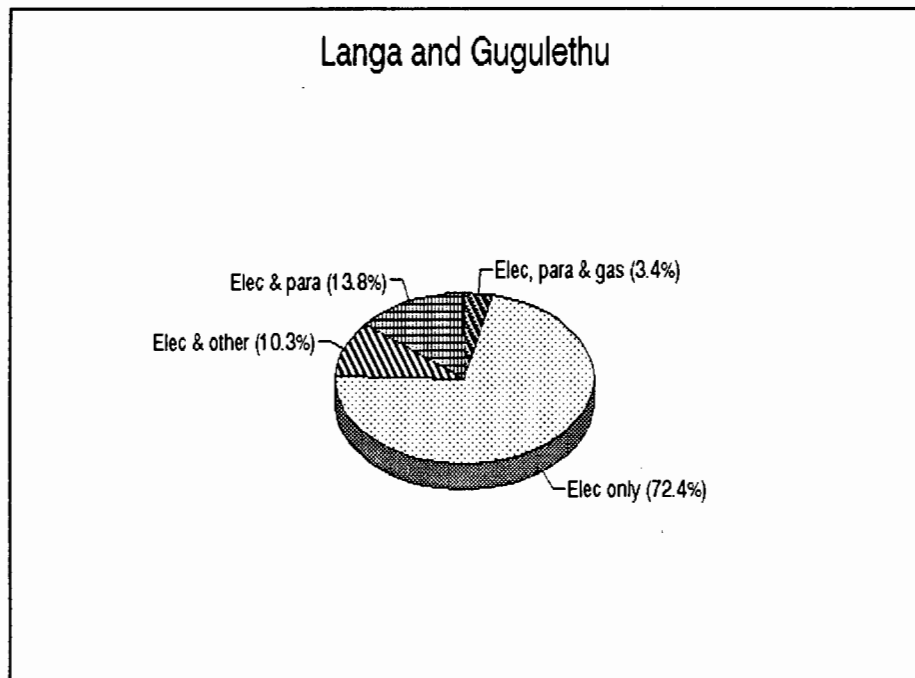


Figure 6.4 Combinations of fuels used daily.

6.3 CONTRIBUTIONS OF FUELS TO ENERGY CONSUMPTION

6.3.1 Net and useful energy consumption

Table 6.1 shows the average monthly consumption of fuels, in physical units, in the households sampled. Electricity consumption data for the households was obtained from distribution authority records. The amount of other fuels consumed was recorded in the survey.

Average monthly electricity consumption in Langa and Gugulethu is significantly higher than in Khayelitsha.

Table 6.1 Monthly consumption of fuels.

Fuel	Units	Whole sample	Langa & Gugulethu	Khayelitsha
Electricity	kWh/month	420.7	631.6	344.0
Gas	kg/month	6.9	2.1	8.8
Paraffin	l/month	16.1	22.4	13.2
Wood	kg/month	3.0	3.5	2.5
Coal	kg/month	0.7	0.3	1.1
Car batt.	charges/month	0.5	0.7	0.4
Candles	packets/month	0.6	0.7	0.6

Figure 6.5 shows the average monthly net energy consumption in the areas sampled.

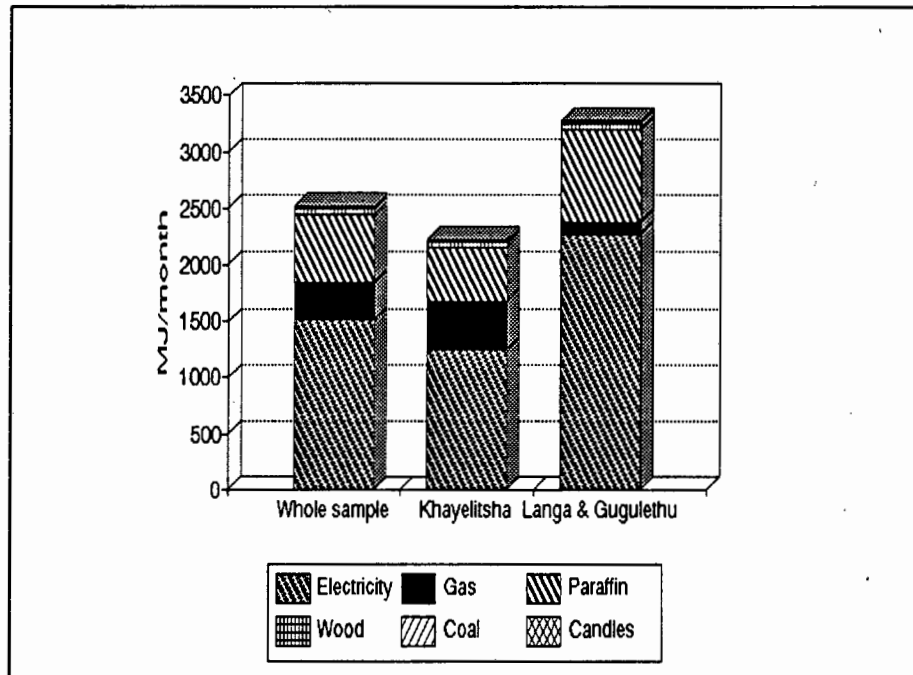


Figure 6.5 Average monthly net energy consumption.

Table 6.2 shows the energy content of each of the fuels. These values were used to translate physical quantities of fuel into the net energy that they contain.

Table 6.2 Energy content of various fuels.

Fuel	Energy content
Electricity	3.6 MJ/kWh
Gas	49 MJ/kg
Paraffin	37 MJ/l
Wood	17 MJ/kg
Coal	27 MJ/kg
Car batteries	1.3 MJ/charge
Candles	20.7 MJ/packet

Sources: Borchers et al (1991); Viljoen(1989)

Net consumption in Langa and Gugulethu is predictably higher (3291 MJ/month) than in Khayelitsha (2241 MJ/month). This is largely due to the higher consumption of electricity and paraffin in the older areas. This offsets the effect of higher gas consumption in Khayelitsha.

Figure 6.6 shows the average monthly useful energy consumption in the areas sampled, and other areas.

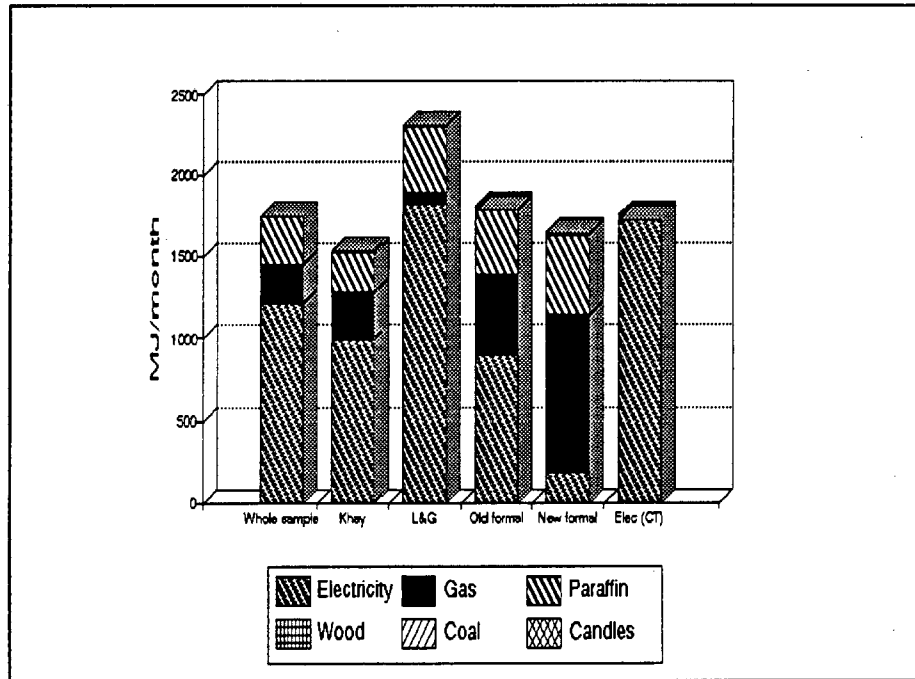


Figure 6.6 Average monthly useful energy consumption.

Table 6.3 shows the conversion efficiencies assumed for appliances using each of the fuels. These values were used to translate net energy used into the useful energy actually derived.

Table 6.3 Conversion efficiencies for various appliances.

Fuel	Conversion efficiency
Electricity	80.0
Gas	70.0
Paraffin	50.0
Wood	10.0
Coal	20.0
Car batteries	80.0
Candles	50.0

Source: Bennett (1977)

Useful consumption in Langa and Gugulethu is once again higher (2323 MJ/month) than in Khayelitsha (1553 MJ/month). This effect is accentuated as a result of the higher conversion efficiency of electrical appliances.

For the purposes of comparison, useful energy consumption data from other sources were also shown on figure 6.6. The 'old formal' group are households in Langa, Gugulethu and Nyanga sampled by Viljoen in 1988 (1989:38). The 'new formal' group are households in Khayelitsha Town 1 and New Crossroads, also sampled by Viljoen. 'Elec (CT)' represents the average household served by the City of Cape Town electricity department.

Useful energy consumption in the 'old formal' sample is lower due to lower electricity consumption levels. Only 49% of households in these areas sampled by Viljoen actually used electricity (Viljoen,1989:77).

Useful energy consumption in the 'new formal' sample is roughly equivalent to that in Khayelitsha. Electricity consumption in the latter sample is substantially higher. This is due to low levels of access to electricity in the areas surveyed by Viljoen. Only 10% of households in the 'new formal' sample actually used electricity (Viljoen,1989:77). Since 1988 access to electricity has increased. The Khayelitsha sample in this project was made up entirely of electrified homes.

Useful energy consumption in an average, electricity dependent household served by the City of Cape Town electricity department is roughly equal to that in the areas surveyed in this project. Average domestic electricity consumption was 612 kWh/month in 1989 (City of Cape Town,1989:4)

6.3.2 Per capita net and useful energy consumption

Figure 6.7 shows the average monthly net and useful per capita energy consumption in the areas surveyed. Average household size for the whole sample was 6.2. In Khayelitsha average households had 4.3 members, compared to 7.7 in Langa and Gugulethu.

It is clear from the figure that household energy consumption is strongly dependent on household size. Energy consumption per household in Langa and Gugulethu is higher than in Khayelitsha, but energy consumption per capita is lower. Higher consumption in the older areas, when measured on a per household basis, is probably due to larger households.

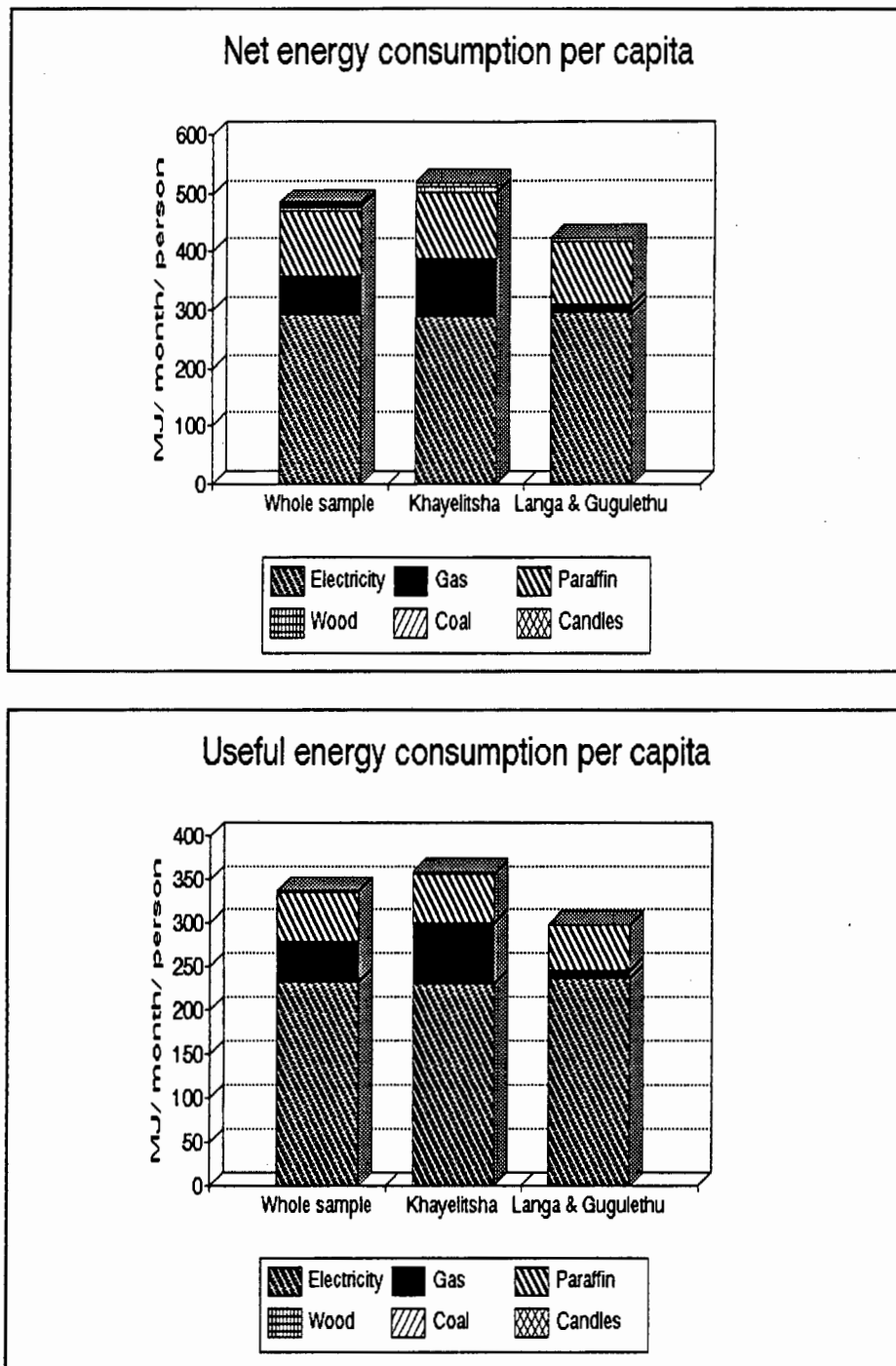


Figure 6.7 Average monthly per capita net and useful energy consumption.

6.3.3 Percentage contribution of fuels to useful energy consumption

Figure 6.8 shows the percentage contribution of the various fuels to useful energy consumption in the areas surveyed. Once again, electricity is seen to be more significant in Langa and Gugulethu than in Khayelitsha.

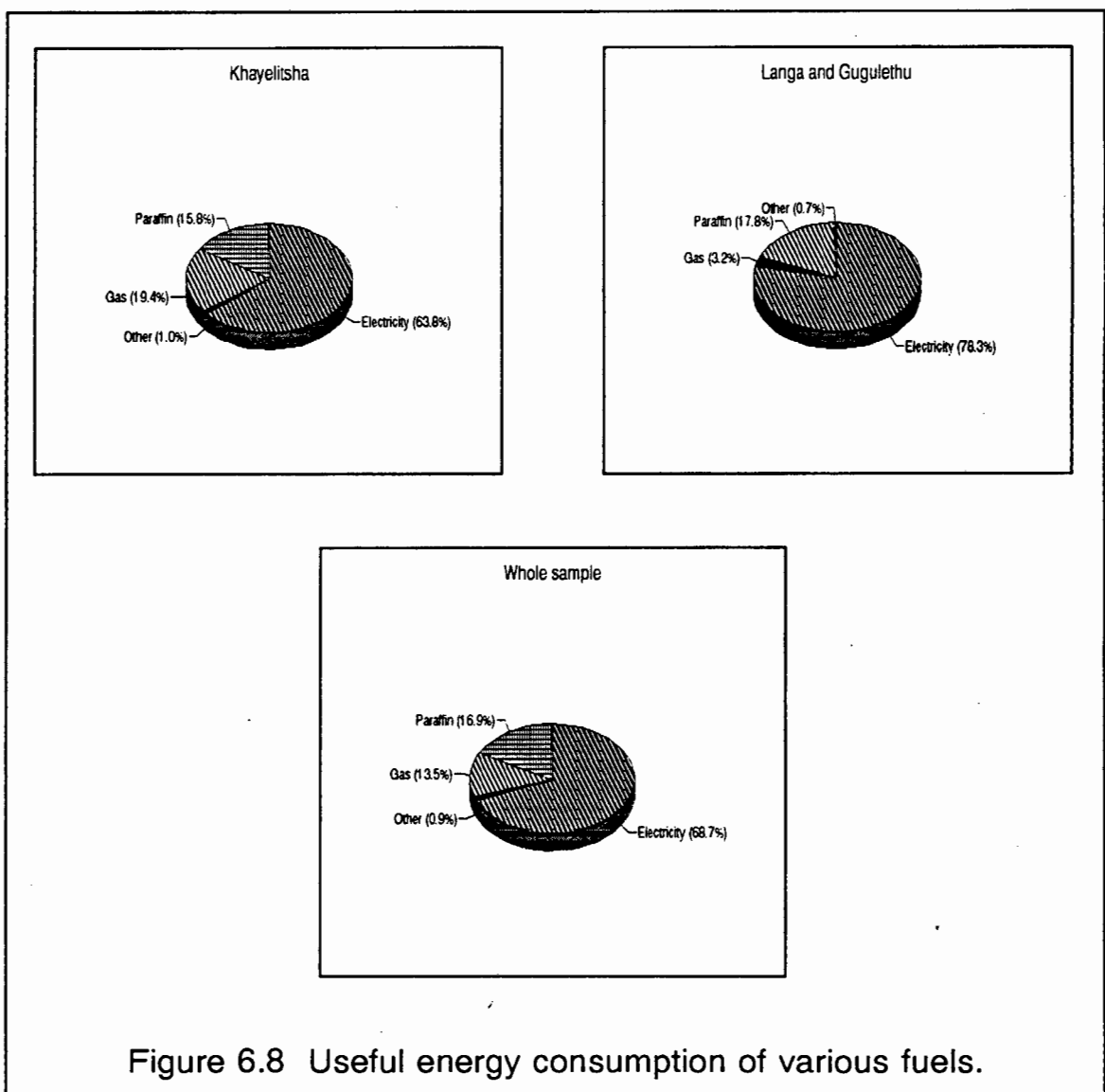


Figure 6.8 Useful energy consumption of various fuels.

