

The supply of clean energy services to the urban and peri-urban poor

THEMATIC PHASE

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Executive summary

Urban growth in the developing world is accelerating and this is no longer a developed world phenomenon. Concerns about this relate to the deterioration in quality and reliability of energy services available to the poor as a whole but particularly to the growing population in the urban and peri-urban areas of the developing world. Population densities in these areas will be such as to make them more vulnerable to indoor health hazards, lack of access to clean energy services, transmitted diseases and its associated problems.

South Africa is following the urbanizing trend, but already ahead of the global curve and well ahead of the rest of sub-Saharan Africa. Due to urbanization and the repeal of discriminatory legislation in the late 1980s and early 1990s, the majority of the population now lives in urban areas (almost 57 %). South Africa's population of 44.8 million is stratified along four major lines of inequality: class, gender, race and space. It has amongst the highest income disparities in the world, with estimations that 13% live in 'first world conditions' while the majority live in 'third world conditions'. Of the approximately 12 million households in South Africa, close to 15% live in informal housing. As a result of apartheid planning, many urban settlements in South Africa are not properly functional in serving the needs of the majority of the poor, in terms of access to amenities, infrastructure and livelihood opportunities. Until 1986 it was the policy of the apartheid government to discourage the permanent rural-urban migration of black South Africans. Thus, cities were left unprepared for the influx, and people have often been forced into informal settlements (slums) in a situation of deprivation with few or no services at all. Informal or shack settlements in urban and peri-urban areas are major concentrations of poverty. As the rate of urbanization increases, access to clean, affordable energy for the poor is becoming increasingly important. The energy problem for most of the urban and peri-urban poor in South Africa is, however, not so much access to clean energy services as how to deal with the constraints on using electricity, land tenure, legal electricity connections, housing and safety. Deficient energy services to the urban poor results in urban air pollution (indoor and ambient) from the use of wood and coal, especially in winter; hazards of illegal electricity connections causing fires and electrocution; low quality illegal electricity services result in voltage surges, blackouts and damage to household equipment; illegal electricity connections are also more expensive than regular services and limit the opportunities for income generating activities.

Urban poverty is exacerbated by other trends like the distance many of the poor on the urban periphery have to travel for work as a result of the limitations of current transport systems and its high costs; 'informal governance arrangements' exist where 'shacklords' and gangsters control many aspects of community life resulting in denial of rights and exclusion; a growth in the number of immigrants from other African countries, many of them illegal; and urban areas in South Africa are also faced with higher rates of HIV/AIDS

The key objective of the study under the broader theme on 'Energy access' was to carry out an initial assessment of the household energy situation in the rapidly growing urban and peri-urban areas of South Africa and identify viable and proven policy options that can assist in providing clean, affordable and more sustainable energy services.

A primary household energy survey was conducted of 100 households in Imizamo Yethu, a poor urban area outside Cape Town. The sample size is small, given the fact that Imizamo Yethu has approximately 3 800 households and a population of 16 000, so it is difficult say whether the findings of the study represent the whole of Imizamo Yethu or of other low-income areas elsewhere in the country.

Access to electricity is generally seen as an important step in socio-economic development and many countries, including South Africa, are working towards universal access. To this end, government embarked on a National Electrification Programme (NEP) in the early 1990s, seeking to address the electrification backlog fully by 2012.

An evaluation of the first phase of the National Electrification Programme concluded that, even though benefits are limited in households where electricity is only used for lighting and media purposes, electrification in general improved the welfare of households and communities through street lighting,

improved health care services and enhanced educational outcomes at schools. Although the majority of urban and peri-urban poor in South Africa have access to grid electricity, affordability remains a major problem, and the 2001 Census showed that many households are still using multiple fuels. Comparing energy sources used for cooking in 1996 and 2001 households using electricity have increased by only 4.3%.

In 2003 the government introduced the Electricity Basic Services Support Tariff (EBSST) to assist poor households with a record of using less than 150kWh monthly. These households qualify for a free allocation of 50kWh of electricity per month. Targeting of the poor to receive the subsidy is a serious challenge. In many instances the less poor have also benefited from this poverty tariff. This coupled with the fact that only grid electrified poor households received the poverty tariff, the government has developed a Free Basic Alternative Energy Policy (FBAE) for the poor. FBAE include alternative fuels/technologies (paraffin, LPG, renewable energy). This has the potential to advance access and promote a more equitable share in energy services. But currently capacity constraints (inadequate staff complements, lack of skills and skewed budgeting) at the municipality level make it hard to identify beneficiaries for FBAE.

Currently four concessionaires are providing solar home systems (SHSs) in four of the original six rural concession areas. The SHS is subsidized from the National Electrification Programme at a cost of R3 500 per connection. The customer pays a R100 connection fee and R58 per month. The system provides enough electricity for four lights, a radio, a black and white TV and the facility to charge a cell phone. Critics point out that it does not go far enough to satisfy the thermal needs of the poor.

Despite the fact that most of the urban poor have access to grid electricity, paraffin (kerosene) remains the fuel of necessity for cooking for a large number of urban households. This may be attributed to a good paraffin distribution network, easy access in slum areas, relatively cheap appliances and the fact that paraffin can be purchased in small quantities which match the irregular income streams of the poor. In 2001 the government exempted the sale of paraffin from value added tax (VAT) to make it more affordable to the poor. Because the urban poor live in high density areas, shack fires caused by the use of paraffin lead to the loss of lives and property as well as ingestion by small children. LPG is used less frequently by the urban poor because of perceptions of danger associated with its use, poor distribution networks in slum areas, upfront cost for containers, high cost of appliances and the fact that LPG is relatively far more expensive than electricity and paraffin.

Initially a scoping study was carried out which generally focused on access to clean and modern energy services by the urban and peri-urban poor in South Africa in general and on the Cape Town metropolis (Khayelitsha) in particular. Issues related to access, availability, household energy expenditure, and the affordability of energy sources (electricity, paraffin, LPG) and appliances was explored. This study also reviewed the most important government policies and strategies that address broader urbanization processes and spatial questions, policies and programmes at local government (municipality) level because the provision of clean energy services to the urban poor are linked to these policies and strategies.

In 2003 the government initiated the Urban Renewal Programme (URP) and the Integrated Sustainable Rural Development Strategy (ISRDS) were formed to address the vexed questions of interdepartmental coordination and to effect intergovernmental cooperation. Together with these strategies the first National Spatial Development Perspective was formulated to coordinate the spatial allocation of resources in South Africa. The key issues are to define where growth and decline would occur in the space economy, and to consider government investment in infrastructure and shelter programmes. The provision of basic services to all residents has been the most important priority for all post-apartheid local governments. After 2000 all local governments put in concerted efforts to redress the imbalances of the past. The City of Cape Town has set itself various quantifiable targets in its Energy and Climate Change Strategy (City of Cape Town 2005). One of the residential sector targets set by the City is that 90% of informal households will be connected to electricity from 2010 onwards. The scoping report also reviewed the findings of a household energy survey that was conducted in Khayelitsha in 2004. Khayelitsha is a township about 30 kilometres from the centre of Cape Town which was established in 1984, when the then apartheid government sought to control the accommodation of black South Africans

in urban areas. The main objective of the study was to identify and understand the barriers to modern energy services in low-income urban communities. The report identified two barriers to access electricity namely access to an electric supply and the ability to afford to use the supply. The survey sampled three categories of households: metered supply, extension cord supply and unelectrified households

For electrified households the main barrier on extensive electricity use lie in household budgetary constraints. Households using extension cords mentioned a number of disadvantages. Many complained that the power supply was unreliable (37% of responses), that they were charged too much (24%) and that the extension-cord power supply could cause damage to appliances (22%). Other problems mentioned were that the connecting wires could be stolen (11%) and three households said that extension cords were dangerous. All these households expressed a strong intention to obtain a metered supply through the normal supply authorities, rather than relying on informal connections. All respondents with no electricity supply expressed a willingness to pay for a metered connection. However, the main constraint these households experienced was the fact that their homes were built on unauthorised land and the municipality would not supply them with an electricity connection.

