Alleviation of Poverty Through the Provision of Local Energy Services

APPLES

Project no. EIE-04-168

Deliverable No. 4:

Report on Selected Locations

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Introduction

In defining the criteria to be applied for the selection of the APPLES project locations several broad considerations were made. Overall, it was agreed that the selected locations should together offer a range of conditions to allow the experiences to be widely replicated. In the selection of locations for the APPLES projects, it was also decided that the selected locations must have:

1. Infrastructure, existing or under development, that can be used as a foundation for APPLES activity.
2. Political stability and consensus from policy makers at all levels.
3. Close links to the nationally-determined poverty nodes.
4. Local community buy-in.
5. Close match with the interests of APPLES project donors (national and international).
6. Local authority commitment, with evidence of demand for energy services and willingness for participation.
7. Demand for energy services and willingness to consider alternative energy solutions.
8. Practical accessibility through infrastructure (tarred roads or well-used dirt tracks) that is unrestricted at all times of the year.
9. A diversified portfolio of interests, recognizing the need for energy access to achieve other economic development objectives.
10. No duplication or conflict with other activities.

Using the above criteria, the following locations have been identified as targets for APPLES:

- *Khayelitsha* in peri-urban Cape Town
- *Imizamo Yethu* in peri-urban Hout Bay (near Cape Town)
- *Nkweletshini/Highflats* in a rural area of the province KwaZulu Natal
- *Lucingweni/Hluleka* in a rural area of the province Eastern Cape

As pointed out in this project's Inception Report, the exact extent to which the above criteria and the needs of the project are met on each location can only be ascertained after visits to the sites. As a result of the sustained delay of funding from the main South African co-funder, the Department of Science

and Technology, such visits have not yet been possible. This document is therefore restricted to providing a brief socio-economic profile of each location and a short description of current energy use there, based on existing information. For each location the decisive factors in the choice of the site are listed. The rest of the document presents the selected locations, with Khayelitsha as the first followed by Imizamo Yethu, Lucingweni and Nkweletshini. The document ends with a section containing brief concluding remarks.

Khayelitsha[1]

Socio-economic profile

Khayelitsha is a township about 30 kilometers outside the inner-city areas of Cape Town. The township was established in 1984 and has grown to a population of more than 600 000 people[2]. A third of Capetonians live in this area and it absorbs new in-migrants as well as some of the natural growth from communities in other Cape Town township areas and within Khayelitsha.. The township is located in a rather barren portion of the Cape Peninsula. The ground is sandy, and the area is wind-swept and exposed, which causes significant problems at certain times of the year. During the rainy winter season, several areas of Khayelitsha are vulnerable to bad flooding. Levels of air pollution are so high that the City of Cape Town has a targeted the township for a campaign to improve its air quality.

Many of today's residents originate in the rural areas of the Eastern Cape and came to the township in the hope of finding work. However, Khayelitsha hosts more than 50% of the city's unemployed population and 48 percent of the surveyed economically active in Khayelitsha are unemployed. One of the important features of Khayelitsha is that the population is not static. There are people living in shack areas (informal settlements) and people living in formal brick housing. Resulting from new people moving to the area, there is settlement pressure and new shacks are built on marginal areas of land which are not approved for settlement by the municipality. In the latter cases, as opposed to

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1 This section consists to a very large extent of (occasionally modified) extracts from the ERC Report "Barriers to modern energy services in low-income urban communities: Khayelitsha energy survey, 2004", by Bill Cowan and Nthabiseng Mohlakoana, 2005. Obviously, the current author is nevertheless responsible for any flaws in the content.

2 In a case study covering the electrification programme in Khayelitsha, Wendy Annecke reported that the latest official count was 625 000, but the local electricity supplier, PN Energy, estimated 1 million. (Annecke W, 2003, *Innovative approaches to slum electrification: a case study*. Presented to Human Sciences Research Council, Cape Town.)

informal settlements on approved grounds, the provision of services such as running water, sanitation and electricity is very limited. The informal settlements are thus divided among those that have services and those that are without. The formal brick houses are divided as well. At least four types of socio-geographical areas of Khayelitsha need be recognized:

- Informal settlements with shacks which are *not* provided with services except for a few communal water taps. There is no formal electricity provision, but some households get an electricity supply from other nearby households, using extension cords.