6.3.4 Relationships between energy consumption and household income levels

Figure 6.9 provides a breakdown of useful energy consumption in the areas surveyed. In each case, the energy consumption of high income group is significantly higher than the low and mid income groups. Electricity consumption is significantly higher amongst high income households. This effect is particularly marked in Langa and Gugulethu. The high income group has an average useful energy consumption of 4077 MJ/month. This is over double the average useful energy consumption of the mid income group (1993 MJ/month).

On the information presented above it is clear that energy consumption and income are correlated. Households with higher incomes use more energy.

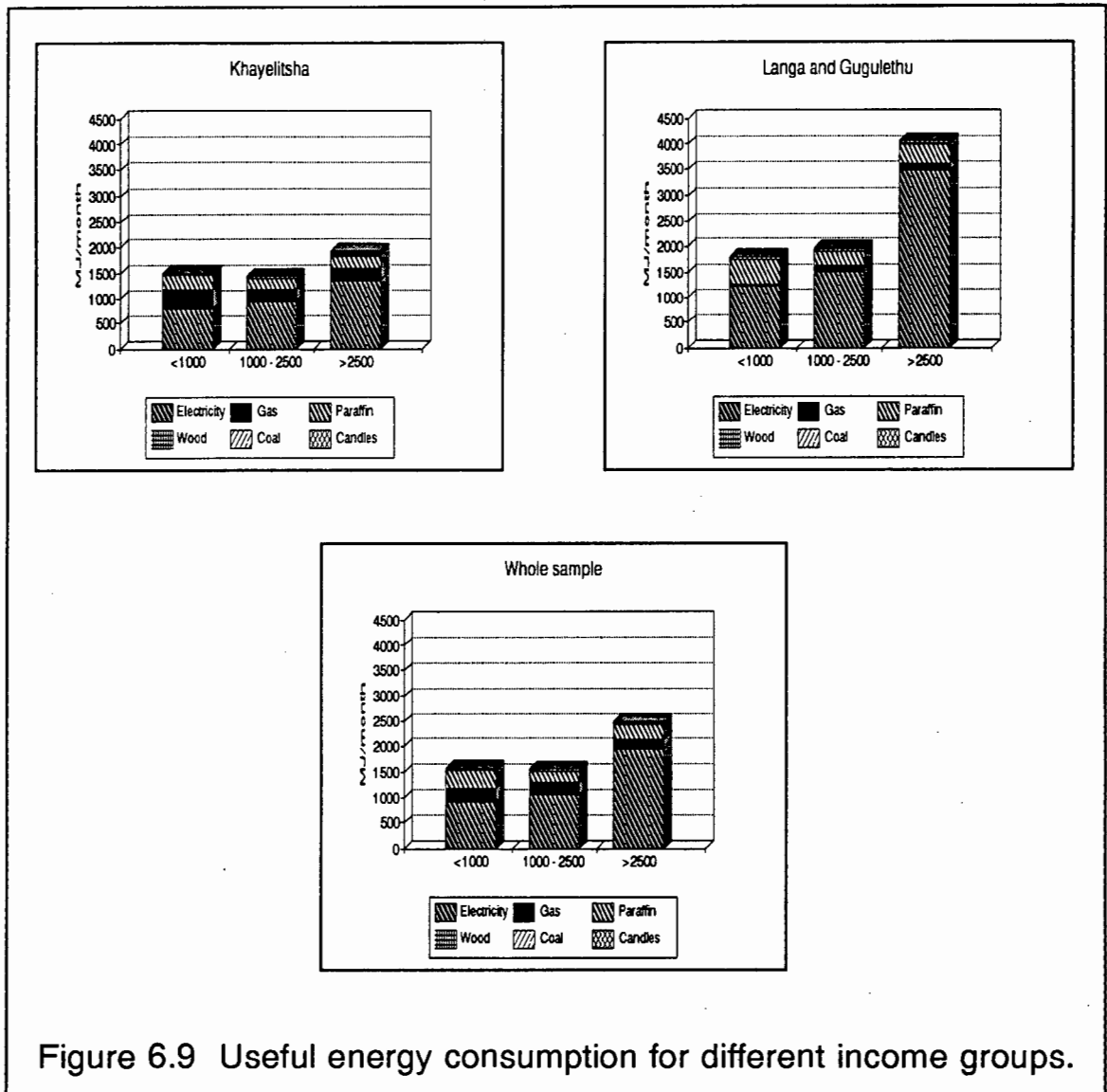


Figure 6.9 Useful energy consumption for different income groups.

6.4 THE COSTS OF FUELS USED

This section examines contribution of different fuels to energy costs. Firstly, fuel prices in Langa and Gugulethu and Khayelitsha are examined. Secondly, average monthly energy costs in the areas surveyed are presented. Thirdly, the relationship between energy costs and income levels is explored. Fourthly, the contributions of fuels to the household energy budget are described. Finally, the significance of energy costs in total household budgets is dealt with.

6.4.1 Fuel prices in the areas surveyed

Table 6.4 shows the average cost of all fuels in the two areas surveyed, in different units. Some of the information here has been repeated from table 5.1. The data presented was arrived at by calculating the mean of costs actually reported by users. Figure 6.10 presents this information graphically.

It is clear that in useful energy terms, electricity is the cheapest fuel in both Khayelitsha, and Langa and Gugulethu.

In useful energy terms, wood coal, car batteries and candles are all very expensive.

Table 6.4 Energy costs.

Fuel	Unit	Khayelitsha	Langa & Gugulethu
PHYSICAL QUANTITIES			
Elec. unit charge	c/kWh	15.00	10.53
Monthly charge	R	0.00	3.00
Ave. elec. cost	c/kWh	15.00	11.20
Gas	R/kg	1.8	2.40
Paraffin	R/l	1.00	1.10
Wood	c/kg	35.0	25.3
Coal	R/kg	1.60	0.9
Car batteries	R/charge	3.20	-
Candles	c/candle	29.5	36.7
NET ENERGY COST			
Electricity	c/MJ	4.2	3.1
Gas	c/MJ	3.8	6.9
Paraffin	c/MJ	2.7	3.0
Wood	c/MJ	5.2	5.8
Coal	c/MJ	6.7	3.2
Car batteries	c/MJ	230.8	-
Candles	c/MJ	8.4	10.3
USEFUL ENERGY COST			
Electricity	c/MJ	5.2	3.9
Gas	c/MJ	5.3	9.9
Paraffin	c/MJ	5.4	6.0
Wood	c/MJ	52.5	57.5
Coal	c/MJ	33.3	15.8
Car batteries	c/MJ	288.5	-
Candles	c/MJ	16.8	20.5

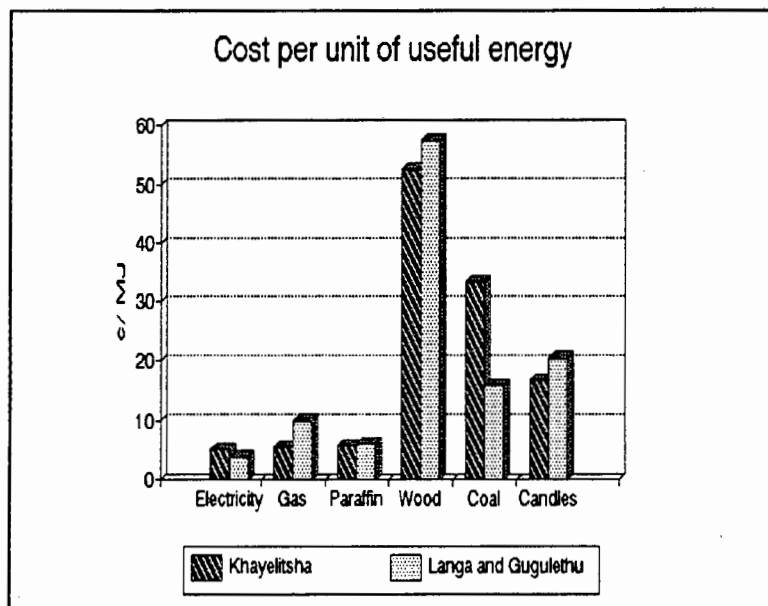
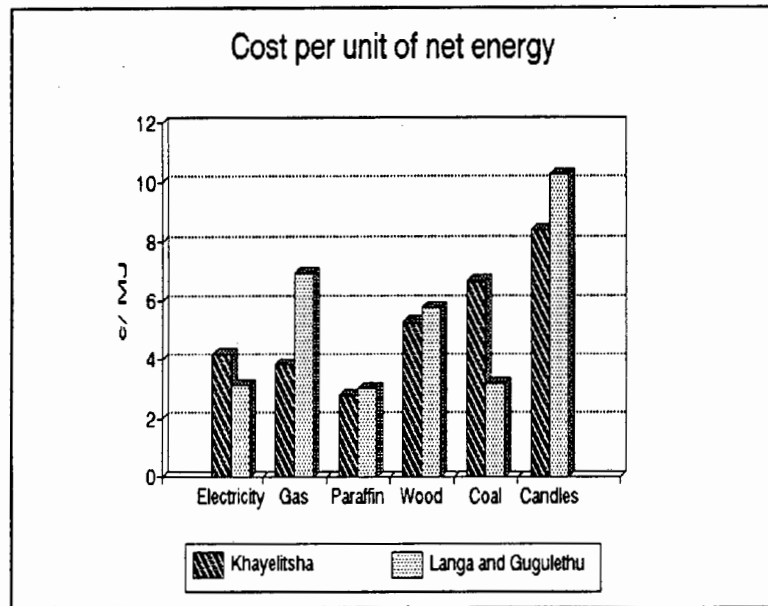
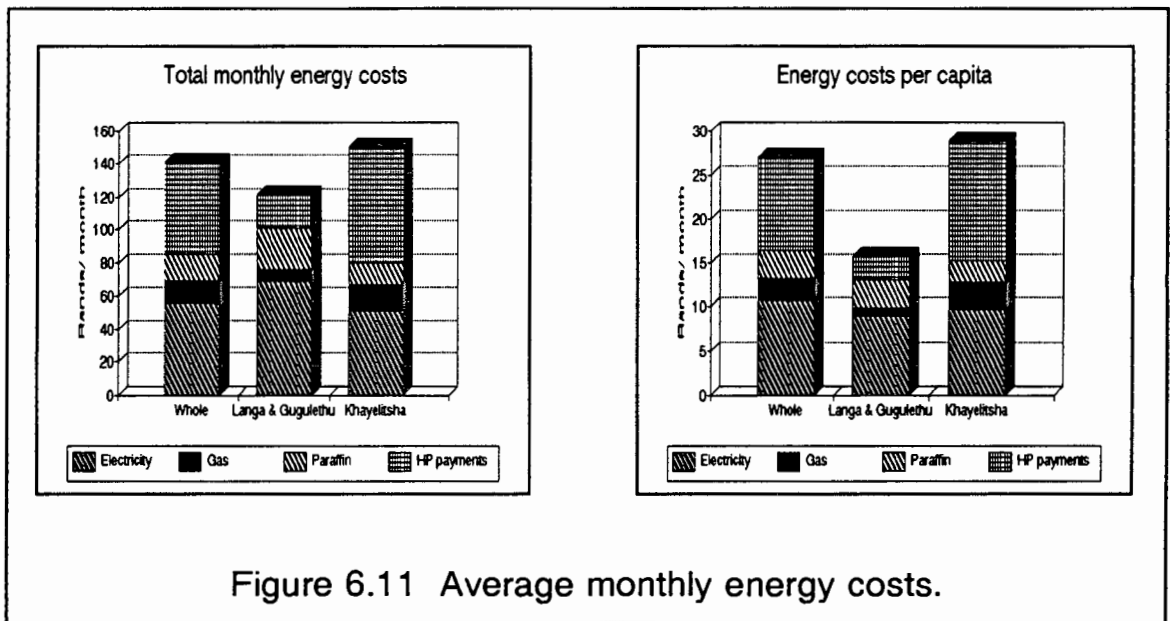


Figure 6.10 Net and useful energy costs.

6.4.2 Average monthly energy costs

Figure 6.11 shows the average monthly energy costs of households in the areas surveyed. Importantly, the costs of hire-purchase (HP) payments for electrical appliances is included in these figures. Costs in Khayelitsha are substantially higher (R151/month) than in Langa and Gugulethu (R122/month). This is primarily due to higher average HP costs (R71/month, as compared to R21/month).



As was shown in chapter four, incomes in Khayelitsha are higher. Electricity is also much newer. Appliance purchase is clearly a priority for residents in these areas.

Figure 6.12 shows the total household energy bill, but excludes HP costs. As a comparison, the monthly energy costs of the average City of Cape Town consumer in 1990, at R67/month is included. The electricity tariff at this time was 10.53 c/kWh, plus a fixed charge of R3.00. Electricity use in Langa and Gugulethu (served by the City of Cape Town) is higher than the average for domestic consumers elsewhere in Cape Town. This is primarily due to the larger households in these areas.

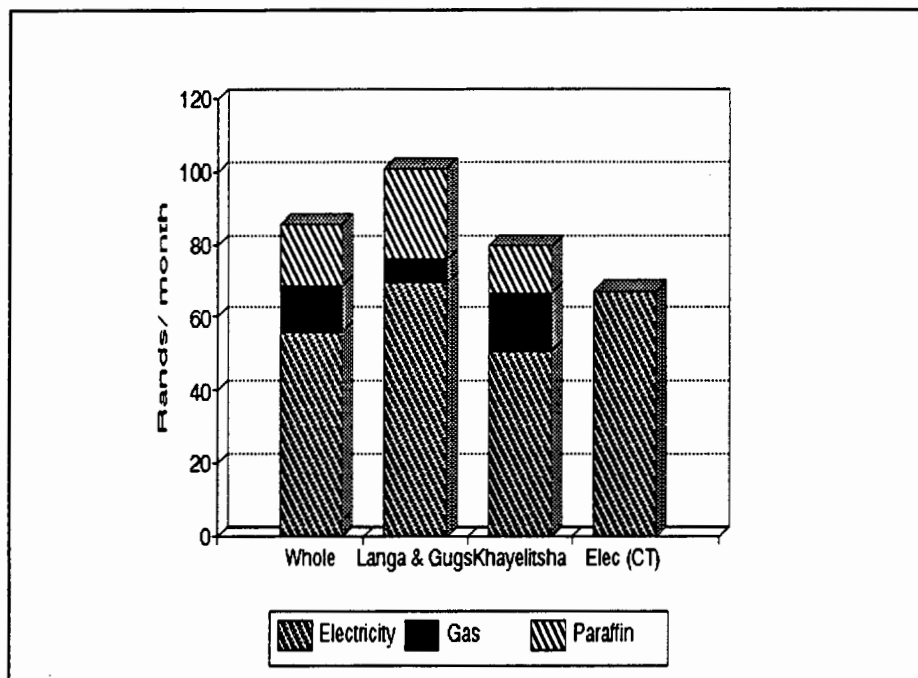


Figure 6.12 Total monthly energy costs (excluding HP costs).