In terms of accessibility of fuels, the majority of respondents perceived electricity as very accessible (equal to paraffin), very efficient, cheap, very clean, very easy to use and very safe. Perhaps the most striking result here is that most people considered electricity very safe, while the median responses for all the other fuels were 'dangerous' or 'very dangerous' (candles).

As part of this study a household energy survey of 100 low-income urban households were conducted in Imizamo Yethu to further investigate issues related to access to electricity, paraffin and LPG. The study also investigated the uptake of small business/productive enterprises. The township of Imizamo Yethu is situated in the picturesque seaside suburb of Hout Bay, about 20 kilometres outside Cape Town.

Imizamo Yethu is a poorly serviced high-density 'urban' settlement close to the commercial localities of Hout Bay. It has a section with formal houses, but the overwhelming majority live in informal settlements, some well established (and serviced), but others where people have been building shacks in unplanned areas that have not been authorized by the municipality, e.g. in areas considered too close to roads, subject to flooding, or subject to land-use disputes.

Three communities were surveyed: Dontseyake (unelectrified), Zola (meter-electrified) and Hades (mixture of electrified and extension cords). The tables below provide a summary of sample sizes, and access to energy in localities surveyed.

Sample sizes and localities by community surveyed

<i>Locality in Imizamo Yethu</i>	<i>Shacks – serviced</i>	<i>Shacks - unserviced</i>	<i>No. of households interviewed</i>
Dontseyake	0	46	46
Zola	29	0	29
Hades	17	8	25
Total	46	54	100

Household access to energy by community surveyed

<i>Community</i>	<i>Metered supply</i>	<i>Extension cord</i>	<i>Unelectrified</i>	<i>LPG</i>	<i>Paraffin</i>
Dontseyake	0	20	26	3	46
Zola	29	0	0	3	10
Hades	17	8	0	0	24
Total	46	28	26	6	80

Access to electricity is not the main problem to the majority of the urban and peri-urban poor, but rather the ability to afford to pay for the service. According to the sample surveyed, almost 70% perceived access to electricity as good. People living in settlements not approved for housing by local government experience the gravest forms of energy poverty. Some of these people make use of extension cords, with attendant reported problems of less security of supply, dangers, theft of wires and higher costs than metered customers. The average cost of an extension cord connection is almost 10 times a metered connection according to the sample surveyed. This category of households, according to the survey, had the highest per capita expenditure on energy and do not benefit from the free basic electricity subsidy. Households without any electricity had a higher per capita average energy expenditure than electrified households, but lower than the extension cord customers, and are forced to make use of dangerous appliances (paraffin) and fuels in densely populated informal settlements. The problem the urban poor experience is broader than electricity supply. It is rooted in the housing shortage, land issues and continuing in-migration to urban and peri-urban areas.

Access to paraffin is very good because of a good infrastructure network, paraffin is zero VAT rated and paraffin appliances are generally cheap compared to electric and LPG appliances. Access to LPG is regarded as not good because of a poor network, distance to retail outlets, and the high cost of gas and appliances.

Access to electricity does not automatically lead to higher levels of productivity and income generation. Most of the small businesses at household level are of a retail nature. Of the households surveyed, 57 expressed the intention to start a small business, whilst only 26 home businesses were actually established. Interestingly, none of the unelectrified households had an actual business, and only a small number of them, compared to the electrified customers, expressed an interest in starting a business. The electric fridge is the main business appliance and shebeens (selling liquor) appear to be the main type of business in Imizamo Yethu.

The socio-political benefits of electrification are well documented, but economic benefits that are generally assumed have not been well researched and analysed. Future research should focus on the impact of electrification on the uptake of small and productive enterprises and self-employment among households in poor urban and peri-urban areas.

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List of abbreviations used

DoH	Department of Housing
DME	Department of Minerals and Energy
EBSST	Electricity Basic Services Support Tariff
FBE	Free basic electricity
FBAE	Free basic alternative energy
GDP	Gross domestic product
GNESD	Global Network on Energy for Sustainable Development
GWh	GigaWatt hours
HSRC	Human Sciences Research Council
IEA	International Energy Agency
IeC	Integrated energy centre
IPP	Independent power producer
ISRDS	Integrated Sustainable Rural Development Strategy
LPG	Liquefied petroleum gas
Mtoe	Million tonnes of oil equivalent
MW	MegaWatt
NEP	National Electrification Programme
NER	National Electricity Regulator
PJ	PetaJoule
RDP	Reconstruction and Development Programme
SA	South Africa
SADC	Southern African Development Community
SANERI	South African National Energy Research Institute
SHS	Solar home system
SSN	Southsouthnorth
UNIDO	United Nations Development Organisation
URP	Urban Renewable Programme
VAT	Value added tax
W	Watt
WRI	World Resources Institute

1. Introduction

1.1 Background and rationale

The developed world is already 75% urban, but urban growth in the developing world is accelerating and this is no longer a developed world phenomenon. The world's annual urban growth rate is projected at 1.8 %, in contrast to the rural growth rate of 0.1%, and about 60 % of the world's population will live in cities by 2030 (Topfer:2001).

Concerns about this relate to the deterioration in quality and reliability of energy services available to the poor as a whole but particularly to the growing population in the urban and peri-urban areas of the developing world. What is worrisome is that the population densities in these areas will be such as to make them more vulnerable to indoor health hazards, lack of access to clean energy services, transmitted diseases and its associated problems.

South Africa is following the urbanizing trend, but already ahead of the global curve and well ahead of the rest of sub-Saharan Africa. Due to urbanization and the repeal of discriminatory legislation in the late 1980s and early 1990s, the majority of the population now lives in urban areas. The 2001 Census showed an urbanization level of 56.25%, but with wide variations among the country's four measured population groups: Indians are the most urbanised at 97.49%, followed by whites at 89.87%, coloureds at 86.78% and Africans at 47.47%. Levels of urbanisation vary substantially between the nine provinces (see Figure 1): three provinces – Gauteng, the Western Cape and the Northern Cape – have levels above the national figure, with Limpopo the lowest at 10%. The continuing urbanization has led to major problems in terms of infrastructure, poverty, unemployment and the inadequate provision of energy services.



Figure 1: Map of the nine South African provinces
Source: www.sa-venues.com/maps-south-africa-provinces

South Africa's population of 44.8 million is stratified along four major lines of inequality: class, gender, race and space. It has amongst the highest income disparities in the world, with estimations that 13% live in 'first world conditions' while the majority live in 'third world conditions'. Of the approximately 12 million households in South Africa, close to 15% live in informal housing.

As a result of apartheid planning, many urban settlements in South Africa are not properly functional in serving the needs of the majority of the poor, in terms of access to amenities, infrastructure and livelihood opportunities. Until 1986 it was the policy of the apartheid government to discourage the permanent rural-urban migration of black South Africans. Thus, cities were left unprepared for the influx, and people have often been forced into informal settlements (slums) in a situation of deprivation with few or no services at all. Informal or shack settlements in urban and peri-urban areas are major concentrations of poverty. The severity and incidence of poverty are most acute in the small towns, followed by secondary cities, and least severe in the four metropolitan areas. Hence, while the absolute number of urban and peri-urban poor is greatest in the metropolitan areas, in relative terms the poverty burden is heaviest in the small towns and secondary cities (see the typology given in Table 1)..