- Informal settlements (shacks) which have been provided with basic services such as water, electricity and sanitation. Each shack is on a site that has been allocated to the owner by the municipality's planning department.

- Fairly new areas with new houses built as part of the RDP programme. These houses are provided with electricity, running water and sanitation.

- Areas of "core houses", as they are commonly known, are settlements of the first few formal houses that were built in Khayelitsha when people started moving into the area. These houses are provided with the basic services just like the RDP homes but are much bigger.

Household energy use

The majority of households in Khayelitsha are electrified.[3] Paraffin is widely available, while LPGas is less widely distributed and tends to be expensive.[4] For the majority of Khayelitsha residents, therefore, the issue of access to electricity – in the sense of having an electricity connection – is less of an issue than are the constraints to *deriving energy services* from electricity. This said, the significant minority of households in Khayelitsha (as in similar lower-income urban areas elsewhere in South Africa) without a regular, metered electricity connection must be acknowledged.

[3] An accurate figure of the electrification rate may be difficult to establish, due to the dynamic population, but the percentage of electrified households is in the order of 80% or more.

[4] Due to the settlement density and the sparse vegetation in the area, access to "free" biomass fuels is very limited.

Other immediate areas for intervention, in addition to that of pollution mentioned above, are a number of issues associated with the widespread use of paraffin, such as shack fire hazards, dangers of ingestion by children and indoor air pollution from inadequately ventilated paraffin heaters.[5] Further, indications from a previous survey are that a high degree of uncertainty prevails around e.g. the relative costs of fuel use for cooking.[6] This suggests a need for participatory information and awareness campaigns so that householders can work out better facts for themselves as to what fuel choices would be most economical for them.

Motivation for the choice of the location

One rationale for selecting Khayelitsha is the diversity of areas available for interventions. Based on the past and current activities of the local partner, all criteria are successfully addressed and the site

- provides opportunity to develop and try-out demand-driven approaches, that would be required to prioritize needs
- provides testing ground for the development of effective delivery options
- benefits from an existing commitment from local authorities
- has existing structures and initiatives that would function as a project platform
- population may not yet be aware of many energy options

[5] A recent survey conducted in Khayelitsha showed that 92% of the sampled households said that they preferred electricity for cooking. Only 5% preferred to use paraffin, and 3% LPGas. This should be compared with actual energy use for cooking, where 55% of the sampled households used mainly electricity, 38% paraffin and 6% LPGas. Similarly, for space heating purposes, about 75% preferred electricity. Nearly all the remainder preferred paraffin. Yet, in practice the use of electricity for space heating was not common among the sampled households: less than 12% reported using an electric heater, while 40% used paraffin heaters.

[6] A recent desk-top analysis and university tests indicate that electricity is the cheapest cooking option for households in Khayelitsha at present, and LPGas is the most expensive. Paraffin is more expensive to use than electricity, by a smaller margin, notwithstanding the exclusion here of “externality” costs of paraffin. Yet, when surveyed nearly 90% of the respondents did not identify LPGas as the most expensive cooking-fuel option. Almost two-fifths though electricity was the most expensive fuel for cooking while almost half paraffin was the cheapest.

Imizamo Yethu

Socio-economic profile[7]

Imizamo Yethu is located in the Cape Town suburb Hout Bay. While Khayelitsha was an apartheid "black residential area" in 1983, Hout Bay under the old dispensation was designated for white occupation, with a section designated for coloured occupation. Hout Bay in 1985 remained sparsely populated with a rustic village character. However, in the same year very rapid urbanisation took off and by 2001 the black community had increased over fifty fold (from 326 to 16503). Over four-fifths of the population in the township was not born there. Thus, like the population of Khaylitsha, that of Imizamo Yethu is highly dynamic. However, while black people migrating to Khayelitsha conform to apartheid designed pales of settlement, those arriving in Hout Bay certainly do not.

Part of Imizamo Yethu has been converted into solid 2 and 3-bedroom houses through a project funded by the Irish philanthropist Niam Mellon. However, the overwhelming majority of the houses in the community are shacks. The informal settlement was created in stages. An old part of the informal settlement called "Dotsoayake" was built in the early 1990s and still exists, while the sections called "Hector Petersen" and "Shooting Range" are new and developed after a substantial part of the informal settlement was destroyed by fire in February 2004. (Thus, like in Khaeylitsha, there are shacks on both approved and non-approved areas. However, electrification rates are distinctly lower here than in Khayelitsha and anecdotal evidence suggests sanitation is a much bigger problem. [Author's note - footnote 7 refers.)