6.4.3 The relationship between household income and energy expenditure

Figure 6.13 shows the average monthly energy costs of households in the areas surveyed, broken down by income group. Again, appliance HP costs are especially significant in Khayelitsha. In Langa and Gugulethu, HP costs are only significant in high income households.

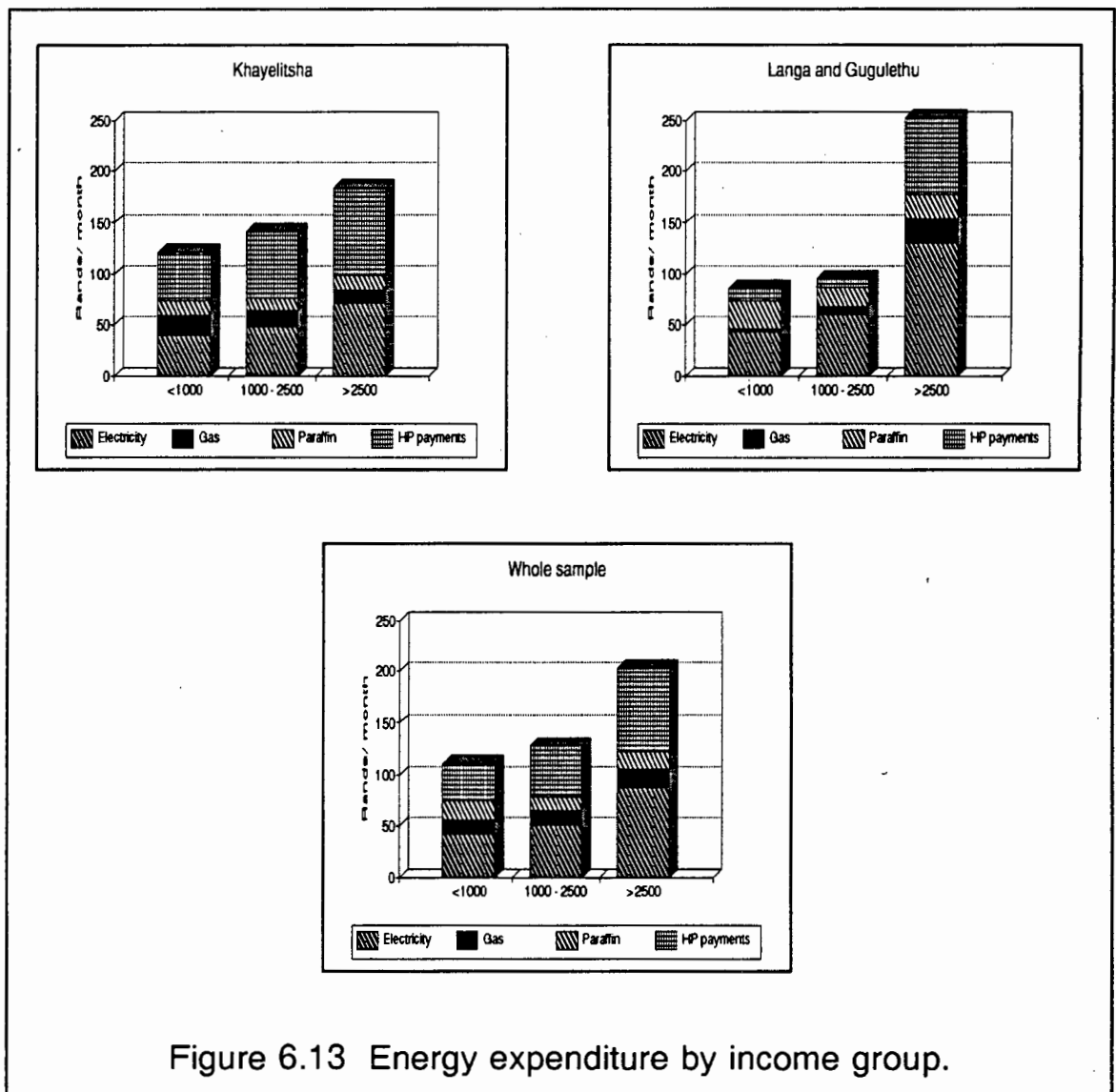


Figure 6.13 Energy expenditure by income group.

6.4.4 Contributions of fuels to household energy budgets

Figure 6.14 shows the contributions of major fuels to the household energy budget in the areas surveyed. Two sets of information are provided, including and excluding appliance HP costs. Once again, the significance of HP costs is seen, particularly in Khayelitsha.

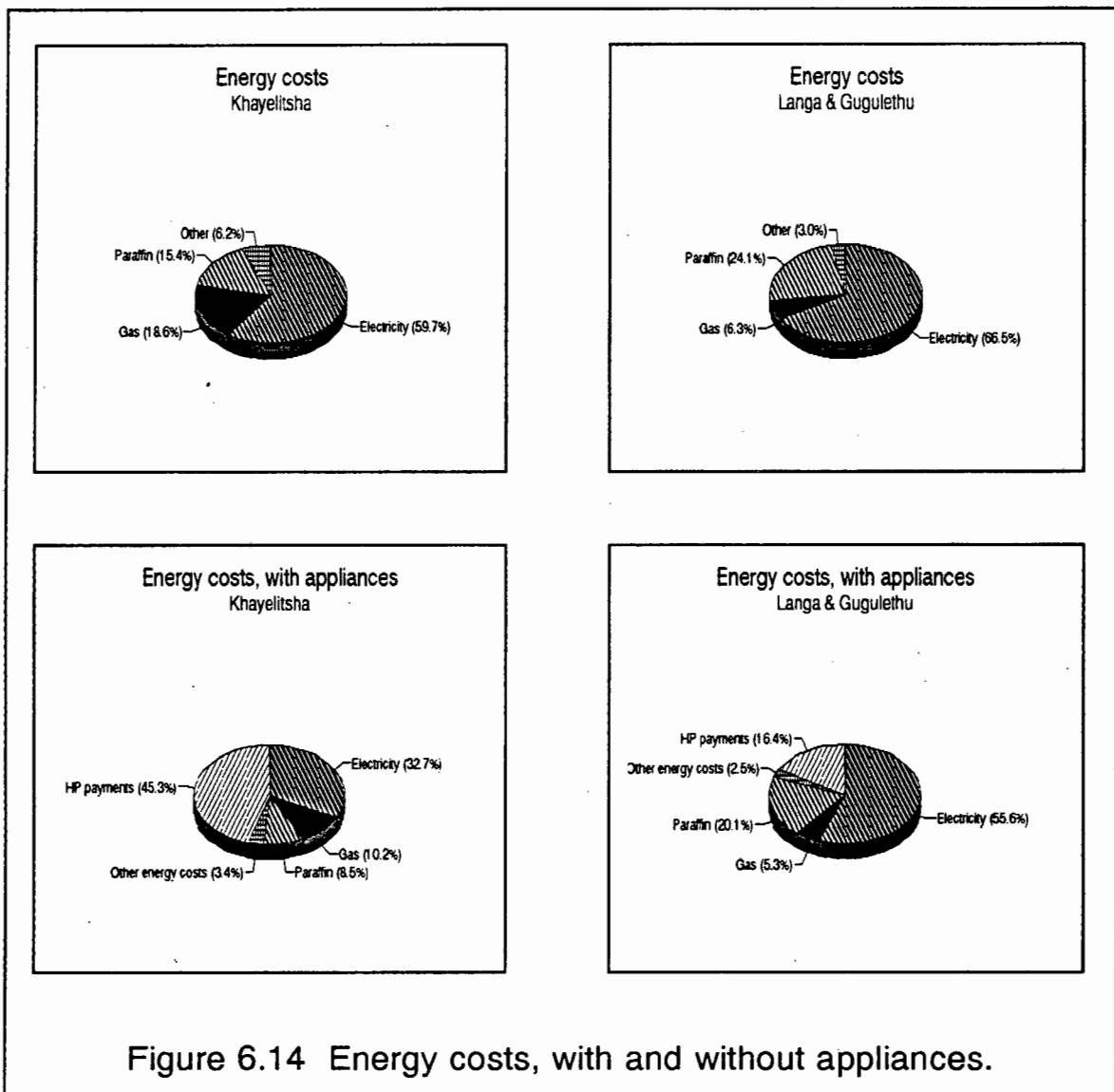


Figure 6.14 Energy costs, with and without appliances.

6.4.5 Energy costs in the household budget

Figure 6.15 shows the significance of monthly energy costs in relation to average monthly household expenditure. The contribution of energy costs to the monthly budget drops as income increases. This is experienced in Khayelitsha, where energy costs fall from 13% of the household budget for those below R1000 per month to 9% for those above R2500 per month. The same is observed in Langa and Gugulethu: 17% for those below R1000 falls to 10% for those above R2500.

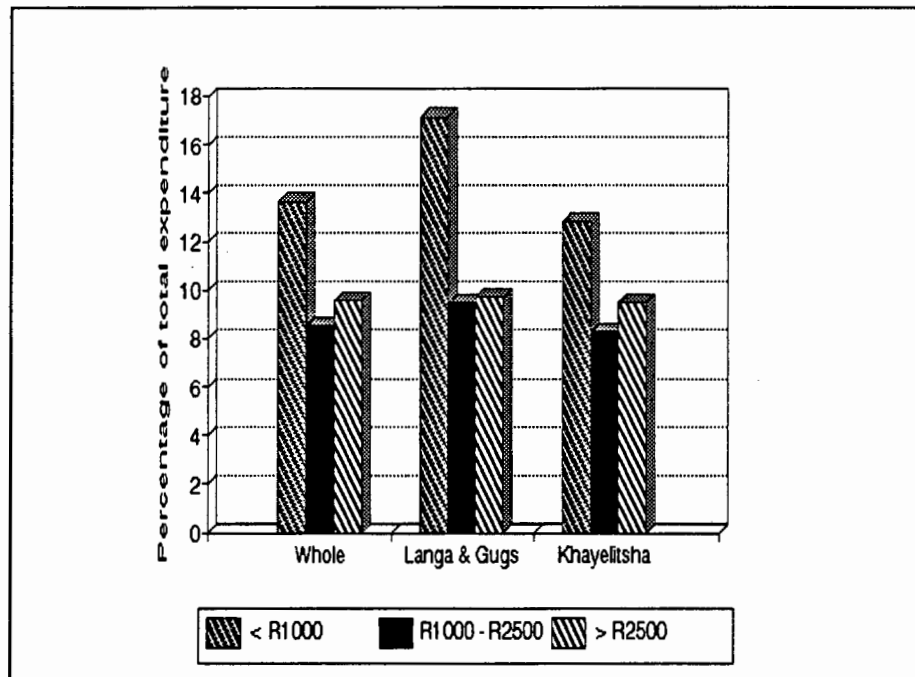


Figure 6.15 Energy costs as a percentage of household budget.

6.5 CONCLUSION

A number of important points have emerged from the information presented and discussed in this chapter. With the regard to the frequency of fuel use these were:

- About one fifth of electrified households in the areas surveyed still use paraffin and gas daily.
- Dependence on electricity - where it is the only fuel used daily - occurs more in the older areas of Langa and Gugulethu.
- Wood and coal are very seldom used by low income households in the Western Cape.

In regard to the contribution of fuels to energy consumption, the main points made were:

- Useful energy consumption in the areas sampled is roughly equal to average useful energy consumption of households in the area of supply of the City of Cape Town electricity department.
- Household electricity consumption in Langa and Gugulethu is significantly higher than in Khayelitsha due primarily to larger households
- Energy consumption is higher in high income households.

In regard to the costs of fuels, the main points were:

- Electricity is the cheapest fuel in both areas on a useful energy basis.
- Hire-purchase payments on electrical appliances contribute significantly

to household energy costs, particularly for newly electrified homes and for higher income groups.

- Energy expenditure makes up between 10 and 20% of total household budgets. The percentage contribution of energy is higher for poorer households.

CHAPTER SEVEN

DETERMINANTS OF ELECTRICITY CONSUMPTION

7.1 INTRODUCTION

This chapter explores the relationship between electricity consumption and a range of key determinants. The reasons for higher levels of consumption are investigated. Relationships between electricity consumption and the following variables are examined:

- Socio-economic factors (household size, household income and business activities)
- Period of access to electricity
- Appliance use for major energy consuming activities

7.2 SOCIO ECONOMIC FACTORS

7.2.1 Household size

Figure 7.1 shows the correlation between electricity consumption and household size in the two areas. No clear correlation exists in either area.

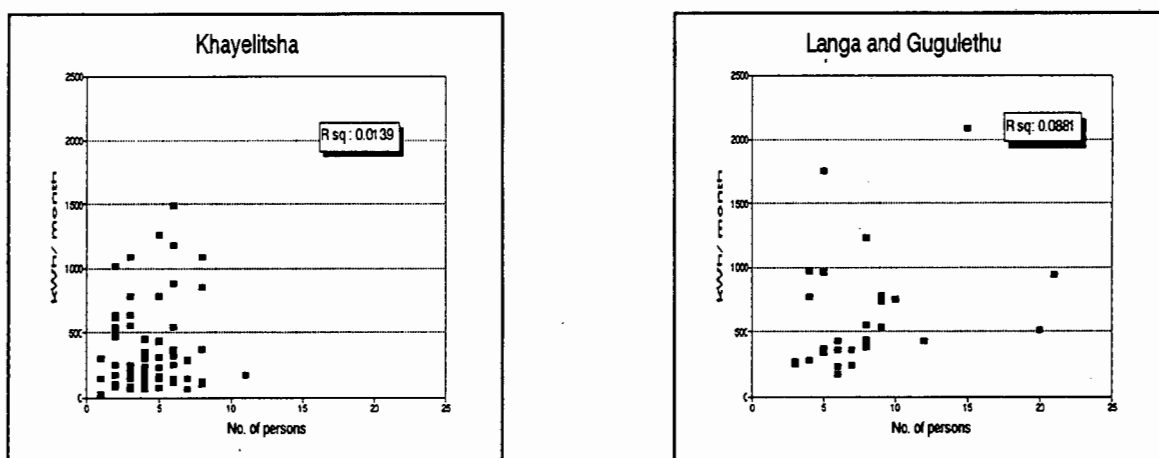


Figure 7.1 Household size.

Figure 7.2 provides a slightly more useful picture. In Khayelitsha, consumption increases marginally as households get larger. Average consumption levels of 342 kWh/month were found for households of 1 to 6 members, and of 350 kWh/month for households of 7 to 12 members. This is not statistically significant.

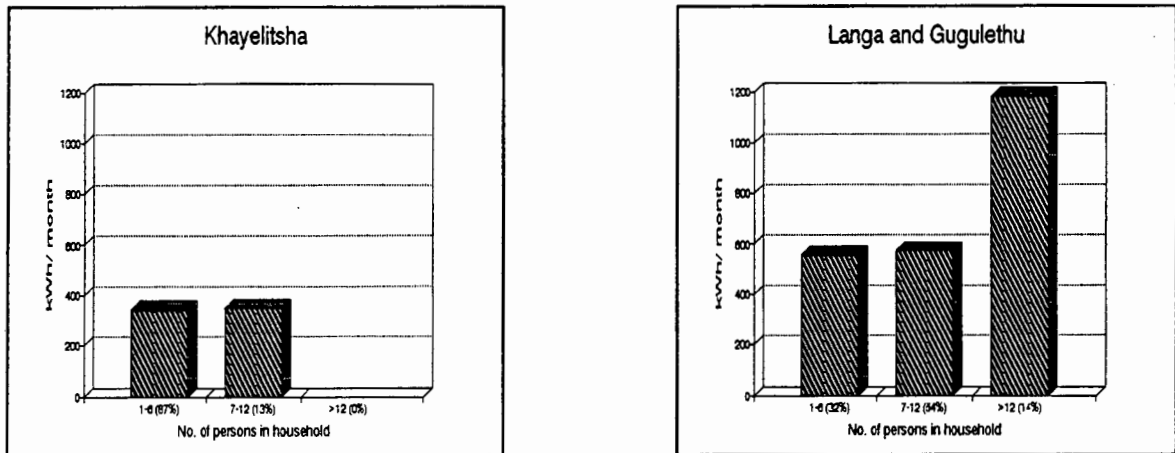


Figure 7.2 Household size.