Table 1: Typology of urban settlements in South Africa

Source: South African Cities Network: State of the Cities Report (2006)

<i>Settlement type</i>	<i>Scale and settlement characteristics</i>
Metropolitan cities	Population over 1 million. Established formal core of industrial, commercial and suburban development. Formal townships, hostels, and backyards. Informal settlements with significant RDP housing on the periphery.
Secondary cities	Population of 250 000 to 1 000 000 Established formal core of mining, commerce and suburban development. Formal townships with backyards plus informal and traditional settlements and significant RDP housing on the periphery.
Large towns	Population 25 000-250 000; Typically former colonial administrative centres, the hubs of mining and industrial areas, but also old homeland capitals. Limited formal suburban stock, formalised townships now extended with RDP housing and informal settlements.
Small towns	Population 2 000 to approximately 25 000. Typically a small commercial, administrative, farming or tourist node. Small, generally ageing formal housing stock and a former township, spatially integrated over the last decade with the 'old' town through RDP housing and informal settlements.
Displaced dense settlements on former homeland borders	Population up to 400 000. Consolidated dense informal settlement in traditional land characterised by absence of formal industrial or commercial activity.

As the rate of urbanization increases, access to clean, affordable energy for the poor is becoming increasingly important. The energy problem for most of the urban and peri-urban poor in South Africa is, however, not so much access to clean energy services as how to deal with the constraints on using electricity, land tenure, legal electricity connections, housing and safety. Deficient energy services to the urban poor results in urban air pollution (indoor and ambient) from the use of wood and coal especially in winter; hazards of illegal electricity connections causing fires and electrocution; low quality illegal electricity services result in voltage surges, blackouts and damage to household equipment; illegal electricity connections are also more expensive than regular services and limit the opportunities for income generating activities.

Urban poverty is exacerbated by other trends. Many of the poor on the urban periphery have to travel between jobs and houses and are confronted by the limitations of current transport systems and high costs. In some poor urban communities 'informal governance arrangements' exist where 'shacklords' and gangsters control many aspects of community life resulting in denial of rights and exclusion. Furthermore, most South African cities face a growth in the number of immigrants from other African countries, many of them illegal.

Urban areas in South Africa are also faced with higher rates of HIV/AIDS than rural areas. Cities like Cape Town, Johannesburg and Port Elizabeth have recorded higher rates of HIV/AIDS compared to the rest of their respective provinces. Migration as a livelihood strategy is associated with higher levels of risk of HIV infection, because of the associated disruption of familial and spousal/sexual relationships (van Donk 2002).

1.2 Objectives

The key objective of the study under the broader theme on ‘Energy Access’ was to carry out an initial assessment of the household energy situation in the rapidly growing urban and peri-urban areas of South Africa and identify viable and proven policy options that can assist in providing clean, affordable and more sustainable energy services. This will include assessing the extent to which previous energy policy reforms have addressed these challenges or have actually contributed to the growing problem of inadequate energy services for the poor.

1.3 Limitations of study

A primary household energy survey was conducted of 100 households in Imizamo Yethu, a poor urban area outside Cape Town. The sample size is small, given the fact that Imizamo Yethu has approximately 3 800 households and a population of 16 000, so it is difficult say whether the findings of the study represent the whole of Imizamo Yethu or of other low-income areas elsewhere in the country. Another limitation is that only one similar study has been conducted, in Khayelitsha (urban township outside Cape Town) in 2004, meaning that there is little in the way of secondary sources with which to compare the findings of the study before conclude whether they might be applicable in other areas. Furthermore, the Western Cape is one of the more affluent and better governed of the provinces and different socio-political, economic and cultural dynamics in other provinces might lead to different findings.

1.4 Organisation of report

Section 2 describes the national situation on energy access and analyses the different policy responses. Next the report discusses the methodology and research framework. Section 4 outlines the key findings of the scoping phase and the Section 5 discusses the thematic phase, the key findings from the survey and interviews with stakeholders. Conclusions and policy recommendations are made in Section 6, followed by a discussion of further areas for research and the way forward.

2. National situation on energy access

This section gives a broad overview of key government policies and programmes to promote access to affordable, clean, reliable and safe energy services to the urban and peri-urban poor in South Africa.

2.1 Policies and programmes to promote clean energy services

At present the electricity supply industry is dominated by a vertically integrated electricity supply and distribution utility Eskom which is state-owned. Eskom generates about 98% of the country’s electricity, and, together with local authorities (municipalities), also contributes significantly to the distribution and retailing of electricity to customers. Local authorities supply electricity mostly to urban and peri-urban customers, whilst Eskom supplies mostly rural customers.

Access to electricity is generally seen as an important step in socio-economic development and many countries, including South Africa, are working towards universal access. Government energy policies in relation to the household sector have been, in fact, driven by the need to compensate for the injustices of the apartheid era. A priority for the government is to increase access to affordable energy services while minimizing the negative effects of energy use on personal health, the environment and to promote safety. To this end, government embarked on a National Electrification Programme (NEP) in the early 1990s, seeking to address the electrification backlog fully by 2012.

The First Phase of the NEP (1994-1999) was funded entirely by the electricity supply industry (Eskom and municipalities, the latter being responsible for distribution). By 2001, 67% of the population, or 30.8 million people, had access to electricity. In rural areas the proportion of the population with access was 50%; in urban areas it was 80%. Table 2 shows the urban and rural electrification levels from 1998 to 2001. (From 2000 the government embarked on a second phase, the Integrated National Electrification Programme, funded by the Fiscus/Treasury.)

Table 2: Urban and rural electrification information from 1998 to 2001*Source: Based on figures from Statistics South Africa (2003)*

<i>Year</i>	<i>Type of area</i>	<i>% electrified</i>
2001	Rural	49.10
	Urban	77.20
	Total	66.10
2000	Rural	45.75
	Urban	74.24
	Total	62.95
1999	Rural	46.29
	Urban	79.81
	Total	66.31
1998	Rural	42.59
	Urban	76.69

An evaluation of the first phase of the Electrification Programme concluded that, even though benefits are limited in households where electricity is only used for lighting and media purposes, electrification in general improved the welfare of households and communities through street lighting, improved health care services and enhanced educational outcomes at schools. Although the Programme has been a success in terms of expanding the numbers of South African households connected to the national grid, the following limitations were observed:

- Even after electrification a major percentage of poor households (both rural and urban) continued to use non-electric fuels for their larger-quantity energy needs.
- The wider socio-economic development benefits of electrification seemed disappointing, partly because this improved supply was not integrated with other necessary improvements in infrastructure, services and economic development initiatives.
- Some groups of poor people, like backyard dwellers¹ and people living on land not approved for settlement, are excluded from electrification and subsidies.

Although the majority of urban and peri-urban poor in South Africa have access to grid electricity, affordability remains a major problem, and the 2001 Census showed that many households are still using multiple fuels. Comparing energy sources used for cooking in 1996 and 2001 (Table 3), households using electricity have increased by only 4.3%.

Table 3: Comparing energy sources for cooking in 1996 and 2001*Source: Census data 1996 and 2001 from Statistics South Africa (2003)*

<i>Fuel</i>	<i>1996 (%)</i>	<i>2001 (%)</i>
Electricity	47.1	51.4
Gas	3.2	2.5
Kerosene	21.5	21.4
Wood	22.8	20.5
Coal	3.5	2.8
Other	1.9	1.4

¹ Backyard dwellers live on formal or informal housing plots/land in shacks or buildings that do not comply with planning and building code norms required by local governments/municipalities

Total	100	100
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In 2003 the government introduced the Electricity Basic Services Support Tariff (EBSST) to assist poor households with a record of using less than 150kWh monthly. These households qualify for a free allocation of 50kWh of electricity per month. The implementation of EBSST is fraught with difficulties, not least of which are the various pricing and delivery limits imposed by the plethora of different distribution agencies (Prasad et al 2006). Although EBSST partially addresses the issue of affordability, it is not the only solution to the problem of energy poverty, as it does not reach people who are living without the electricity infrastructure, nor can people hope to be included in the infrastructure if they live on unauthorised land.

Targeting of the poor to receive the subsidy is a serious challenge. In many instances the less poor have also benefited from this poverty tariff. The government has recognized this fact and has developed a Free Basic Alternative Energy Policy (FBAE) for the poor. FBAE include alternative fuels/technologies (paraffin, LPG, renewable energy). This has the potential to advance access and promote a more equitable share in energy services. But currently capacity constraints (inadequate staff complements, lack of skills and skewed budgeting) at the municipality level make it hard to identify beneficiaries for FBAE.