In terms of employment, 31 percent of the economically active are unemployed, which is considerably lower than the figure for Khayelitsha. On a similar note, when asked what adults liked best about living in the area 19 percent mentioned the availability of jobs or opportunities. To provide a wider perspective of the living conditions in the community, a slightly more frequent answer to the same

[7] This subsection draws on the Introduction and Tables 9, 16-19 and 58 of "Migration to Two Neighbourhoods in the Suburb of Hout Bay, Cape Town, 2005", a survey report and baseline information. The publication is compiled and published by the Southern Africa Labour and Development Research Unit and the Centre for Actuarial Sciences of the University of Cape Town.

question was the environment (nature, scenery) while also safety (low crime and violence) was a frequent answer with 15 percent of the adults.

Household energy use[8]

Out of the shacks in Imizamo Yethu, 56 percent have access to the electricity grid. Among those, two-thirds use grid electricity for all of cooking, space heating and lighting. Just above ten percent of households substitute paraffin for the grid for space heating purposes and another ten percent use paraffin for both cooking and space heating but remain with electricity for lighting. Among the shacks without access to the grid, 93 percent use paraffin for cooking and space heating, with only one-tenth of the group preferring candles instead of paraffin for lighting. Again like in Khayelitsha, the even more widespread use of paraffin is associated with hazards such as the shack fire referred to above, dangers of ingestion by children and indoor air pollution from inadequately ventilated paraffin heaters. In further comparison to Khayelitsha, the fraction of households without electricity connection, whether metered or not, is greater.

Motivation for the choice of the location

A special rationale for selecting Imizamo Yethu is its migration density, which we hope is representative of some of the conditions facing the many rural-to-urban migrants in South Africa today. Based on the past and current activities of the local partner, all criteria would be successfully addressed and like Khayelitsha the site

- provides opportunity to develop and try-out demand-driven approaches, that would be required to prioritize needs
- provides testing ground for the development of effective delivery options
- benefits from an existing commitment from local authorities
- has existing structures and initiatives that would function as a project platform

[8] The figures referred to in this subsection are own computations from the survey raw data upon which the report and baseline document mentioned in footnote 1 is based.

Lucingweni[9]

Socio-economic profile

The village Lucingweni consists of some 220 households and is located in the Nyandeni municipality within O R Tambo District Municipality in the province of the Eastern Cape. The District Municipality is an official "poverty node". OR Tambo is divided into seven Local Municipalities within which rural villages accommodate the overwhelming majority of the population. The total population of Lucingweni is approximately 1000 individuals, as compared to the 294 000 in Nyandeni and 1.7 million in the whole nodal area.

The whole OR Tambo District Municipality generally lacks a major economic base. The Government is the largest economic sector in the District Municipality. Agriculture is predominantly of a subsistence character and the potential of commercial agriculture is undermined by lack of infrastructure, training and financial support for local aspirant farmers. Several factors also undermine further investment into the area, among which are found:

- a limited skills base in the population
- high crime rates
- poorly developed infrastructure to connect the region to nearby seaports
- a complicated land tenure system which impedes access to land with economic potential

Further indicators of the severe living conditions in the region are that:

- almost three-quarters of the economically active population is unemployed
- nearly 90 percent of households live below the minimum poverty level
- over three-fifths of the working-age population has primary schooling or less as their highest level of education
- less than one-tenth of the resident population have access to formal sanitation services

[9] The information in this section draws heavily on a OR Tambo poverty node description by the South African Department of Provincial and Local government (http://www.dplg.gov.za//html/progs/isrdpNodes/Tambo.htm), but also uses information from a project description provided by Telecom Techniques (http://www.teltec.co.za/lucingwe.htm); "KwaZulu-Natal Mini-grid Feasibility Study" a report to the National Electricity Regulator by I Banks and R Aitken, 2004. The current author is nevertheless obviously responsible for any flaws in the content.