As shown on table 6.1, the average electricity consumption level of households sampled in Khayelitsha was 344 kWh/month. Average consumption in Langa and Gugulethu was 632 kWh/month.

In Langa and Gugulethu, consumption is significantly higher (at 1187 kWh/month) in very large households. As was noted before, consumption levels are also higher in Langa and Gugulethu, in all groups, than in Khayelitsha.

This information suggests that household size is only a determinant of electricity consumption in significantly larger households. In this study, these larger households were all in Langa and Gugulethu.

7.2.2 Household income

Figure 7.3 shows the correlation between electricity consumption and household income in the two areas. The correlation is weak in Khayelitsha, and fairly good in Langa and Gugulethu.

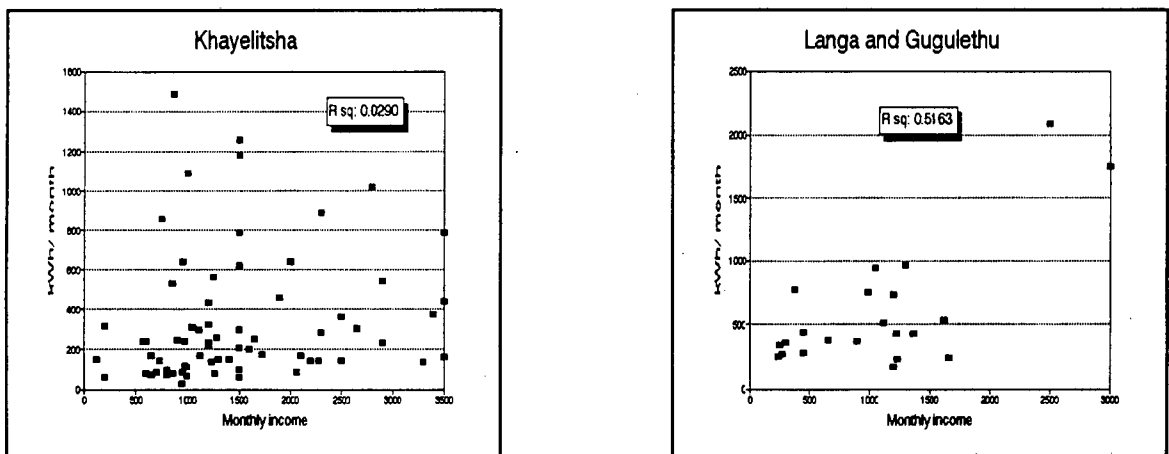


Figure 7.3 Household income.

Figure 7.4 shows the same information, with consumption information averaged over three income ranges. In Khayelitsha, electricity consumption increases from 245 kWh/month to 375 kWh/month, then falls to 368 kWh/month in the ranges shown.

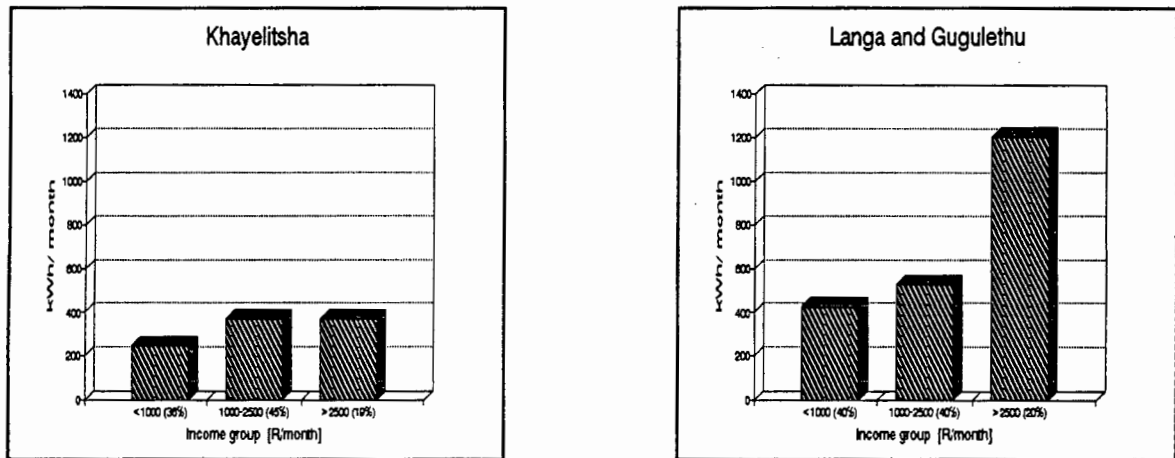


Figure 7.4 Household income group.

In Langa and Gugulethu the situation is clearer. Consumption climbs steadily from 427 kWh/month to 524 kWh/month to 1206 kWh/month.

In order to check whether there was a correlation between household size and income levels in Langa and Gugulethu, a regression analysis was performed on these two variables. The R_{sq} coefficient was found to be 0.0018 – a very weak correlation. The effect of income levels on electricity consumption in Langa and Gugulethu is thus fairly independent of household size.

The foregoing suggests that income is not a strong determinant of electricity consumption. Whilst the correlation in Langa and Gugulethu is reasonable, the Khayelitsha information is less clear.

7.2.3 Business activities

The business activities undertaken by households in the sample were described in chapter four. In this section, business activities were classed in two categories: those for which electricity was actually used, and those for which it was not. For example, the running of a shebeen involves the use of electricity in refrigerators, and would be categorised accordingly. On the other hand a home-based vegetable store would not utilise any additional electricity, and would be categorised as a non-electrical business.

Figure 7.5 shows the effect of business activities on electricity consumption. In Khayelitsha, households not operating a business from home (80% of the sample) used 324 kWh/month. Those operating businesses not specifically using electricity (4% of the sample) used 184 kWh/month. Homes which are used as the premises for an electricity dependant business used 474 kWh/month.

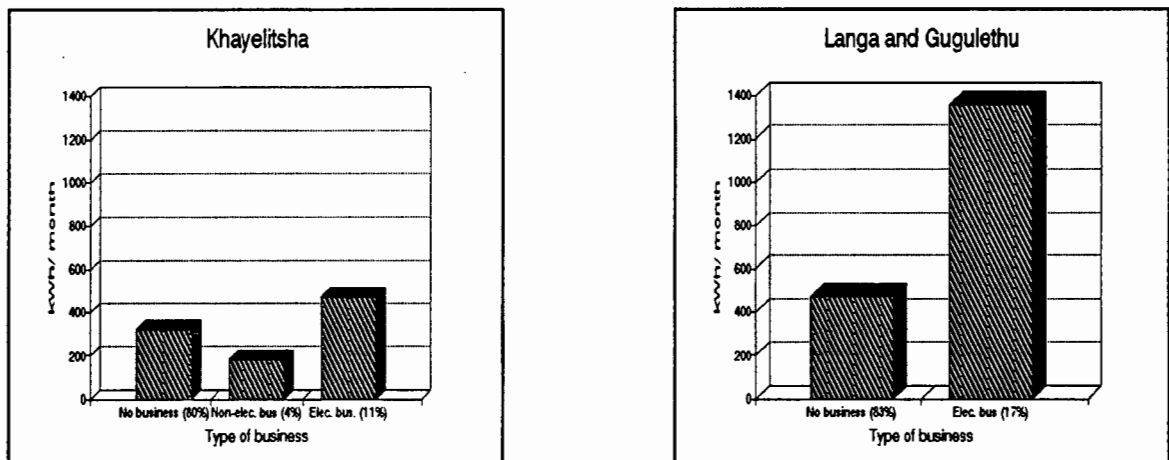


Figure 7.5 Business activity.

In Langa and Gugulethu, consumption of those without businesses (83% of the sample) averaged at 474 kWh/month. Those operating an electricity dependant business (17% of the sample) used 1358 kWh/month. There were no businesses in the area which did not use electricity.

As expected, the operation of a business which uses electricity from home pushes up consumption levels. It should be noted that the consumers in these areas were all residential homes. Only homes were included in the sample selection process.

Only about one fifth of households operate a business from home. Access to electricity may be a necessary, but not a sufficient, condition for such activities. However, it is clear that potential exists for electricity consumption levels to be increased through the provision of support for the formation of home-based micro-enterprises in electrified areas.

7.3 PERIOD OF ACCESS TO ELECTRICITY

The length of time that members of a household have lived in electrified homes can be expected to influence their use of electrical appliances, and hence their levels of electricity consumption. This information was collected in the survey by tracing the movement of each household over the years and ascertaining whether electricity was available at each address recorded.

Figure 7.6 indicates that the correlation between years of access to electricity and electricity consumption is fair in Khayelitsha and poor in Langa and Gugulethu.

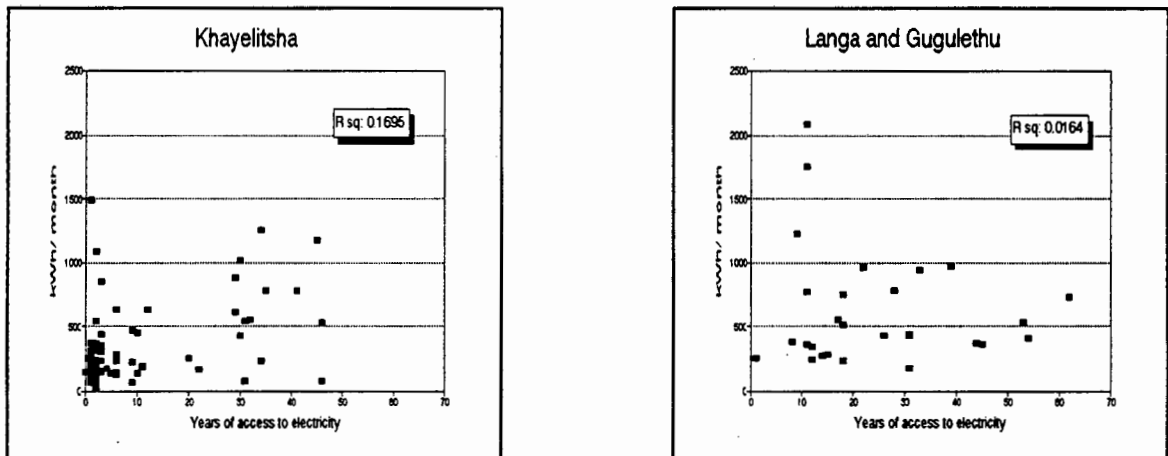


Figure 7.6 Years of access to electricity.

Figure 7.7 provides a more aggregated version of the same information. In Khayelitsha, households broadly fall into two categories: those who have moved into their first electrified home (the 30% and 31% of the sample who have had access to electricity for 5 years or less) and those that have moved into their present homes from other electrified areas (the rest). Electricity consumption in the latter category is predictably higher, at 445 kWh/month.

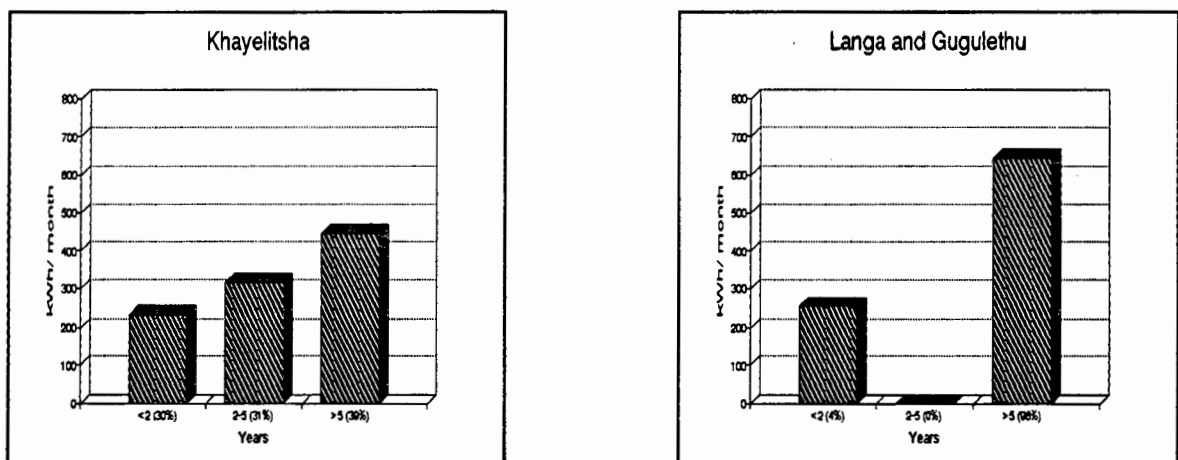


Figure 7.7 Years of access to electricity.

In Langa and Gugulethu, consumption levels are much higher (646 kWh/ month, as compared to 255 kWh/month) for those who have had access for longer. This result is not especially useful, since 96% (or all but one household) of the sample fall into this category.

Another way of illustrating the relationship between electricity consumption and the period of access to electricity is shown in figure 7.8. Using the system data on electricity consumption in Khayelitsha provided by the Lingeletu West City Council, an analysis of consumption by selected users in Town 2 Village 3 was carried out.

It can be assumed that most households in this area have not been exposed to electricity for long. For example, of the 15 households in Town 2 Village 3 included

in the sample, 3 had lived in electrified homes for over thirty years. Another two had had access for 9 years. The remaining 10 households experienced electricity in the home for the first time when moving into these premises.

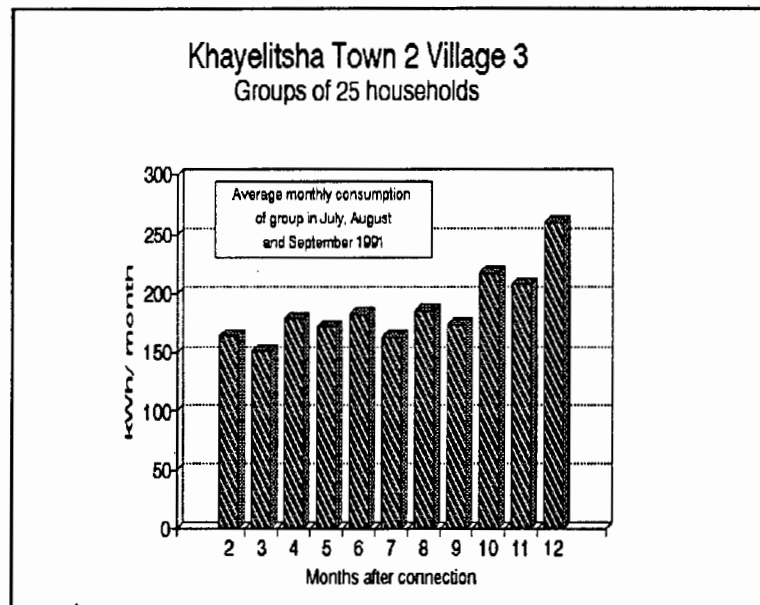


Figure 7.8 Period of access to electricity.

Of the 2024 consumers in the area, groups of 25 connected each month from August 1990 through to June 1991 were assembled. The average consumption in the three months of July, August and September 1991 was then calculated for each consumer group. The result is a discernably upward trend in consumption as a function of the number of months after connection. The increase over the first year was approximately 60%: up from 162 kWh/month to 259 kWh/month.

Further data collection to monitor the development of this trend would be useful.

The implication of the above information is that electricity consumption can be expected to increase as the period over which households have had access to electricity increases.

7.4 APPLIANCE USE

7.4.1 Primary cooking appliances

Figure 7.9 shows the relationship between electricity consumption and the use by households of different primary cooking fuels and appliances. These categories of users were identified in chapter five.