Many of the poor resist the acceptance of alternative fuels to electricity as they believe it prejudices their chances of being connected to electricity in the future. This may largely be attributed to people's lack of information with regard to the FBAE policy. Focus group workshops have shown that people are willing to accept alternative fuels to electricity if they understand that it is a temporary measure and does not compromise their eligibility for electrification in the future.

Currently four concessionaires are providing solar home systems (SHSs) in four of the original six rural concession areas. The SHS is subsidized from the National Electrification Programme at a cost of R3 500 per connection. The customer pays a R100 connection fee and R58 per month. The system provides enough electricity for four lights, a radio, a black and white TV and the facility to charge a cell phone. Critics point out that it does not go far enough to satisfy the thermal needs of the poor.

Despite the fact that most of the urban poor have access to grid electricity, paraffin (kerosene) remains the fuel of necessity for cooking for a large number of urban households. This may be attributed to a good paraffin distribution network, easy access in slum areas, relatively cheap appliances and the fact that paraffin can be purchased in small quantities which match the irregular income streams of the poor. In 2001 the government exempted the sale of paraffin from value added tax (VAT) to make it more affordable to the poor. Because the urban poor live in high density areas, shack fires caused by the use of paraffin lead to the loss of lives and property as well as ingestion by small children.

Liquefied petroleum gas (LPG) is used less frequently by the urban poor because of perceptions of danger associated with its use, poor distribution networks in slum areas, upfront cost for containers, high cost of appliances and the fact that LPG is relatively far more expensive than electricity and paraffin. In order to overcome these barriers, Totalgaz Southern Africa has produced a 5kg gas cylinder called Shesha. It is easily transportable and comes in a value pack with a burner and cooker top for a deposit of R50 per cylinder. Shesha comes with safety features and a connector that can be used for other appliances such as heaters lamps and cookers. It is meant to be distributed in rural areas and urban informal settlements. Thus far the take-off has been slow.

So far globalisation has had a limited effect on the price and availability of paraffin and LPG. The sale of bottled paraffin with safety caps to curb accidental paraffin poisoning in young children may be attributed to the influence of international lobby groups. Globalisation is also influencing the replacement of fossil fuel sources with renewable energy sources (especially solar and wind) as well as nuclear. The restructuring of the electricity industry is still underway and it is too early to assess the effects of this aspect of globalisation at household level.

2.2 Critical review of the White Paper on Energy Policy

The White Paper on Energy Policy of South Africa (1998), asserts the government's commitment to promote access to affordable and sustainable energy services for small businesses, disadvantaged households, small farms, schools, clinics, and other establishments in rural and other communities. In December 2007 an energy summit was held to review to what extent the government has lived up to the intentions and promises contained in the White Paper. Testimony to some of these policy objectives in terms of making basic energy accessible to poor households, is the zero-rating of paraffin. As good as that policy is, the challenge is with the monitoring and the lack of a visible inspectorate to ensure that the price of IP is passed on to the end consumers.

The Department of Minerals and Energy (DME) is also currently rolling out LPG pilot programmes to households in Tshwane's Atteridgeville and Thembisile's Tweefontein townships. The objectives of the pilots are to offer households an alternative choice of energy for cooking and space heating, thus enabling them to switch from electricity to LPG for cooking and space heating. The ultimate result of such an intervention is to contribute to demand side management (DSM) objectives, which is one of Eskom's long-term strategic objectives to minimise consumption of electricity during peak periods by consumers. If the pilots indicate support, then DSM funds could be used to assist especially the low income households to switch to LPG for cooking and space heating. It is also the aim of the pilots to promote LPG as an appropriate household energy carrier for thermal purposes with a long-term view of converting consumers to natural gas as and when it becomes available throughout the country. The pilots also are intended to inform and provide the DME with important policy issues and insight into the operation of the LPG industry which will be used to inform policy with a possible regulatory framework around pricing of LPG.

There is virtually no infrastructure in the country for the importation, transportation, and optimal distribution of LPG. This is an area where the national oil company, PetroSA, can play an important role in investing in such infrastructure. Coupled with this could be sustainable supply of LPG to the market as PetroSA can approach other African oil and gas producing countries by virtue of membership of the African Petroleum Producers Association (APPA). The Algerian state owned oil company, SONATRACH, has indicated that it wishes to sell LPG to South Africa at a very affordable price.

The DME launched a pilot called Basa Njengo Magogo, aiming to educate low-income households which use coal as an energy carrier to make coal fires in such a way that less smoke is emitted.

The Energy White Paper also calls for co-ordination between government departments and various spheres of the government, so as to achieve greater integration in energy policy formulation and implementation. It is the observation of this paper that this policy objective has not taken root yet in relation to energy carriers other than electricity. The Ministry of Provincial and Local Government, for example, through municipalities, and the National Treasury, work very closely, if not in perfect harmony when it comes to electrification programmes, with the DME. This is, however, not the case when it comes to the implementation and rolling out of other energy policies and carriers. A glaring example of this is the lack of knowledge and understanding by the municipalities when it comes to the implementation of the free basic alternative energy policy – a DME-driven policy which is to be implemented by municipalities that constitutionally report to the Ministry of Provincial and Local Government. It is such disjointed co-ordination between government departments and various spheres of government that may render greater integration in the energy policy formulation and implementation futile.

3. Methodology, approach and research framework

The study aims to assess the household energy situation in poor urban areas of South Africa through a household energy survey, focused group discussions, stakeholder interviews and a literature review. A literature review was undertaken of relevant research into household energy supply and usage amongst the poor in urban and peri-urban areas of South Africa. Apart from an extensive review of secondary sources, case-based analysis will be given of Imizamo Yethu. The main data sources for the study were household energy surveys conducted by the ERC, Department of Minerals and Energy, Statistics South

Africa, City of Cape Town and non-governmental organisations. The findings of the scoping study were discussed with relevant stakeholders to learn from their experiences and to refine implementable policy options that will contribute to the provision of improved, cleaner and more sustainable energy services for the urban and peri-urban poor in South Africa.

4. Description and findings of the scoping phase

As stated above, the key objective of the study under the broader theme on ‘Energy Access’ was to carry out an initial assessment of the household energy situation in the rapidly growing urban and peri-urban areas of South Africa and identify viable and proven policy options that can assist in providing clean, affordable and more sustainable energy services. This will include assessing the extent to which previous energy policy reforms have addressed these challenges or have actually contributed to the growing problem of inadequate energy services for the poor.

The scoping study generally focused on access to clean and modern energy services by the urban and peri-urban poor in South Africa in general and on the Cape Town metropolis (Khayelitsha) in particular. Issues related to access, availability, household energy expenditure, and the affordability of energy sources (electricity, paraffin, LPG) and appliances was explored.

This study also reviewed the most important government policies and strategies that address broader urbanization processes and spatial questions, policies and programmes at local government (municipality) level because the provision of clean energy services to the urban poor are linked to these policies and strategies.

4.1 Policies and strategies to address urbanization and spatial issues

South Africa has three spheres of government – national, provincial and local. The division of powers and functions between various levels of government has the potential to increase capacity to address poverty and inequality. Whilst the national government is responsible for establishing norms and standards regarding redistribution and equity, thus providing the framework within which service delivery will occur equitably, a significant proportion of services delivery that will impact on poverty and inequality is the responsibility of provincial and local government or municipalities. In terms of the Constitution, municipalities have a mandate to govern, to provide services and to promote social and economic development. Local government has been described as the ‘hands and feet’ of reconstruction and development in South Africa, and it is true that in the absence of effective local delivery, government is powerless to implement its policies and provide services (HSRC 2004).