Household energy use

Lucingweni has been identified by the government to be an ideal location to test the concept of Mini Grids.[10] Especially because of its close proximity to Hluleka, where Shell Solar Southern Africa has already installed a much smaller mini grid. Lucingweni forms part of the government rural upliftment program. Shell Solar has installed generating equipment on the top of the North-facing hill above the village. The equipment consists of 5 6kWwind generators and a 50 kW array of S100 solar modules., a battery bank and inverters. The inverters suppy 220v via a conventional reticulation system to each of the 220 homes.

The mini-grid system is supposed to provide a maximum of 1 amp with a daily limit of 1kw hour per 24-hour period and household. This is intended to allow each home to have access to TV, lighting and radio. However, the mini-grid will not eliminate the need for traditional (presumably mostly wood) fuels for cooking and water heating. In the longer term it is envisaged that a number of mini grids will be interconnected in order to form a "Macro" grid and eventually as the national grid comes to the area, to connect into the multiple mini grids. The existing generating equipment will then feed into the national grid as well.

Motivation for the choice of the location

The fifth criteria in the list is essential, with great interest and support from the South African Department of Minerals and Energy. All other criteria seem acceptable, but this can only be confirmed after visits, and

- past activities demonstrate demand for energy services
- there is a strong buy-in from national Government
- contacts with past initiatives are already established
- the site provides an opportunity to demonstrate the stand-alone Integrated Energy Centre model, for which local stores can provide existing infrastructure

[10] Not unlike a number of the villages in the Eastern Cape in the old Transkei region, this village was developed along more modern lines with each home on a designated plot of land. The land was structured so that each household's piece of land abutted the next. Thus forming orderly rows along which you can string overhead conductors to each house. In a large number of the other villages in the nodal area, the houses tend to be scattered and far apart from each other making it unfeasible to interconnect them onto an electrical grid.

Highflats/Nkweletshini[11]

Socio-economic profile

The community Nkweletshini is located in a remote area of south-western Kwa-Zulu Natal. The housing is sparse, and, with less than 50 homes per km^2 the community is therefore unlikely to receive grid electricity in the foreseeable future. Hence, the community, local and regional support organizations favour experiments with alternative energization options. The area is also interesting in the sense that it not been the subject of prior study.

Homes in Nkweletshini are quite modest, containing on average three rooms, with mostly thatched roofs and walls built with either traditional mud or cement-block. Some houses have fully or partly galvanized iron roofing due to a lack of thatching grass. A survey of the community found that almost half the homes are female-headed, which suggests that labour migration has been and may still be prominent in the community. Around 45 percent of the household heads were in formal employment, two-thirds of which was in the public sector. Another quarter was either in self-employment or farming. The remaining quarter of household heads was unemployed, but around two thirds of their households received pensions.

Household energy use

In terms of household energy use, the overwhelming majority of households (more than 95 percent) use fuel wood for cooking, water heating and space heating. For lighting, 70 percent of the households use candles for lighting and the remainder use paraffin lamps. The use of wood for space and water heating is not surprising since it is easily available, cheap and few alternatives exist.

[11] The first two subsections in this section are drawn from "The energy profile of a rural community", by PJ Lloyd, A Dick and M Howells, published in Journal of Energy in Southern Africa, Vol. 15 No. 3. The article is based on a household survey to which is also referred in the current text.

Motivation for the choice of the location

The second and sixth criteria are central for the choice of this location, with infrastructure identified and close contacts established after previous work with the local partner. All other criteria are well accounted for and especially the location offers

- strong Government buy-in at all levels
- potential to model IeC as part of MPCC
- useful links to Local Economic Development
- a foundation in place for hub-and-spoke business structure
- additional donor support from GEF-SGP

Concluding remarks

In summary, to our current best knowledge, all the selected locations meet the criteria listed in the introduction. Four locations have been chosen that represent a wide range of conditions; Khayelitsha is a typical, although large township originating in the apartheid era urban planning, with a considerable internal variety of living conditions and implied energy related challenges. Imizamo Yethu is a much more recent design. With its very high migrant density it is suitable to represent conditions facing the many migrants that currently leave or have left the rural areas of South Africa for the urban. Lucingweni is a rural area that is undergoing an experience with a renewable-energy driven mini-grid system that presumably will be integrated into the national grid in a not too far-off future. Finally, Nkweletshini represents a remote, rural area for which hopes of a speedy connection to the national grid are low. As stated initially in this document, an overall objective was that the selected locations should together offer a range of conditions. The four locations presented above thus seem to meet that requirement too.