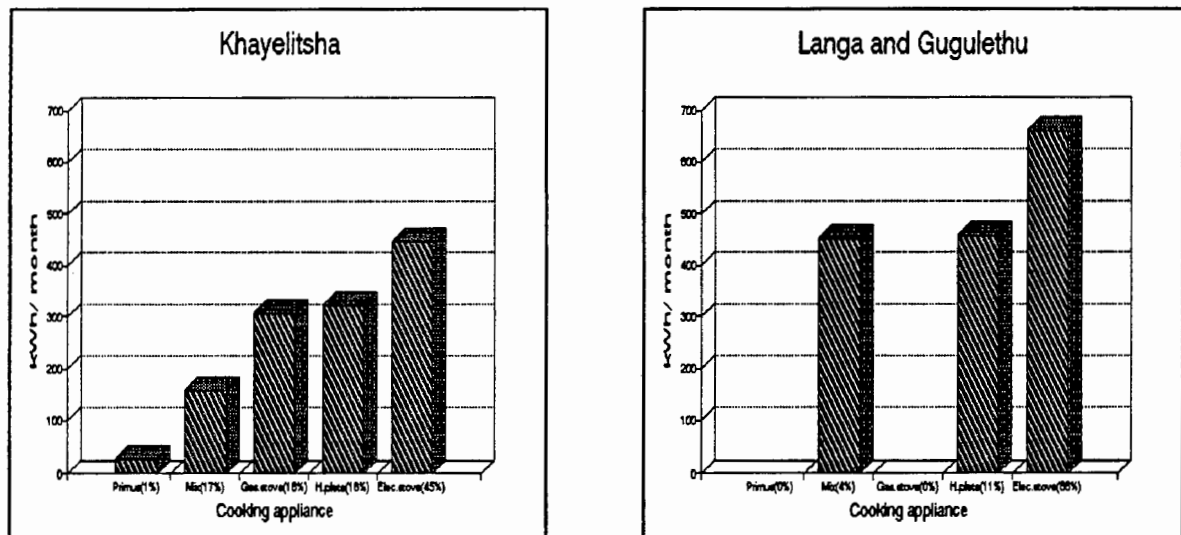


Figure 7.9 Total electricity consumption for households using various cooking appliances

In Khayelitsha, electricity consumption is significantly higher (445 kWh/month) amongst those households (45% of the sample) using electric stoves for daily cooking. Households using gas and hot plates daily (18% of the sample each) used 307 and 323 kWh/month respectively.

The yearly average in the sample in Khayelitsha was 344 kWh/month. Consumption levels of those cooking with electric stoves were 29% above the average. Levels of those cooking with gas, and those cooking with hot plates, were 11% and 6% below the average respectively.

In Langa and Gugulethu, where electric stove use is more prevalent (86% of the sample), electricity consumption in this category is also notably higher than other categories at 661 kWh/month.

These findings confirm the importance of electric stoves in contributing to higher household electricity consumption levels.

Electric hot plates do not have a very significant effect on electricity consumption. Those using them daily for cooking had consumption levels only 5% higher than those cooking daily with gas.

7.4.2 Water heating appliances

Figure 7.10 displays the relationship between electricity consumption and appliance use for water heating. Geyser users in Khayelitsha (58% of that sample) and in Langa and Gugulethu (10%), use significantly more electricity than other categories.

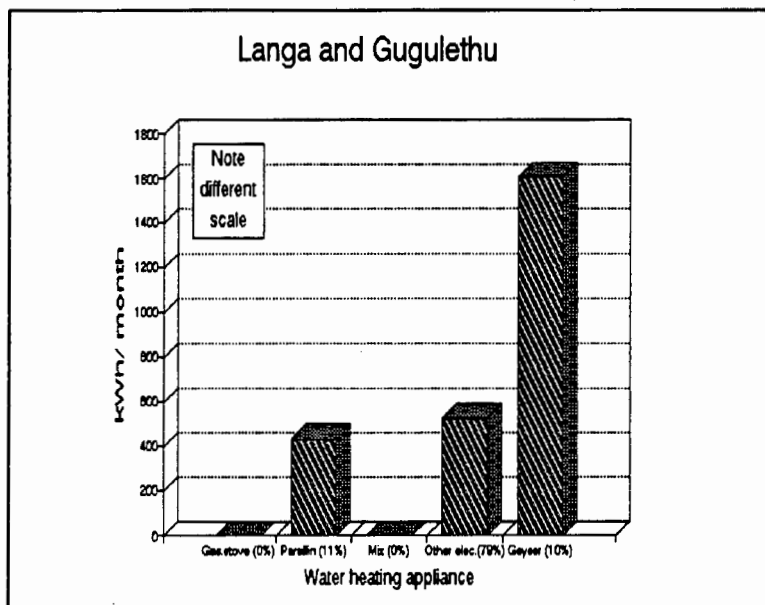
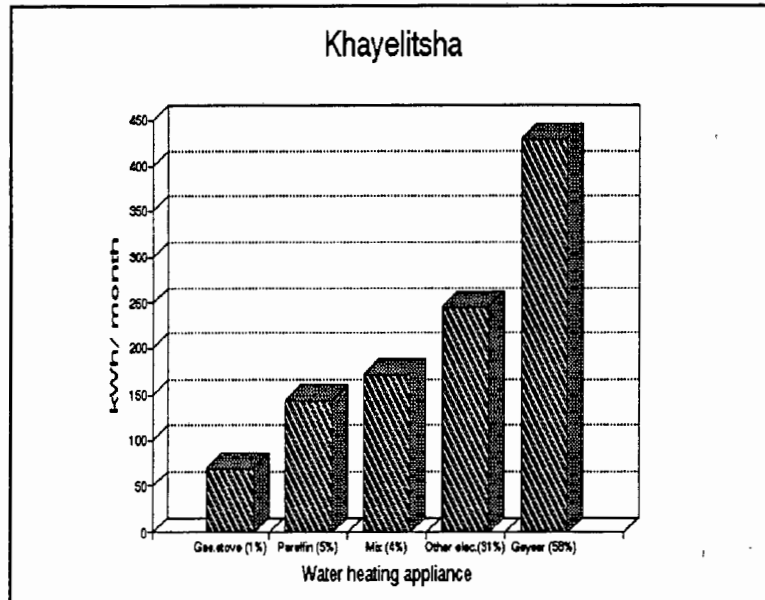


Figure 7.10 Total electricity consumption for households using various water heating appliances.

From figures 7.9 and 7.10, it is not possible to determine whether there is any overlap between those with geysers and those with electric stoves. The entire sample was thus dis-aggregated into four groups: those with neither geysers nor stoves; those with a geyser only; those with a stove only; and those with both.

Figure 7.11 shows the different average levels of electricity consumption for these groups of households. The geysers only group has an average consumption level of 339 kWh/ month. The stoves only group has a level of 448 kWh/ month. The 'both' group has a level of 649 kWh/ month. Thus it would appear that using an electric stove is more likely to lead to higher electricity consumption levels than owning a geyser.

Within the group that has stoves, geysers increase consumption by 45% (from 448 kWh/month to 649 kWh/month).

Within the group that does not have stoves, geysers increase consumption by 66% (from 204 kWh/month to 339 kWh/month).

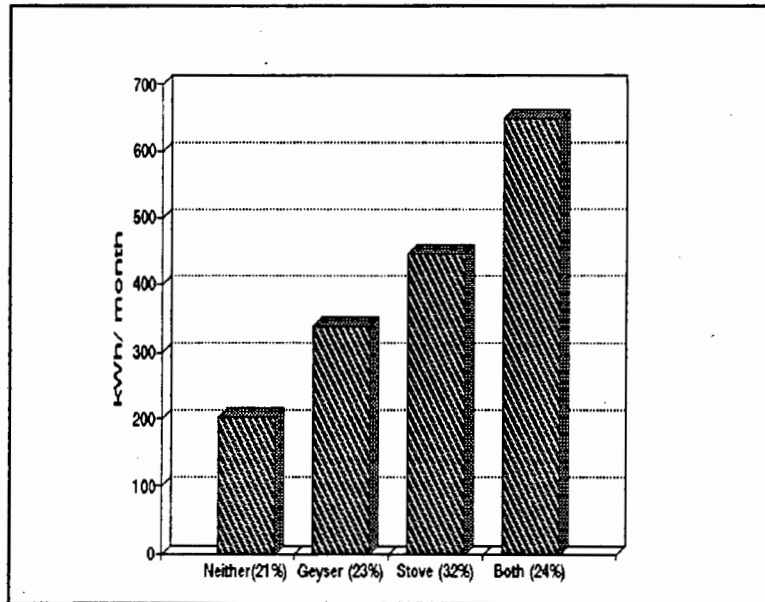


Figure 7.11 Total electricity consumption for households using various stoves and/ or geysers.

7.4.3 Space heating appliances

Figure 7.12 provides similar information on electricity consumption levels of households using particular sorts of space heating appliances. Users of electric heaters (bar heaters, and other types) use more electricity than paraffin heater users in Khayelitsha (443 kWh/month, as compared to 259 kWh/month). The difference is more pronounced in Langa and Gugulethu (777 kWh/month, as compared to 535 kWh/month).

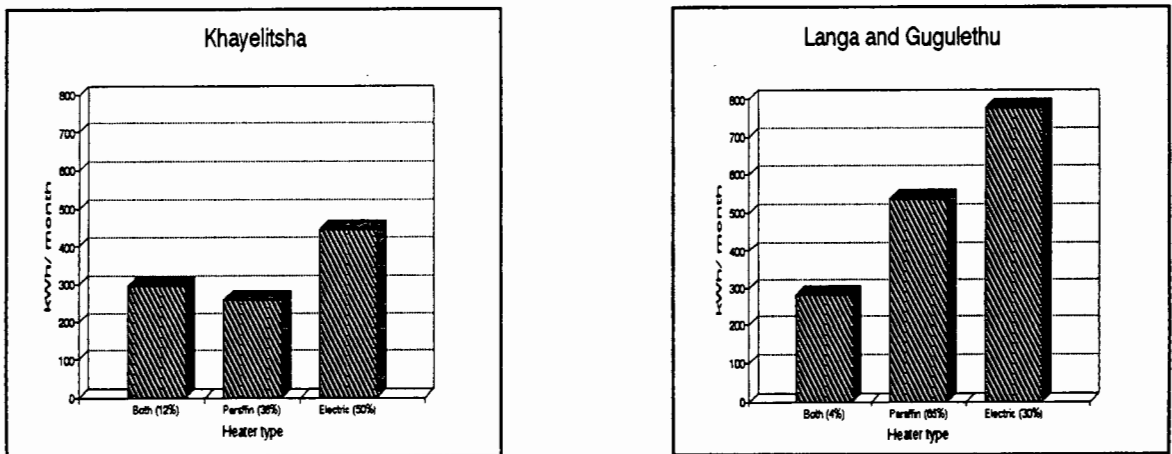


Figure 7.12 Total electricity consumption for households using various space heating appliances.

7.5 CONCLUSION

The main conclusions reached in this chapter are the following:

- In both areas, electricity consumption increases as household size increases. Households are larger in older areas (Langa and Gugulethu and Khayelitsha Town 1) due to the construction of backyard shacks.
- Household income is not clearly a determinant of electricity consumption, although a reasonable correlation between the two were found in the Langa and Gugulethu sample.
- Business activities which are carried on from the home increase electricity consumption considerably. In the two areas studied, about one fifth of households engage in some type of economic activity from home.
- Electricity consumption increases with the period that households have access to electricity. This effect is particularly noticeable in new areas of Khayelitsha. In Town 2 Village 3, consumption of households connected for a year were 60% higher than those connected for only two months.
- Daily use of electric stoves significantly increases electricity consumption levels. In the sample in Khayelitsha, daily stove users had consumption levels of 445 kWh/month. This was one third above the average for the whole sample.
- Electric hot plates do not have a very significant effect on total monthly electricity consumption.
- Geysers increase total electricity usage appreciably. Households in both areas with geysers have consumption levels about 50% higher than those without.

CHAPTER EIGHT

ATTITUDES OF CONSUMERS IN LOW INCOME AREAS TO ELECTRICITY

8.1 INTRODUCTION

This chapter presents information on the attitudes and perceptions of households in the areas surveyed toward aspects of the electricity service that they receive. Included are:

- Attitudes towards the quality of supply, and the distribution authority.
- Perceptions of the affordability of electricity
- Attitudes towards supply technologies (area lighting and metering systems)

8.2 ATTITUDES TO ELECTRICITY SUPPLY

8.2.1 Perceptions of the quality of supply

Figure 8.1 shows the perception of households as to the frequency of electricity blackouts. In some areas, like Khayelitsha Town 2 Village 4a, the supply network is more reliable. Problems have clearly been experienced in Bongweni, where 80% of households described blackouts as occurring often. Reliability in Town 1, and in Langa and Gugulethu is also perceived to be low.

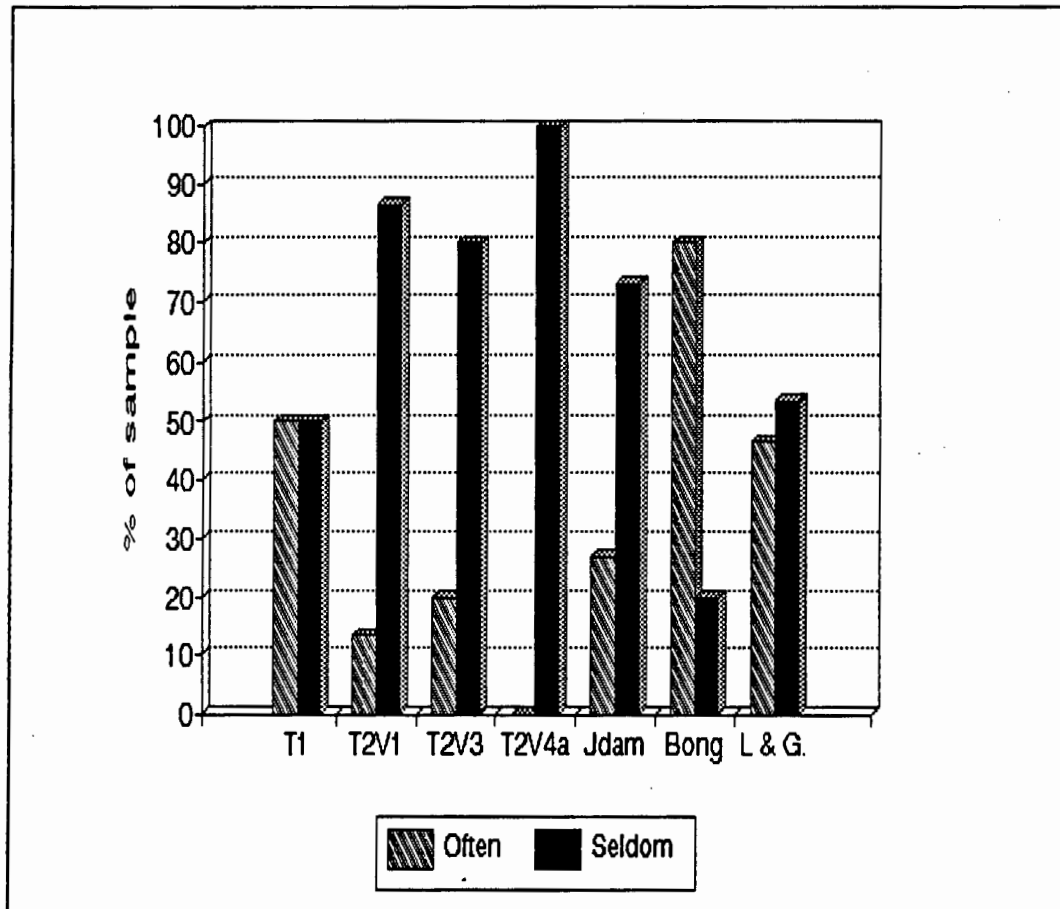


Figure 8.1 Frequency of blackouts.

Low levels of reliability prevent households from being dependant on electricity for key activities such as cooking. As was found in chapter five, many households own gas and paraffin stoves for use in case of a blackout. For example, 47% of those surveyed in Khayelitsha own gas stoves, but only 18% of households use them as the primary appliance for cooking on a daily basis.

8.2.2 Perceptions of the distribution authority

Figure 8.2 shows the percentage of households in each area that have had occasion to call their distribution authority to report a problem with their electricity supply. Very high percentages are shown in some areas, particularly in the older areas of Khayelitsha. In many cases call outs were to report malfunctioning pre-payment meters.