The Reconstruction and Development Programme (RDP) was the first developmental policy document of the national democratic government. However, the RDP was vague on urbanization with a strong focus on the needs of all citizens, irrespective of where they may live. In 1995/6 the RDP Office coordinated two strategies: the Urban Development Strategy (UDS) and the Rural Development Framework. These strategies encouraged synergies between rural and urban areas to promote economic linkages. No clear policy directives emanated from these strategies and various government departments introduced their own strategies, with their own views on urbanization and migration (Atkinson *et al*). The UDS planning was subsequently transferred to the Department of Housing, which then published the strategy as the Urban Development Framework in 1997. The UDF argued strongly for more efficient and productive cities and towns, through the growth of local economies.

In 2003 the government made renewed attempts at finding alternative ways of service delivery. The Urban Renewal Programme and the Integrated Sustainable Rural Development Strategy were formed to address the vexed questions of interdepartmental coordination and to effect intergovernmental cooperation. Together with these strategies the first National Spatial Development Perspective was formulated to coordinate the spatial allocation of resources in South Africa. The key issues are to define where growth and decline would occur in the space economy, and to consider government investment in infrastructure and shelter programmes.

4.2 Policies and programmes at local government or municipal level: City of Cape Town

The provision of basic services to all residents has been the most important priority for all post-apartheid local governments. After 2000 all local governments put in concerted efforts to redress the imbalances of the past. The national government via the Municipal Infrastructure Grant supported them in addressing basic service provision backlogs. Current backlogs in housing are largely a product of the continuing formation of informal settlements resulting from migration into the cities.

The City of Cape Town is the first city in Africa to develop a comprehensive energy and climate change strategy. The overall objective of the strategy is to promote sustainability within a framework that provides a clear vision and direction for the city as a whole, and specifically the energy sector. The strategy recognizes that the approximately 300 000 poor households require a special strategic focus, as conventional market-driven supply systems do not effectively meet their needs because of their low spending power. Furthermore, the city recognizes that energy related problems such as shack fires and paraffin poisoning, as well as poor indoor and outdoor air quality, result in an unacceptable burden on poor households.

The City of Cape Town has a population of approximately 3 154 000 people or about 800 000 households (300 000 low-income and 500 000 middle-to-high income). All formal households are connected to electricity, whilst informal electrification rates are difficult to estimate. According to Roger MacFarlane of the CCT Electricity Department (City of Cape Town 2008), informal settlements change frequently due to people moving in and out and some moving to formal houses. Informal settlements on private land are not eligible for electrification (although some houses on private land do get some form of electricity in cases where they border informal electrified areas, and not all housing settlements on municipal land are eligible for electrification – such as those on road reserves, pylons and banks of rivers and wetlands. A number of households are illegally electrified (i.e. shacks close to electrified households) – a ‘small business venture’ for electrified households. MacFarlane estimates the percentage of informal households as follows: 80-85% of informal households on municipal land are electrified, as are roughly 60% of total shacks in informal areas (both on private and municipal land). About 26% of people live under the ‘breadline’ (State of Energy Report for Cape Town 2003). Approximately 19% of households are informal (shack informal and backyard informal). Table 4 gives an indication of the key household energy characteristics of low income households in the City of Cape Town.

Table 4: Key household energy characteristics: low-income
Source: City of Cape Town: Energy and climate change strategy Draft 2005

1.	Partly dependent on fuels such as paraffin, particularly in informal settlements
2.	Problems: 10 – 20% of income spent on energy. Paraffin and candles cause fires. The extent of the devastation is exacerbated by the density of informal settlements and consequent lack of access for emergency vehicles, as well as strong prevailing winds; Paraffin poisoning of children; indoor air quality poor.
3.	Efficiency potential: Thermally efficient housing design could save 15% energy whilst efficient lighting could save 5%

The City of Cape Town has set itself various quantifiable targets in its Energy and Climate Change Strategy (City of Cape Town 2005). The residential sector targets include the following:

- 10% of all households to have solar water heaters by 2010.
- 10% of City-owned housing to have solar water heaters by 2010.
- All City-owned housing to use CFLs by 2010.
- All existing houses to be retrofitted with ceilings by 2020.
- 90% of informal households to be connected to electricity from 2010 onwards.

A literature review was undertaken of relevant research into household energy supply and usage amongst the poor in urban and peri-urban areas of South Africa. Apart from an extensive review of secondary sources, case-based analysis was given of Khayelitsha, a generally poor urban township outside Cape Town. The main data sources for the study were obtained from household energy surveys conducted by the ERC, DME, Statistics South Africa, City of Cape Town and non-governmental organizations.

4.3 Overview of the findings of the Khayelitsha household energy survey

A household energy survey was conducted in 2004 in Khayelitsha. The main objective of the study was to identify and understand the barriers to modern energy services in low-income urban communities. The report focuses mostly on barriers to access electricity and less on barriers to use other fuels like paraffin and LPG.

Khayelitsha is a township about 30 kilometres from the centre of Cape Town. It was established in 1984, when the apartheid government sought to control the accommodation of black South Africans in urban areas. As in many other parts of the country, poorly serviced high-density 'urban' settlements were established at some distance from the main industrial and commercial localities, allowing a labour pool (of, in this case, mainly poorer people from the Eastern Cape) to be housed close enough to Cape Town to be able to work in local commerce and industry, while at the same time keeping them separate from the wealthier sectors and suburbs. People who had previously been living in a number of scattered shack areas near Cape Town were relocated to Khayelitsha (which means 'new home'). The township has grown to a population of more than 600 000 people, absorbing new migrants, and foreigners from neighbouring African countries, as well as some of the natural growth from communities in other Cape Town township areas and within Khayelitsha (Cowan & Mohlakaona 2004).

Four areas in Khayelitsha were chosen: Monwabisi Park, Kuyasa, Makhaya and Site C. Table 5 provides a summary of sample and sub-sample sizes.

Table 5: Sample sizes and localities in 2004 Khayelitsha energy survey

Source: Cowan & Mohlakoana (2004)

<i>Locality in Khayelitsha</i>	<i>Area type</i>	<i>No. of households interviewed</i>	<i>% of sampled households without a electricity supply</i>
Site C	Shacks – serviced	49	0%
Monwabisi Park	Shacks – unserviced	74	51%
Kuyasa	RDP houses	54	0%
Makhaya	Core houses	49	0%
Total sample		226	17%

The report identified two barriers to access electricity namely access to an electric supply and the ability to afford to use the supply. The survey sampled three categories of households: metered, extension cord, and unelectrified households

All households in the survey were asked their opinions about the ease of access to an electricity connection. 80% replied that access was easy, or very easy. 11% said access was difficult or very difficult. Most of the latter lived in informal settlements, but even there the majority felt that access was easy. The report states that access to an electricity connection is only difficult for those households living in areas which are not approved for settlement (by the municipality). However, this is an important category of households, both because of the extra needs and hardships they may experience, and because of in-migration – mainly in search of employment.

For electrified households the main barrier on extensive electricity use lie in household budgetary constraints.

Households using extension cords mentioned a number of disadvantages. Many complained that the power supply was unreliable (37% of responses), that they were charged too much (24%) and that the extension-cord power supply could cause damage to appliances (22%). Other problems mentioned were that the connecting wires could be stolen (11%) and three households said that extension cords were dangerous. All these households expressed a strong intention to obtain a metered supply through the normal supply authorities, rather than relying on informal connections.

All respondents with no electricity supply expressed a willingness to pay for a metered connection. However, the main constraint these households experienced was the fact that their homes were built on unauthorised land and the municipality would not supply them with an electricity connection..

People were asked about the disadvantages of using electricity, LPG and paraffin. A minority (24%) said it was expensive to use electricity, while smaller numbers of people's answers mentioned safety concerns (17%), availability (6%) and poor customer service (2%). The overall picture is that people in the sampled areas of Khayelitsha feel that there are few disadvantages in using electricity, compared with other fuels (Cowan & Mohlokwoana, 2004).

Table 6: Disadvantages of using electricity

Source: Cowan & Mohlokwoana (2004)

Answer category	Number of responses	% of responses
No comment / don't know		39%
Expensive		24%
Dangerous		17%
Supply not sufficient, or unreliable		12%
Sometimes not available to buy		6%
Poor customer service		2%
Totals	274	100%

The biggest concern about the use of LPG was safety. As Table 7 shows, 66% of the responses mentioned safety concerns.

Table 7: Disadvantages of using LPG

Source: Cowan & Mohlokwoana (2004)

Answer category	Number of responses	% of responses
No comment / don't know		17%
Dangerous		66%
Expensive		7%
Smells bad		4%
Difficult to obtain		4%
Not easy to use		2%
Heavy to carry		1%
Totals	337	100%

As shown in Table 8, by far the greatest concern is in the area of paraffin safety, which includes worries about fire dangers, paraffin poisoning by ingestion, and adverse health impacts arising from smoke. The overall picture is that Khayelitsha residents (in the sample) do not like to use paraffin. But nobody said it was hard to obtain paraffin, and few (4% of responses) complained it was expensive (Cowan & Mohlokwoana, 2004)..

Table 8: Disadvantages of using paraffin*Source: Cowan & Mohlokwoana (2004)*

<i>Answer category</i>	<i>Number of responses</i>	<i>% of responses</i>
No comment / don't know		4%
Dangerous / polluting		79%
Smells bad		10%
Expensive		4%
Not easy to use		3%
Totals	337	100%

In terms of accessibility of fuels, the majority of respondents perceived electricity as very accessible (equal to paraffin), very efficient, cheap, very clean, very easy to use and very safe. Perhaps the most striking result here is that most people considered electricity very safe, while the median responses for all the other fuels were 'dangerous' or 'very dangerous' (candles). In terms of specific problems with electricity, the majority viewed power failures as the main problem. People also complained that they were not warned in advance when there were going to be power failures.

Initial findings of the scoping study were discussed with relevant stakeholders to learn from their experiences and to refine implementable policy options that could contribute to the provision of improved, cleaner and more sustainable energy services for the urban and peri-urban poor in South Africa. Table 9 summarises the key issues related to access to these fuels for the urban and peri-urban poor.

Table 9: Summary of issues related to access for the urban and peri-urban poor in South Africa

<i>Fuel</i>	<i>Reasons why fuel is used</i>	<i>Reasons why it is not used</i>	<i>Issues related to access</i>	<i>Reasons why issues exist</i>
Electricity	Clean and convenient to use; relatively cheap and 50 kWh free per month to the poor	Minimum purchasing amount is too high for many poor people – whilst paraffin can be bought in small amounts which is affordable to the poor who have irregular income	People on unapproved land excluded from electrification; Uncontrolled growth of informal settlements; Extension cords are dangerous and expensive	Access to approved land is limited; Low lying areas; steep slopes
LPG	Clean and fast cooking	Expensive compared to electricity and paraffin; Users have to transport cylinders; Risk of accidents and can dangerous in shack fires	Poor distribution network; Appliances are expensive	Low demand creates poor distribution; LPG not subsidized; High markup in distribution chain
Paraffin	Easily available; It is affordable and free from VAT; Can be bought in small quantities; Appliances easily available and affordable	Shack fires; Bad smell; Children sometimes mistaken paraffin for cooldrink	People sometimes use contaminated bottles to buy paraffin	Safer paraffin appliances; Education and information needed about the safe use of paraffin; Mandatory standards to promote safer stoves

4.4 Key findings

- More than 80% of the urban population has access to electricity.
- The three most commonly used clean energy sources available to the urban poor in South Africa are electricity, LPG and paraffin. Paraffin is the primary fuel used for cooking and heating in electrified poor urban households. In unelectrified poor urban households it is the most common fuel used for lighting, cooking and heating. LPG is limited by its current pricing and distribution structure, as well as by the perception of the poor that it is a dangerous fuel
- In 2003 the government introduced the EBSST to assist poor households who have a record of using less than 150kWh monthly. These households qualify for a free allocation of 50kWh of electricity per month. The implementation of EBSST is fraught with difficulties, not least of which are the various pricing and delivery limits imposed by the plethora of different distribution agencies (Prasad et al: 2006).
- Barriers to electricity access: (1) Access to supply – only difficult to those urban households living in areas not approved for settlement; and (2) ability to make use of electricity for various desired energy services – affordability of electricity and appliances.
- Backyard dwellers and some people in informal settlements are supplied by neighbours via extension cords. Problems with extension cords: power supply unreliable; they do not benefit from government subsidies; suppliers charge them too much; the extension cord power supply cause damage to their appliances; connection wires could be stolen and the wires were dangerous. The cost of connection wires is high and these wires are sometimes stolen or tampered with.
- Even after electrification a major percentage of poor households (both rural and urban) continued to use non-electric fuels for their larger-quantity energy needs.
- The wider socio-economic development benefits of electrification seemed disappointing, partly because this improved supply was not integrated with other necessary improvements in infrastructure, services and economic development initiatives.
- Despite the fact that most of the urban poor have access to grid electricity, paraffin remains the fuel of necessity for cooking, for a large number of urban households. This may be attributed to a good paraffin distribution network, easy access in slum areas, relatively cheap appliances and the fact that paraffin can be purchased in small quantities which match the irregular income streams of the poor. In 2001 the government exempted the sale of paraffin from VAT to make it more affordable to the poor. Because the urban poor live in high density areas, shack fires caused by the use of paraffin lead to the loss of lives and property as well as ingestion by small children.
- LPG is used less frequently by the urban poor because of perceptions of danger associated with its use, poor distribution networks in slum areas, upfront cost for containers, high cost of appliances and the fact that LPG is relatively far more expensive than electricity and paraffin.
- Access to land tenure was identified as a critical issue. In the City of Cape Town the estimated number of households without access to land tenure and adequate housing and services is 360 000, and this is estimated to be increasing by an additional 16 000 households per year as a result of in-migration.
- Upgrading informal settlements is not prioritised by the City of Cape Town. It is mentioned in the city's strategy document, but implementation is rather slow.
- Municipal budgetary planning and allocations for infrastructure development and housing are hampered by the rate of in-migration to the city.
- Stakeholders highlighted the fact that new housing developments are located on the periphery of urban areas far from employment opportunities and social services. As a result, some poor

households opt to stay in informal settlements (or even return to) informal settlements, because these are centrally located.

4.5 Areas of research identified for the thematic phase

- Reliable data on household energy use patterns is generally old. This is problematic when one considers that the data is not reflecting the impact of the extensive electrification programme which has taken place largely since 1996.
- There is a lack of information with regard to government policies for the upgrade of informal settlements.
- There is no information as to perceptions with regard to the cost of clean fuels; ease of accessibility for different fuels; problems associated with the use different fuels
- Information about expenditure on fuels for the different electricity categories (metered, extension cord and unelectrified customers) is needed.
- There is a need to explore the link between energy fuels and small business/productive enterprises at household level.

5. Description and findings of the thematic phase – Imizamo Yethu household energy survey

The township of Imizamo Yethu is situated in the picturesque seaside suburb of Hout Bay, about 20 kilometres outside Cape Town. Hout Bay is like a microcosm of South Africa, with a wealthy, mainly white community, living nearby the black community in Imizamo Yethu, and a so-called ‘coloured’ community in the township of Hangklip near the harbour. Imizamo Yethu, meaning ‘through collective struggle’, is a site-and-service scheme informal settlement situated on 18 hectares. It has about 3 800 households and a population of roughly 16 000 (Tokwe, 2008) who are mainly Xhosa-speaking. The informal settlement was established in the early 1990s when 450 families who had been squatting in shacks around Hout Bay were moved to this new area on the side of a mountain overlooking the harbour. The population of the township has mushroomed since then, as black people in search of work, education and a better future settled there. The photographs below show the main entrance to Imizamo Yethu, a typical shack built there of a variety of building materials, and a general view.