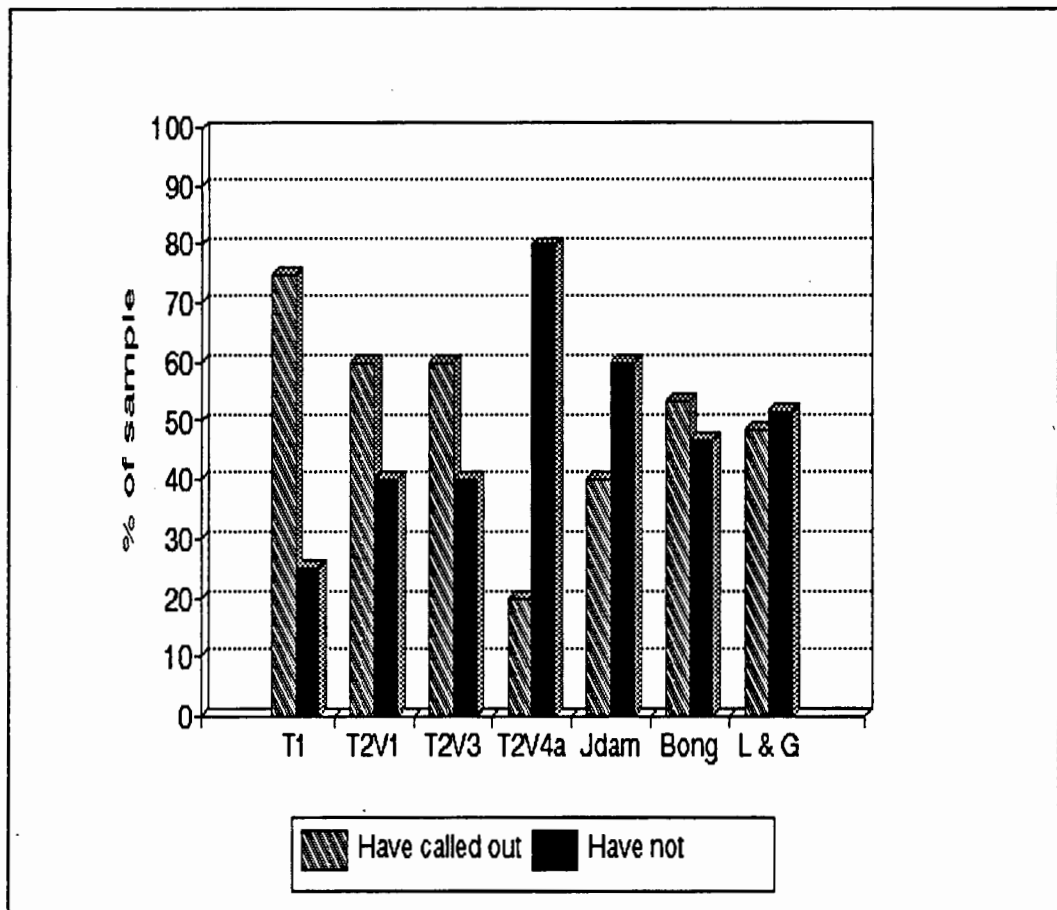


Figure 8.2 Electricity department call outs.

Figure 8.3 shows the perception of households that did have occasion to call their distribution authority, as to their responsiveness. Most households appear to have been satisfied with the service received.

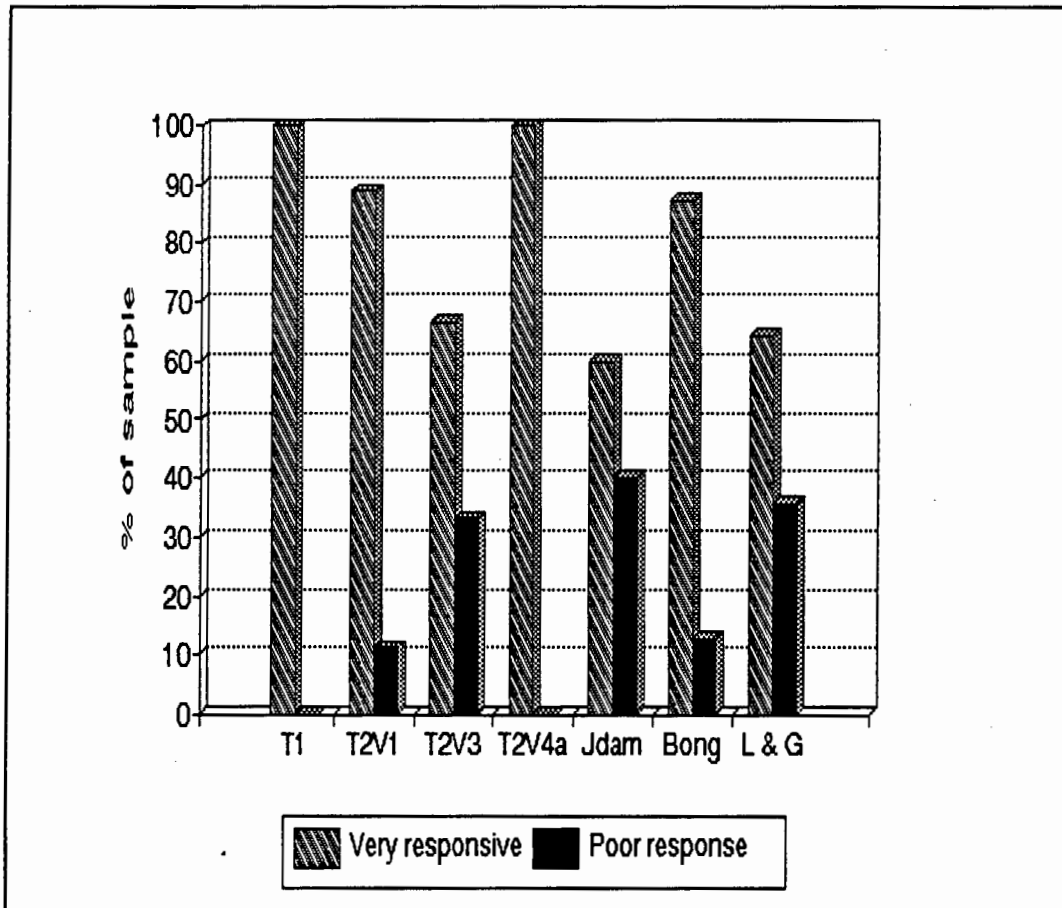


Figure 8.3 Electricity department responsiveness.

8.3 PERCEPTIONS OF THE AFFORDABILITY OF ELECTRICITY

Figure 8.4 indicates responses to the question: "is electricity affordable?", in different areas of Khayelitsha, and in Langa and Gugulethu. The question begs a subjective response. Perceptions that electricity is unaffordable are more prevalent in Jonkersdam, Bongweni, Langa and Gugulethu. These are all areas where credit meters are installed in households. As explained in chapter three, many households in these areas are deeply in arrears.

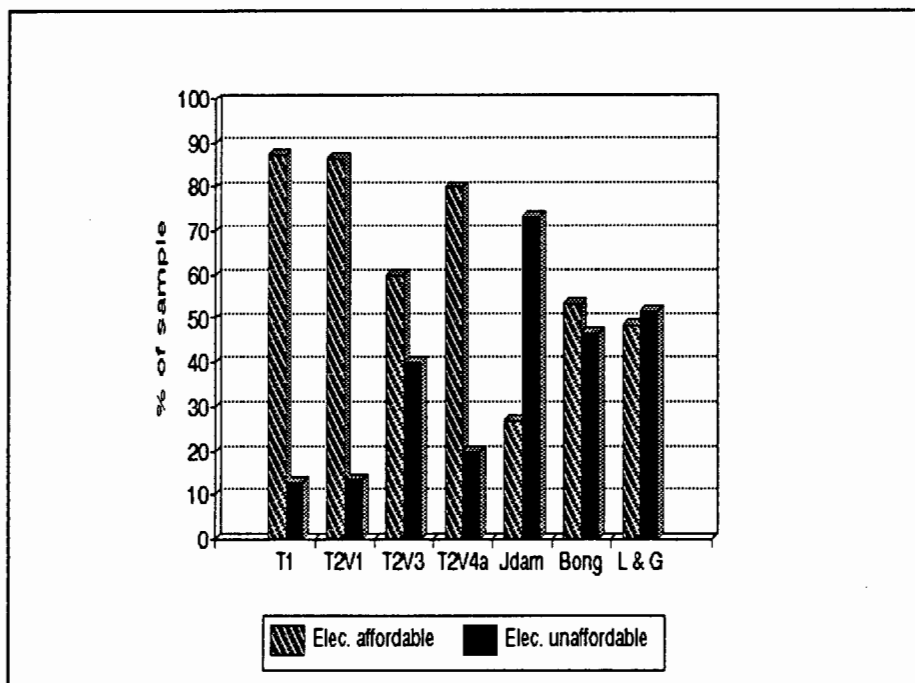


Figure 8.4 Affordability of electricity.

8.4 ATTITUDES TO SUPPLY TECHNOLOGIES

8.4.1 Area lighting systems

Area lighting in Khayelitsha Town 1 and 2 is provided by high-mast lights. In Langa and Gugulethu, and in Jonkersdam and Bongweni, area lighting is provided by standard street lights.

In figure 8.5, attitudes towards high-mast lights are recorded. Only 14% of respondents in areas with high-mast lights dislike them. The primary reasons for liking them are the fact that they allow for higher visibility at night, and that they create a more safe environment. Less significant reasons were that they are vandal proof, and that they save (the household) electricity because no outside light is necessary.

The primary reason given by the minority who dislike high-mast lights are that they prevent sleep at night. They are also seen as unreliable in areas such as Town 1, where general blackouts are relatively frequent. Others (who happen to live in areas not well covered by the nearest high-mast light) feel that they are too dim.

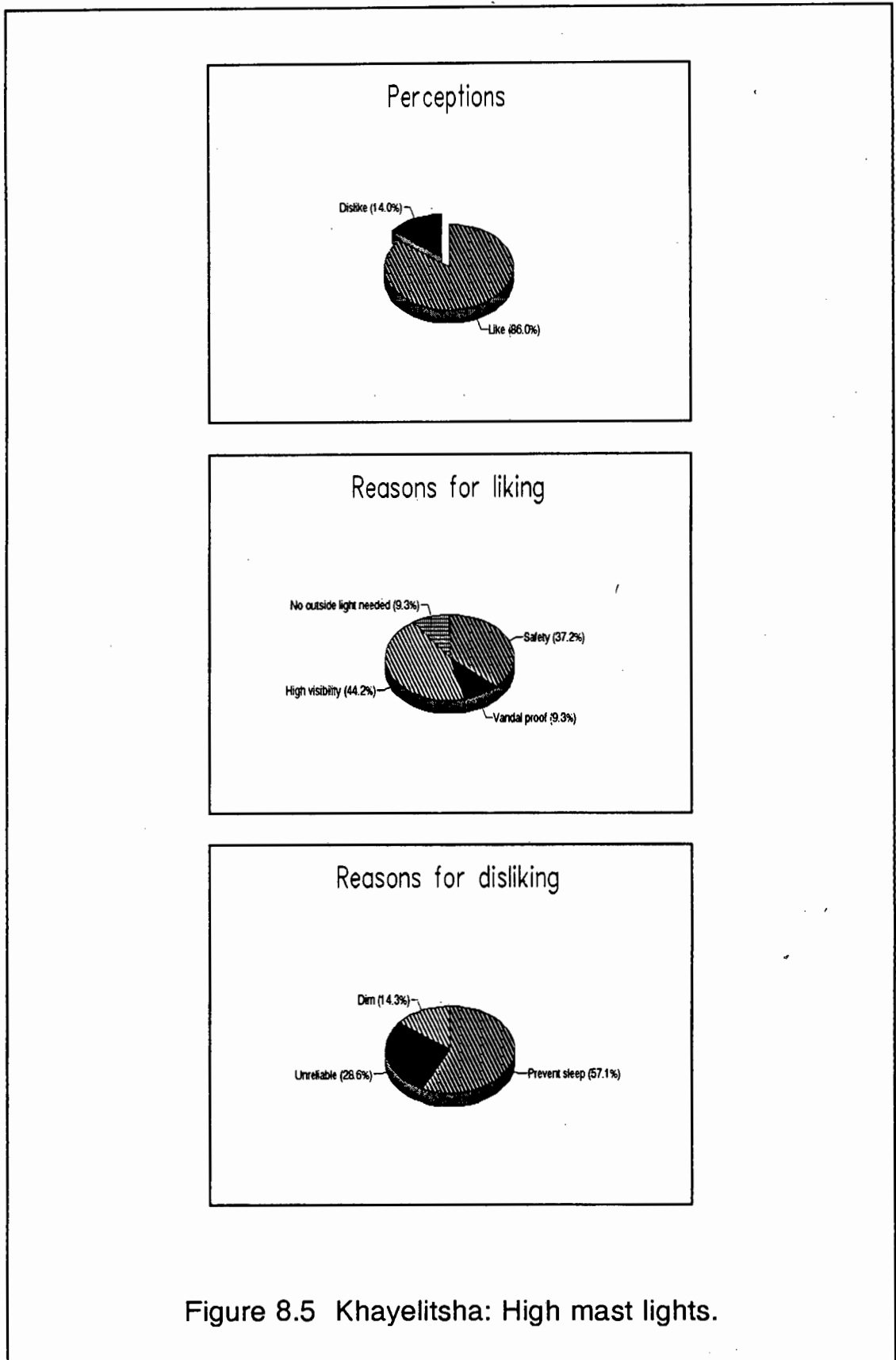


Figure 8.5 Khayelitsha: High mast lights.

In figure 8.6, attitudes towards streetlights are recorded. 58% of respondents who live in areas where they provide the only area lighting dislike them. Reasons given for liking streetlights are all general reasons for the desirability of area lighting (safety, high visibility, etc). Reasons given for disliking streetlights are primarily that they are dim and unreliable.

The above would suggest that high-mast lights are preferred by most residents of low-income areas. Residents attach a premium to the added safety and visibility of the high-mast lights. Whether township residents would prefer them if their areas were free of crime and violence is a moot point.

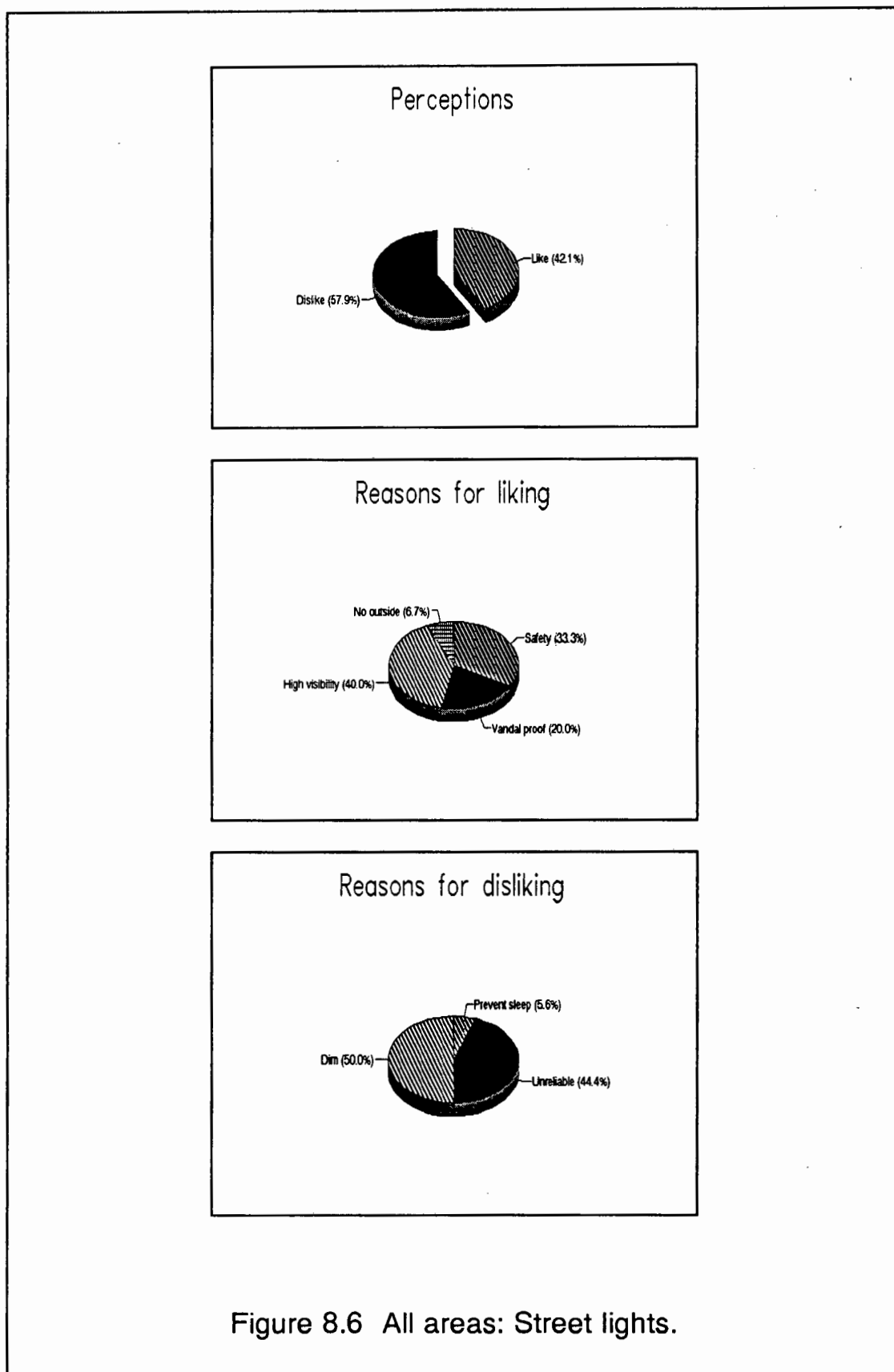


Figure 8.6 All areas: Street lights.

8.4.2 Metering systems

In the survey, households were questioned on their attitudes towards their electricity meters. In this section information is provided on those with credit meters, and those with pre-payment meters (also known as budget energy controllers). Figure 8.7 shows the percentage of those with credit meters who have experienced a meter failure. Percentages are very low, as may be expected with this very well established technology.

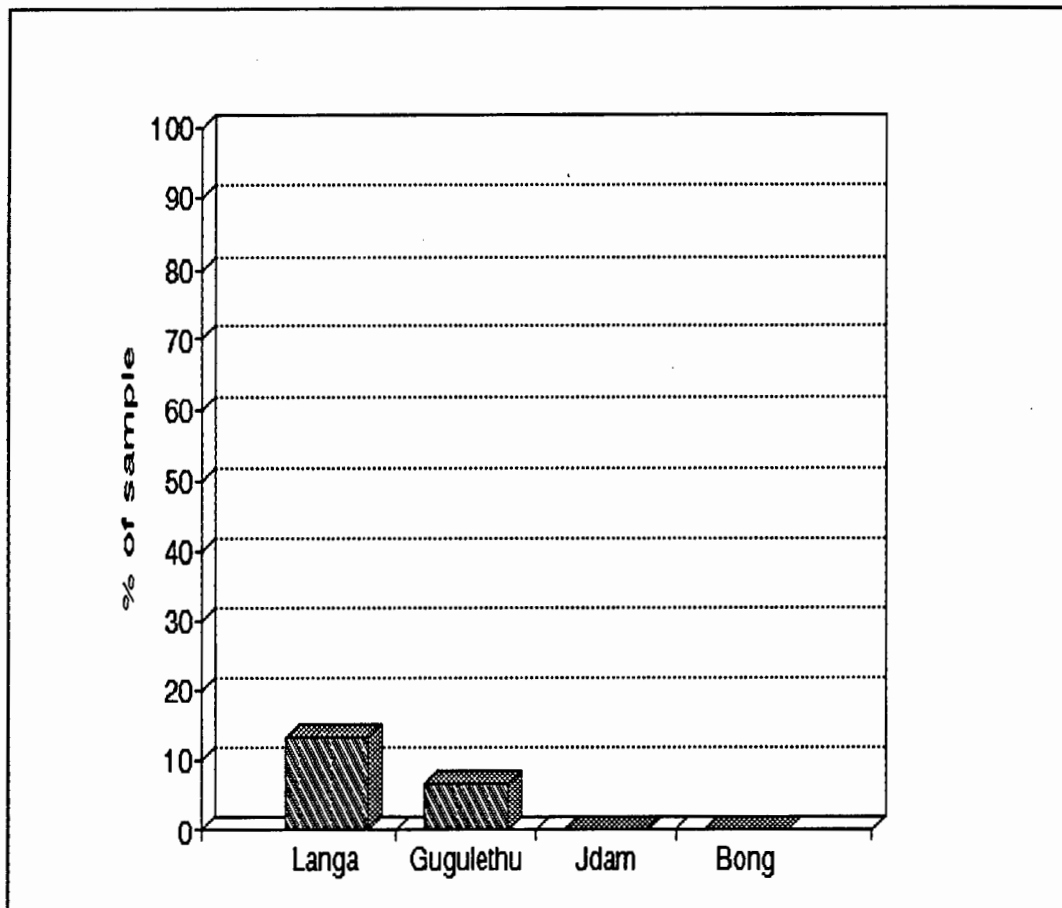


Figure 8.7 Credit meter failures.

Figure 8.8 records attitudes to these credit meters. About half like this system of metering. The major reason for liking them is that they allow credit. A further 28% (most in Langa and Gugulethu), are pleased to note that electricity continues to be supplied with this type of meter, despite the fact that the consumer is in arrears. This is a reflection of the disconnection policies of the distribution authorities, as discussed in chapter three.

There are two reasons given for disliking credit meters. 55% do not trust the electricity bills that they receive. Another 45% believe that credit meters cause debt problems, since information on consumption is only received once electricity has actually been consumed.

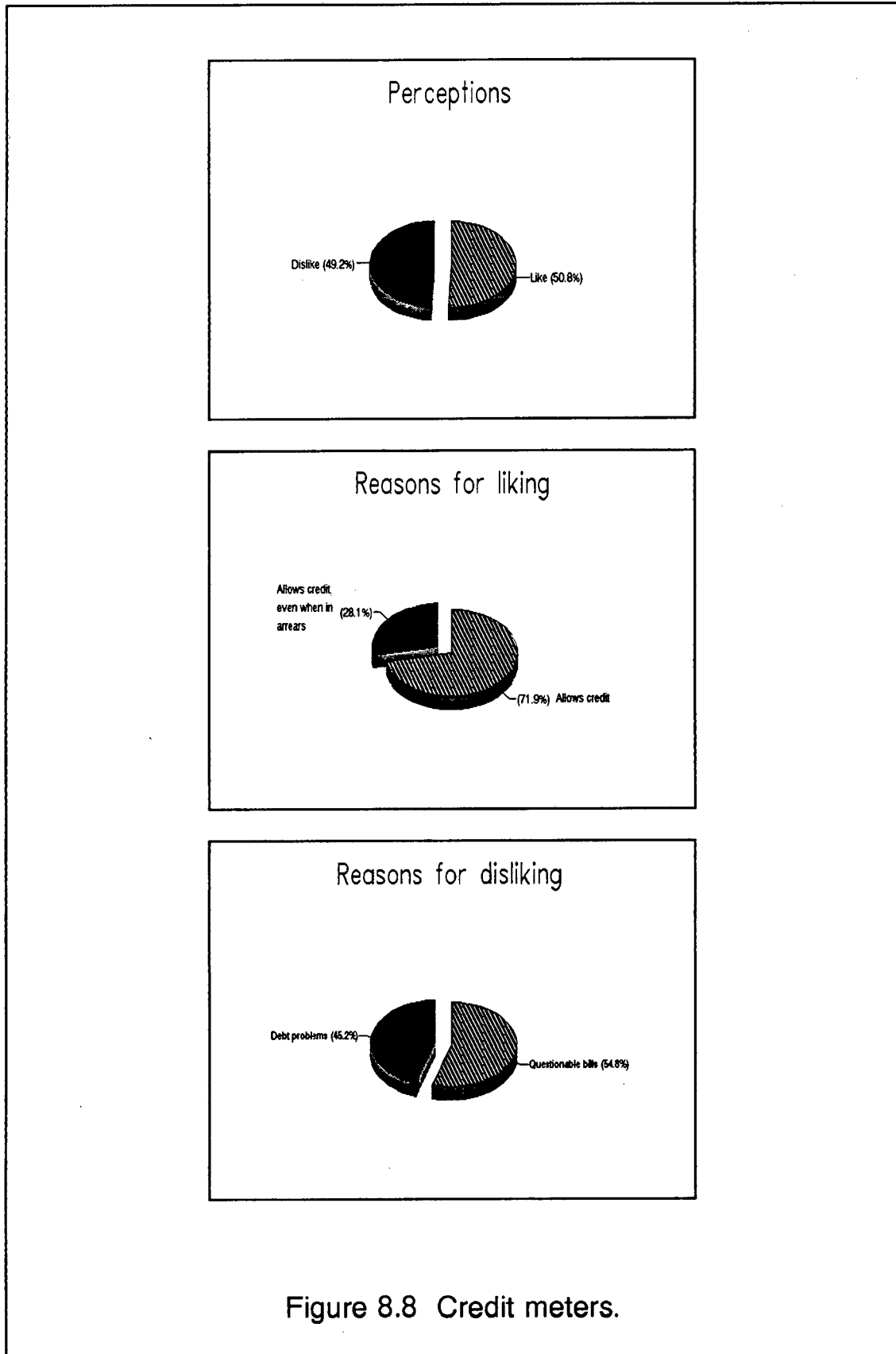


Figure 8.8 Credit meters.

Figure 8.9 shows the percentage of those with pre-payment meters who have experienced a meter failure. Failures were sorted into meter problems and card problems (where a card did not work when fed into the meter). Meter failures are very evident in all areas of Khayelitsha. 80% of all users in Bongweni had experienced problems with their meters. This confirms the seriousness of the initial problems in operating the pre-payment meter system in the area, as outlined in chapter three.

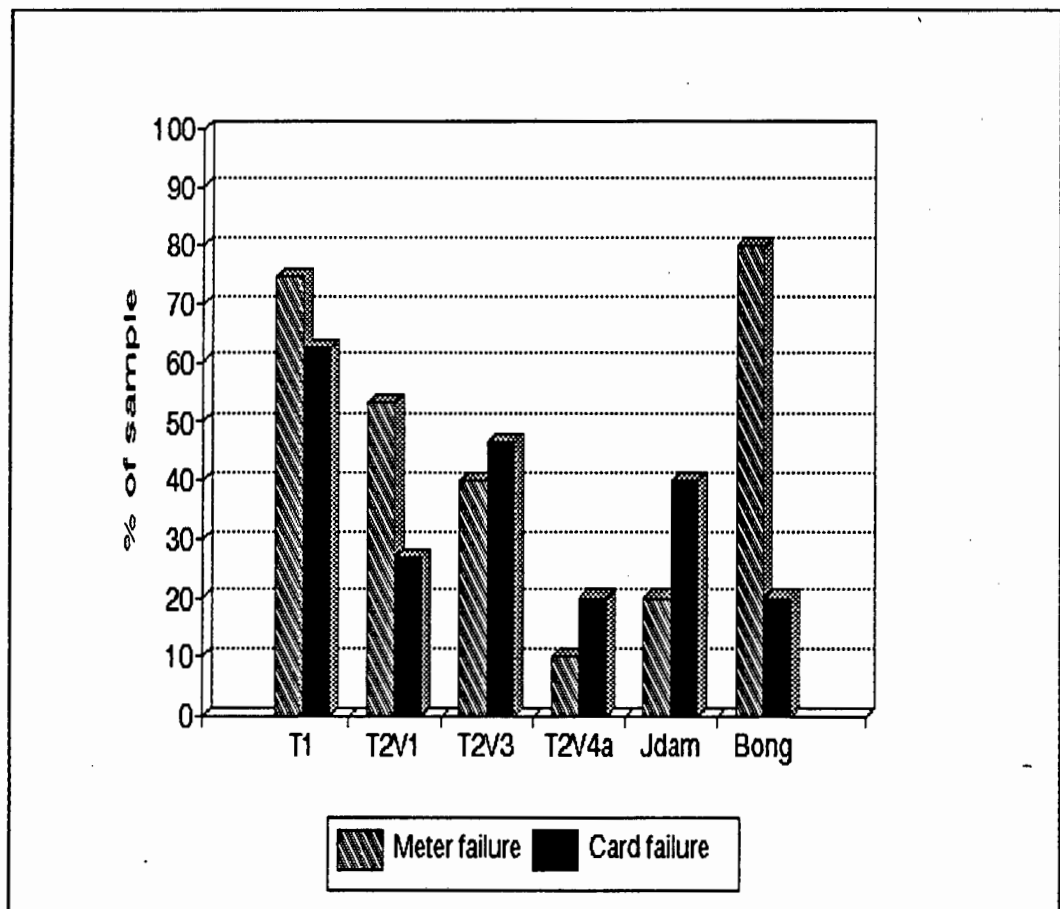


Figure 8.9 Prepayment meter failures.

Given their poor reliability, support for the pre-payment metering system is surprisingly high. Figure 8.10 records attitudes to these meters. 56% like this system. The vast majority of this group (98%) like them because they allow control over electricity usage.

There are three reasons given for disliking pre-payment meters. 63% feel inconvenienced when the electricity supply is cut due to their credit running out. Another 31% cite meter problems. A further 6% have experienced problems in purchasing cards.

The above evidence suggests that the type of metering system installed has a major effect on the perceptions of electricity. Depending on the circumstances of each household, one system may be more appropriate than the other. This points toward the desirability of giving consumers the choice of which metering system they would like to use.

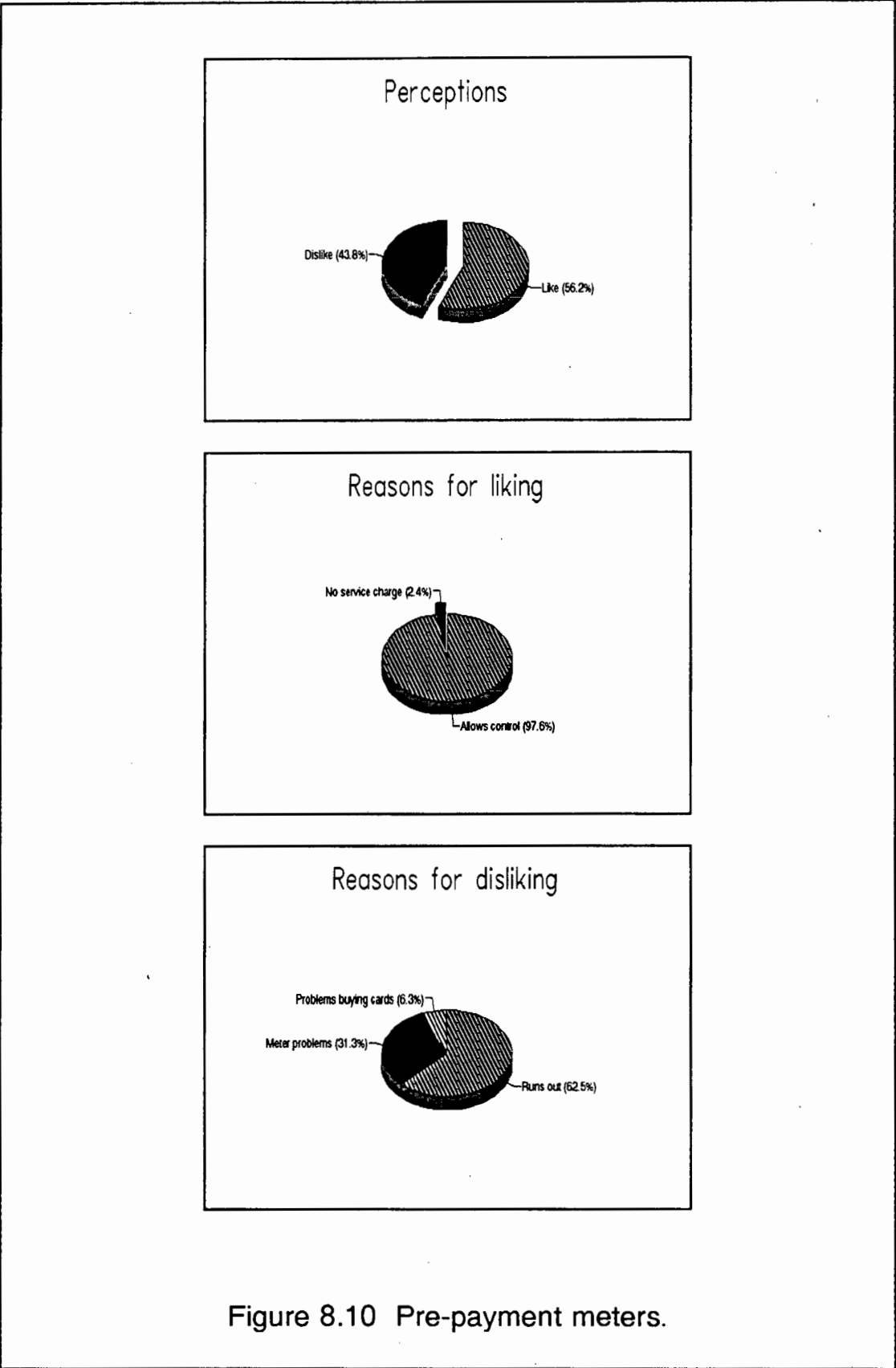


Figure 8.10 Pre-payment meters.