Imizamo Yethu is a poorly serviced high-density ‘urban’ settlement close to the commercial localities of Hout Bay. It has a section with formal houses, but the overwhelming majority live in informal settlements, some well established (and serviced), but others where people have been building shacks in unplanned areas that have not been authorized by the municipality, e.g. in areas considered too close to roads, subject to flooding, or subject to land-use disputes. A study by the Southern African Labour, Development and Research Unit (Saldru) found that more than 96% of Imizamo Yethu’s residents live in shacks.

The survey paid special attention to the energy situation of such residents. Their significance, from a social perspective, lies in the extra hardships and insecurities experienced by such households, their generally lower income levels, and the fact that these unserved ‘fringe’ settlements are likely to remain a continuing (though dynamic) feature of urban life, as people continue to migrate towards cities in search of work. For people in this sub-group, access to cleaner fuels is indeed a concern. These are mainly the result of people continuing to migrate to Cape Town, leading to the development of informal shack areas where municipalities face the challenge of upgrading the facilities and services or allocating alternative housing areas.

As part of this study a household energy survey of 100 low-income urban households were conducted in Imizamo Yethu to further investigate issues related to access to electricity, paraffin and LPG. The study also investigated the uptake of small business/productive enterprises. Some of the main energy-related

questions which were expected to be important in Imizamo Yethu, and which the survey hoped to elucidate, were as follows.

- Among electrified households, to what extent is a transition towards greater electricity use taking place? Or are most low-income households continuing to use other fuels (such as paraffin) for their main thermal energy needs?
- Among all households, what are the income and affordability constraints which may be causing aspects of ‘energy poverty’ (such as not being able to cook regularly, or enforced use of dangerous/polluting fuels)?
- What are people’s perceptions with regard to access to affordable, clean and safe energy services.
- Given the prevalence and devastating effects of township fires, especially in informal shack areas, what are the current patterns of paraffin (kerosene) use.
- As a cleaner, more convenient and statistically safer fuel than paraffin, is LPG preferred over paraffin, and affordable?

In general, detailed and up-to-date information on energy use patterns among low-income households in South Africa is scarce (partly due to the high costs of conducting such surveys). It is hoped that this project has provided an opportunity to gather data which can be useful on many fronts.

Three communities were surveyed: Dontseyake (unelectrified), Zola (meter-electrified) and Hedges (mixture of electrified and extension cords). Table 10 provides a summary of sample sizes and localities surveyed.

Table 10: Sample sizes and localities by community surveyed

<i>Locality in Imizamo Yethu</i>	<i>Shacks – serviced</i>	<i>Shacks - unserviced</i>	<i>No. of households interviewed</i>
Dontseyake	0	46	46
Zola	29	0	29
Hedges	17	8	25
Total	46	54	100

Table 11: Household access to energy by community surveyed

<i>Community</i>	<i>Metered supply</i>	<i>Extension cord</i>	<i>Unelectrified</i>	<i>LPG</i>	<i>Paraffin</i>
Dontseyake	0	20	26	3	46
Zola	29	0	0	3	10
Hedges	17	8	0	0	24
Total	46	28	26	6	80

5.1 Electricity supply

All interviewed households in Zola had regular metered electricity supply and of the 25 households interviewed in Hedges 17 had access to metered electricity supply. The households interviewed in Dontseyake had no access to metered electricity supply. In the unserviced area of Dontseyake, 20 of the sampled households had an electricity supply obtained from neighbours, making use of an extension cord, and 26 were without electricity supply. None of the sampled households had an illegal connection, in the sense of obtaining electricity that was not paid for. Overall, 74% of the sample surveyed had electricity.

5.2 Metered electricity

Access to electricity leads to a reduction in the use of other fuels. The number of years lived in a locality has a positive correlation with metered electricity. The inference is that the longer people have lived in a locality the better they overcome some of the barriers associated with access to metered electricity. Electrical appliance ownership was also positively correlated with electricity use, and metered electricity customers used more appliances than those with extension cords.

5.3 Extension cords/informal electrification

Extension cord connections are very expensive compared to metered electricity. The latter is a free connection for those who qualify. Extension connections are expensive in terms of the costs for electrical cords, labour as well as the cost of electricity itself. In this category the common arrangement is that the supplier of electricity does not pay for electricity as the cost is covered by the customers.



Table 12 shows the energy expenditure (Rands/month) per fuel type by electricity status group. Extension cord users have the highest energy bill (R236) followed by unelectrified households who spend on average R186 per month. Extension cord users also spend more on paraffin than electrified households.

Table 12: Energy expenditure (Rands/month) per fuel type by electricity status

	<i>Electricity</i>	<i>Gas</i>	<i>Paraffin</i>	<i>Total</i>
Metered electricity	108	0	24	132
Extension cord	171	0	65	236
No electricity	0	46	140	186

Table 13 shows that the average cost (rand) per connection for an electricity meter (R64) is almost 10 times less than the cost per extension cord (R604).

Table 13: Average cost (Rand) of connections

	<i>Average cost of connection (R)</i>
Metered electricity connection	64
Extension cord connection	604

5.4 Unelectrified households

The use of paraffin is strongly correlated with access to electricity. Dontseyake, which has the highest percentage of extension cord users, and unelectrified households are the highest users of paraffin. These households live on unauthorised land and will not be electrified in terms of government policy. Paraffin is the main fuel used by this group for cooking, heating and lighting.

5.5 Ease of accessibility for the different fuels

Table 14: Accessibility to electricity

	<i>Type of electricity supply</i>			
	<i>Metered</i>	<i>Extension</i>	<i>Unelectrified</i>	<i>Total</i>
Very poor			3	4
Poor		10	18	38
Good	42	18	5	65
Very good	4			4
Total	46	28	26	100

All the metered customers perceive access to electricity as good to very good, as oppose to the majority of unelectrified customers who perceive access as poor.

Table 15: Accessibility to LPG

	<i>Type of electricity supply</i>			
	<i>Metered</i>	<i>Extension</i>	<i>Unelectrified</i>	<i>Total</i>
Very poor			2	2
Poor	20	19	9	48
Good	26	9	15	50
Very good				
Total	46	28	26	100

Fifty percent of all customers view access to LPG as poor. Ninety four percent of the sample perceives access to paraffin to be good. All unelectrified customers, who use paraffin almost exclusively, view access to be good.

Table 16: Accessibility to paraffin (kerosene)

	<i>Type of electricity supply</i>			
	<i>Metered</i>	<i>Extension</i>	<i>Unelectrified</i>	<i>Total</i>
Very poor				
Poor	4	2	0	6
Good	38	26	26	90
Very good	4			4
Total	46	28	26	100

5.6 Problems associated with the different fuels

The majority of electricity users regard electric shocks and power failures as the main problems associated with the use of electricity. Risks of fire accident and high costs are the main disadvantages of

using LPG, and to a lesser degree scarcity of supply. The main disadvantages of using paraffin are health problems and the risk of fire disaster.

5.7 Energy and small business take-up/productive enterprises

It is clear from this sample surveyed and a literature research that electrification in poor urban areas of South Africa does not necessarily lead to the uptake of productive enterprises and small businesses at household level. Most of the small businesses are of a retail nature. Micro-enterprises such as road-side kiosks and restaurants, car repair and communication services are situated along the main road used by public and private transport.

As for small business take-up at household level, a distinction is made between the intention to do business and the actual establishment of small business enterprises. Table 14 summarises the number of business intentions declared as opposed to the number of businesses established, for the different type of electricity supply. Thirty households with metered electricity declared an intention to establish a small business as oppose to eighteen using extension cords. Only nine unelectrified households declared an intention to start a small business, but none have been established in this category.

Table 17: Small business uptake

	<i>Type of electricity supply</i>		
	<i>Metered</i>	<i>Extension cord</i>	<i>Unelectrified</i>
Intention to start business	30	18	9
Established small businesses	16	10	0

The electric fridge is the main appliance used by small businesses, followed by the electric stove and sewing machine, with none using a paraffin appliance. The types of small household businesses include the selling of meat, cooked meals, clothing/sewing, the selling of fruit and vegetables, shebeens (selling liquor), and spaza shops.