8.5 CONCLUSION

The following points have emerged from this chapter:

- Blackouts occur very frequently in many of the areas surveyed, suggesting that the reliability of supply in these areas leaves much to be desired.
- About half of the households surveyed have at some stage called out their electricity distribution authority, often due to pre-payment meter failures. Most were satisfied by the service that they received.
- People perceive electricity to be un-affordable in areas where households have credit meters. This is a reflection of the arrears run up by many in these areas.
- High mast lights are liked by most due to the fact that they increase visibility and increase safety.
- Streetlights are much less popular, due primarily to their dimness and poor reliability.
- About half of those with credit meters are happy with this system of metering. Some prefer the credit system, whilst some are concerned by the debt problems that they can cause. Many distrust their electricity bills.
- Pre-payment meters in Khayelitsha have a very poor record of reliability.
- The majority of pre-payment meter users like the control that these give them over the amount that they consume.
- Most of those that dislike pre-payment meters complain of being inconvenienced by their supply running out at awkward times.

- The very mixed reactions to different types of metering systems suggests that allowing consumers a choice in the metering system installed may be appropriate.

CHAPTER NINE

CONCLUSION

This final chapter draws out major observations made in this study, and examines the relevance of the project findings for the electrification of low income areas. Recommendations are also made for further study.

Electricity consumption levels

Electricity consumption levels in the areas studied in the project vary between a low of 175 kWh/month (in summer in Khayelitsha) and a high of 644 kWh/month (in winter in Langa and Gugulethu). Levels are about 80% higher in Langa and Gugulethu than in Khayelitsha.

Average consumption figures for an entire township may mask substantial variations in consumption levels in particular areas.

The range of consumption levels is thus very wide: from below the levels necessary to sustain a high rate of return on investment in new networks; to levels comparable to those expected of domestic users in much wealthier residential areas.

From an analysis of the data set on pre-payment metered sales in Khayelitsha, there is clear evidence of a steady growth in electricity consumption in newly electrified areas.

Multiple fuel use

About one-fifth of households surveyed in this project still use paraffin and gas on a daily basis. In newly electrified areas, some households have not yet been able to afford large electrical appliances.

In older areas such as Langa and Gugulethu, dependence on electricity is much higher. There is some evidence that households retain paraffin and gas appliances because of problems of reliability of electricity supply.

Wood and coal are not normally used except for cooking traditional meals and braai-ing.

The cost of energy for low income households

Hire purchase payments for electrical appliances are a substantial proportion of household energy costs, especially in new areas and particularly for higher income groups. In Khayelitsha, HP costs make up 45% of the average monthly energy bill.

Energy costs make up between 10 and 20% of total household budgets. The percentage contribution of energy is higher for poorer households.

Metering systems

Responses to credit and pre-payment meters are very mixed. Pre-payment meters are mostly well liked in spite of their poor reliability.

Consumers with different cash flow and income circumstances prefer different types of meters. This points towards the need for a flexible approach to the choice of meters for particular areas.

Area lighting systems

Township residents generally prefer high-mast lights over standard street lights. This is primarily due to the fact that they create a brighter, safer night environment.

Key determinants of increased electricity consumption levels

The use of electric stoves for cooking is the most important determinant of higher electricity consumption levels. In Khayelitsha, about one half of households cook on electric stoves. This group had consumption levels one third higher than the average for the area. Those cooking with electric stoves had consumption levels 45% higher than those cooking with gas.

The high cost of electric stoves was the major reason given for the persistence of gas cooking in Khayelitsha. Nonetheless, most households in this situation intend to buy an electric stove in the near future.

Electric hot plates do not increase electricity consumption markedly, since they tend to be used with other fuels for cooking.

Geysers are also determinants of higher electricity consumption. Households with geysers have consumption levels about 50% higher than those without, in both areas.

The period of access to electricity is another important determinant of growth in consumption levels. Electricity consumption after one year in a part of Khayelitsha was 60% higher than just after connection.

Businesses run from home cause higher household electricity consumption. About one fifth of households in the sample run businesses from home. The extent of the increase in consumption depends on the type of business being operated.

Support for the creation of home-based micro enterprises in low-income areas will probably result in increased electricity consumption.

Household size and reported household income are in general not good indicators of electricity consumption levels. There is some evidence that very large households use significantly more electricity.

The affordability of electricity

Electricity was found to be the cheapest fuel, in useful energy terms and for a range of appliances, in the areas surveyed. This was also found to be true in the particular case of cooking.

Electricity is perceived by consumers to be unaffordable in areas with credit meters, and where arrears are high.

The quality of the electricity service provided

The reliability of supply in the areas studied is poor. Blackouts occur frequently in some areas (up to 80% of households said 'often' in some areas). Poor reliability prevents dependence on electricity for daily activities such as cooking.

Reliability is still a problem in Langa and Gugulethu, which is served by a well established distribution authority. Within all South African cities, low income areas are have been marginalised politically and economically. Few mechanisms exist whereby residents can protest at the poor quality of services that they routinely receive. These issues will need to addressed in the restructuring of the electricity industry on a non-racial basis.

Areas for further research

Trends in electricity consumption in new areas like Khayelitsha need to be studied over a longer period. More detailed analysis of large data sets of consumption levels would probably throw up new ways of interpreting these trends.

In addition, follow up surveys could establish links between rising consumption levels and factors such as changing patterns of appliance ownership. Further surveys could be used to further explore reasons why households choose particular fuel - appliance combinations for particular energy consuming activities.

Given the importance of detailed information on the effects of electrification on low income areas in South Africa, it is suggested that such work be undertaken as a matter of priority.

Relevance of findings for the electrification of low income areas

This study has revealed a number of important issues which have general bearing on the electrification of low income areas.

A central question affecting electrification planning relates to expected electricity consumption levels. This study has provided clear quantitative evidence that consumption levels in newly electrified areas will rise with time. Further tracking of this trend is necessary, but the much higher levels of consumption in Langa and Gugulethu suggest that it will continue. This evidence should encourage those planning electrification projects to count on higher consumption levels with time.

The key determinants of higher electricity consumption were found to be ownership and use of large electrical appliances, particularly stoves and geysers. Higher consumption levels will result from the acquisition of new appliances. This represents a win - win situation. Households will enjoy greater convenience and lower useful energy costs, and the distribution authority will enjoy a better return on its capital investment. On evidence given in this study, consumption levels after installation of a stove or geyser could rise by up to 50%.

The purchase of new appliances may cause total household energy costs (including the cost of paying for the new electrical appliances) to rise for a period. Yet the longer term benefits for the household are clear. The high levels of expenditure on HP payments for electrical appliances in Khayelitsha are evidence that the purchase of appliances is already a priority for newly electrified households.

What steps can be taken to increase market penetration of large electrical appliances? Both appliance manufacturers and electricity distribution authorities stand to gain from producing and marketing lower cost electric stoves. Non-profit schemes to

market and distribute appliances have been used with much success all around the world (including in white municipal areas in the past), and need to be explored actively for use in low income areas.

As evidenced by their low incidence in Langa and Gugulethu, geysers tend to be installed at the time of construction of a new house, or not at all. Nonetheless, distribution authority schemes to assist households to install geysers may be feasible. Again, such schemes would be very much in the interest of manufacturers and distribution authorities to undertake.

Improving the reliability of the electricity service provided in low income areas should be a priority. Besides being necessary for reasons of equity – consumers have a right to equal standards of service in all areas – consumption level will probably rise if quality improves. Many households retain, and continue to use, non-electrical appliances because of the frequency of blackouts. Dependence on electricity will rise if the service is dependable.

Introducing innovative appliance marketing schemes and improving the quality of supply in low income areas can only be undertaken by professionally run, service-oriented distribution authorities. Very few township areas – and certainly not Khayelitsha, Langa or Gugulethu – have such authorities. The distribution sector of the South African electricity supply industry has evolved within the paradigm of apartheid. Fundamental restructuring will be necessary to create a more workable situation.

Electrification in South Africa has reached a stage where it is seen as a necessary strategy for increasing living standards and promoting economic growth. It is to be hoped that the information gained from micro-level studies such as this one will help to maximise the benefits of the electrification process.

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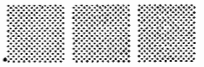
APPENDICES


APPENDIX 1: QUESTIONNAIRE


ELECTRICITY TRANSITION PROJECT QUESTIONNAIRE


I'm and I'm doing a survey on the fuels used by people living in houses with electricity. The survey is for the "Electricity Transition Project" being run by the Energy for Development Research Centre at the University of Cape Town. The survey does not have anything to do with the Government or the Council.


The people and houses to be surveyed have been chosen at random from all the electricity consumers in the area. The information collected will be kept in confidence, and will be used with other questionnaires to prepare a research report. This report will be used to propose improvements in the system of electricity provision in all urban areas around the country.

Questionnaire Code Number: 

Area: 

Date: 

Time: 

Interviewer: 

Introductory remarks by interviewer:

.....

.....

4. Estimates of other income: fill in the following table:

	Estimate of Money/ month
Sent by family living away:	
Pensions:	
Rent from tenants:	
Other (specify):	

5. Estimates of household expenditure: fill in the following table:

HOUSEHOLD ITEM	Estimated expenditure per month
Food:	
Clothing:	
Transport:	
School fees and books:	
Remittances sent to family elsewhere:	
Umgalelo/ Stokvel groups:	
Rent/ bond:	
Other (Specify):	

C. ENERGY USE

1. Which of the following fuels are used in the main house? Tick where appropriate.

FUEL TYPE:	Frequently (Daily)	Seldom	Never
Electricity			
Wood			
Paraffin			
Car batteries			
Gas			
Coal/ charcoal			
Candles			
Other (specify):			

2. Electricity

2.1 How long have you been living with electricity? Please fill in the following table:

Places lived:	Approximate date arrived:	Approximate date left:	Had electricity?	
			Yes	No
Present house:				

2.2 Use of Electricity.

Please fill in the following table. Indicate whether appliances are owned with ticks and written information.

ACTIVITY	APPLIANCE TYPE (fill in brand name where possible)	DETAILS (fill in only where appropriate)	NUMBER OWNED	REASON FOR USING ELECTRICITY (only fill in where electrical appliance <u>is</u> used)
Cooking:	Electric stove:	Number of plates:		
	Hot plate:			
	Microwave oven:			
Heating house:	Bar heater:			
	Other type:			
Heating water:	Geyser:			
	Other:			
Lighting:				
Refrigeration:				
Washing:	Washing machine:			
	Tumble Dryer:			
Dish washer:				
Ironing:				
Kitchen Appliances:	Toaster:			
	Kettle:			
Entertainment:	Television:			
	Hi Fi:			
	Radio:			
Cleaning:	Vacuum cleaner:			
	Polisher:			
Other (Specify):				

2.3 Which electrical appliance did you buy first when you first got electricity?

.....

2.4 Which electrical appliance did you buy most recently?

.....

2.5 Are you still paying off on appliances? List in order purchased, most recent purchase first.

APPLIANCE	Description	Where purchased	Monthly payment

2.6 Are you planning to get any other electrical appliances? List in the order of greatest priority.

APPLIANCE	Description	Where will you purchase it	How you will pay for it:

2.7 Do you run a business from home?

No	Yes	What sort of business?
		Has having electricity made it easier to run your business? Give reasons:

3. Wood

ACTIVITY	Reason for using wood, not electricity:
Daily cooking:	
Cooking traditional meals:	
Brewing:	
Heating water:	
Heating house:	
Other (Specify):	

3.1 How much wood do you use per week (bundles)?

3.2 Do you buy it?

No	Yes	From where?
		What does it cost (per bundle)?

3.3 Do you collect it yourselves?

No	Yes	From where?
		How long does it take to collect a load?
		Who collects it?
		Who goes along?

4. Paraffin

ACTIVITY	APPLIANCE TYPE (fill in brand name where possible)	DETAILS (where appropriate)	NUMBER OWNED	REASON FOR USING PARAFFIN, NOT ELECTRICITY (only fill in where paraffin appliance <u>is</u> being used)
Cooking:				
Heating water:				
Heating house:				
Lighting:				
Other (Specify):				

4.1 How much do you use? Fill in the table:

Size of bottles/ cans normally bought:	Cost per bottle/ can:	Length of time these bottles/ cans usually last:	Number of bottles/ cans used per month:

4.2 Where do you get it from?

4.3 Who gets it?

4.4 Who fills heaters/ stoves/ lamps?

5. Coal / Charcoal

ACTIVITY	APPLIANCE TYPE (fill in brand name where possible)	DETAILS (where appropriate)	NUMBER OWNED	REASON FOR USING COAL/ CHARCOAL, NOT ELECTRICITY (only fill in where coal/ charcoal appliance <u>is</u> being used)
Cooking:				
Heating water:				
Heating house:				
Other (Specify):				

5.1 How much do you use per week?

5.2 Where do you get it from?

5.3 Who gets it?

5.4 What does it cost? 

6. Car Batteries

ACTIVITY	APPLIANCE TYPE (fill in brand name where possible)	DETAILS (where appropriate)	NUMBER OWNED	REASON FOR USING BATTERIES, NOT ELECTRICITY (only fill in where batteries <u>are</u> being used)
Entertainment:	Television:			
	Hi Fi:			
	Radio:			
Other (Specify):				

6.1 How often do you recharge them?

6.2 Where do you recharge them?

6.3 Who takes them to be re-charged?

6.4 What does it cost? 

7. Gas

ACTIVITY	APPLIANCE TYPE (fill in brand name where possible)	DETAILS (where appropriate)	NUMBER OWNED	REASON FOR USING GAS, NOT ELECTRICITY (only fill in where gas appliance is being used)
Cooking:				
Heating water:				
Heating house:				
Lighting:				
Other (Specify):				

7.1 How much do you use? Fill in the table:



Size of bottles normally bought:	Cost per bottle refill:	Length of time these bottles usually last:	Number of bottles used per month:

7.2 Where do you refill gas bottles?

7.3 Who goes to refill bottles?

8. Candles

ACTIVITY	Reason for using candles, not electricity:
Lighting:	
Other (Specify):	

- 8.1 How many do you use per month (packets)? 
- 8.2 Where do you buy them?
- 8.3 Who buys them?
- 8.4 What do they cost? 
-

7

D. ELECTRICITY SERVICE

This part of the questionnaire is designed to get information and opinions about the electricity service available in your area.

1. Type of lighting system in area: (tick one box):

High mast lights	Street lights
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1.1 List advantages and disadvantages of the system ticked above only:

Advantages:

.....

.....

Disadvantages:

.....

.....

2. Type of electricity network in the area: (Tick one box):

Underground cables (like in Khayelitsha):	Cables visible on poles (like in Langa):
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2.1 List advantages and disadvantages of the system ticked above:

Advantages:

.....

.....

Disadvantages:

.....

.....

3. Type of metering system: (Tick one box):

Credit meters (bill at end of month)	Card (pre-payment) meters
--------------------------------------	---------------------------

If respondent has a card meter, skip question 3.1

3.1 Credit Meters:

List advantages and disadvantages of credit metering system:

Advantages:

Disadvantages:

3.1.1 Has the electricity to your house only (not a black out) ever been disconnected?

For how long?

Why?

3.1.2 How often is your meter read?

3.1.3 Do you think that your bills are correct?

3.1.4 How often do you receive bills?

3.1.5 Are you in arrears on your electricity payments?

3.1.6 How much was your last electricity bill?:

3.1.7 Where do you usually pay your account?

3.1.8 Other comments:

If respondent has credit meter, and question 3.1 has already been answered, skip question 3.2.

3.2 Card Meters:

List advantages and disadvantages of this card meter system:

Advantages:
.....
.....

Disadvantages:
.....
.....

3.2.1 Has your meter ever stopped working?
Why?

3.2.2 How many times have you bought a card that did not work when you got home?

3.2.3 How often do you buy cards?

3.2.4 How much do you usually buy at a time?

3.2.5 When do you usually buy cards?

3.2.6 At what time of the day do you normally buy cards?

Are the card sales points open for an adequate number of hours per day?

.....

3.2.7 Who usually goes to buy cards?

3.2.8 Other comments:

.....

.....

.....

4. Type of housewiring in the house: (tick one box):

Plugs, lights in each room	Readyboard
----------------------------	------------

4.1 List advantages and disadvantages of the system in the house:

Advantages:
.....
.....

Disadvantages:
.....
.....

4.2 If you have a readyboard, which room is it in?

Would you prefer it in another room? Which?

5. Perceptions about electricity tariffs:

5.1 Do you find electricity affordable?

Yes	No	If no, why?
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5.2 Do you think that electricity tariffs are fair? If not, why?

6. Electricity Blackouts

6.1 How often does electricity in the area (not only in your house) go off?
.....

6.2 Does this cause problems?

6.3 What kind of problems?