The largest manufacturing industries are in butchery, arts and craftmaking and dressmaking/tailoring. In the service sector the retail shops, bars (shebeens) and barber shop/beauty shop/hairdressing salons are the most common services (Prasad 2008). Many small businesses operate from homes in the community offering a wide variety of services (see photograph below).



5.8 Stakeholder consultations

A range of stakeholder consultations were held with representatives from local government, national government, provincial government, NGOs and private consultants.

The DME only funds electrification to informal settlements located on approved land. This excludes electrification to people living on unproclaimed land which are typically located on the outskirts of existing informal settlements, private land, reserves and inappropriate land such as swamplands. The DME will thus only electrify proclaimed areas allocated by the local authorities (Tinto, 2007). City of Cape Town's electricity department is responsible for the electrification of people living in low-income areas and informal settlements. In informal areas they provide electricity to people that have lived in the area for three years or longer, provided they are not living on unproclaimed land. This policy is applied by all municipalities throughout the country.

A focus group discussion was held with community leaders in Imizamo Yethu. Currently negotiations are continuing with the City of Cape Town to make more land available to build low-cost houses to accommodate people living in shacks. Negotiations are hampered by objections from the surrounding Hout Bay community who fear that low-cost housing will devalue their properties. According to one of the leaders, electricity, water and sanitation are the key priorities for the residents of Imizamo Yethu in terms of infrastructure development. The spread of shack fires, caused mostly by candles and paraffin, is further exacerbated by the extension cords and lack of water to extinguish the fires. This is further complicated by density of the shacks which makes it difficult for fire engines to enter the area.

Some general concerns raised by stakeholders are given below:

- Access to land tenure was identified as a critical issue. In the City of Cape Town the estimated number of households without access to land tenure and adequate housing and services is 360 000, and this is estimated to be increasing by an additional 16 000 households per year as a result of in-migration.
- Municipalities lack the capacity to identify and target beneficiaries of FBAE, as well as to identify appropriate energy sources.
- Awareness should be raised the acceptance of fuels other than electricity through FBAE policy does not exclude future electrification.
- Low-cost housing built by the local government continues to be located on cheap land far from economic activities.
- Upgrading informal settlements is not prioritised by the City of Cape Town. It is mentioned in the city's strategy document, but implementation is rather slow.
- Municipal budgetary planning and allocations for infrastructure development and housing are hampered by the rate of in-migration to the city.
- Stakeholders highlighted the fact that new housing developments are located on the periphery of urban areas far from employment opportunities and social services. As a result, some poor households opt to stay in informal settlements (or even return to) informal settlements, because these are centrally located.

6. Conclusion and recommendations

South Africa, compared to many other developing countries, enjoys a number of advantages which favour national electrification and the extension of benefits to the poor. These include the economic capacity to carry out a subsidised national electrification programme, a fairly favourable policy environment, a free basic energy subsidy to the poor and a reliable (until recently) low-cost electricity generation capacity.

A random survey of 100 households was conducted in Imizamo Yethu to further investigate issues related to access to electricity, paraffin and LPG. The study also investigated business/productive uses of energy at the household level.

Access to electricity is not the main problem to the majority of the urban and peri-urban poor, but rather the ability to afford to pay for the service. According to the sample surveyed, almost 70% perceived access to electricity as good. People living in settlements not approved for housing by local government experience the gravest forms of energy poverty. Some of these people make use of extension cords, with attendant reported problems of less security of supply, dangers, theft of wires and higher costs than metered customers. The average cost of an extension cord connection is almost 10 times a metered connection according to the sample surveyed. This category of households, according to the survey, had the highest per capita expenditure on energy and do not benefit from the free basic electricity subsidy.

Households without any electricity had a higher per capita average energy expenditure than electrified households, but lower than the extension cord customers, and are forced to make use of dangerous appliances (paraffin) and fuels in densely populated informal settlements.

The problem the urban poor experience is broader than electricity supply. It is rooted in the housing shortage, land issues and continuing in-migration to urban and peri-urban areas. Perhaps their energy problems could be partly addressed by de-coupling electricity provision from settlement legitimacy issues. On the other hand, this could compound the broader land-planning, housing and service-provision challenges faced by the municipality, and possibly impede a more sustainable, safe, long-term solution (Cowan & Mohlokoana, 2004).

Access to paraffin is very good because of a good infrastructure network, paraffin is zero VAT rated and paraffin appliances are generally cheap compared to electric and LPG appliances. Access to LPG is regarded as not good because of a poor network, distance to retail outlets, and the high cost of gas and appliances.

Access to electricity does not automatically lead to higher levels of productivity and income generation. Most of the small businesses at household level are of a retail nature. Of the households surveyed, 57 expressed the intention to start a small business, whilst only 26 home businesses were actually established. Interestingly, none of the unelectrified households had an actual business, and only a small number of them, compared to the electrified customers, expressed an interest in starting a business. The electric fridge is the main business appliance and shebeens (selling liquor) appear to be the main type of business in Imizamo Yethu.

From the sample survey the majority of electricity users (both metered and extension cord), regard electricity shocks and power failures as the main problems. The latter is more a problem for extension cord users. All three categories regard LPG as dangerous and expensive. The main disadvantages associated with paraffin use are health problems and the risk of fires.

Better identification and targeting of the indigent by municipalities is needed in order for these people to benefit from FBAE. Municipalities also lack the capacity to identify appropriate fuels for the urban poor.

Poverty reduction efforts of the scale required in South Africa and elsewhere require a great deal more than the securing of property rights in the manner prescribed. Tenure reform remains necessary and important, but is far from sufficient. There is a need to build a better understanding of the complexity of multiple, informal tenures within the extra-legal sector and acknowledge that they are fundamentally different from the individualised, exclusive, private property systems regarded as the Western norm.

Proper identification, measurement and mapping of informal settlements is not always easy. Sometimes, informal or 'illegal' settlements do not appear on city maps, including those intended to guide infrastructure network extensions. These homes are not officially counted as part of the urban poverty population, which is limited to households having a place of residence. They therefore do not qualify for most anti-poverty programmes. Accurate poverty assessments can both better inform policy choices and serve as an important act of empowerment for the poor population.

There is a lack of data regarding urban and peri-urban poor populations and neighbourhoods, because there is a tendency, especially strong in official statistics, to use the same poverty indices for both rural

and urban areas. We do not have adequate data on the urban poor for two reasons: they are either not counted at all because they are occupying land illegally, or information collected is compiled in statistical averages that reflect the urban area as a whole and tell us almost nothing about poor populations specifically.

Access to electricity has to be accompanied by a number of other supportive measures before it makes a strong contribution to meeting poverty-related basic needs of the poor. Similarly, access to electricity does not necessarily lead to an increase in productive enterprises or income generating activities. It has to be accompanied by other supportive circumstances.

Integrated urban energy centres (one stop shop offering information and the sale of energy appliances and fuels) should be established which would enable households to have immediate access to information and various energy sources.

Municipalities need hands-on support (practical and active) to assist them to execute effective policy implementation.

Communication between different spheres of government (national, provincial, municipalities) remains a challenge in delivering services. Differences in the ending times of financial years between these different spheres of government lead to a difference in delivery times in project plans, which further hampers service delivery.

It is the recommendation of this study that the White Paper on Energy should be explicit in its prescription as to which government departments must co-ordinate their activities related to policy formulation and implementation relevant to energy. The past years have given enough lessons as to which government departments and spheres of the government have an impact or otherwise in the implementation of energy related services and policies.

7. Further areas for research and the way forward

The socio-political benefits of electrification are well documented, but economic benefits that are generally assumed have not been well researched and analysed. Future research should focus on the impact of electrification on the uptake of small and productive enterprises and self-employment among households in poor urban and peri-urban areas.

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