

Kuyasa Low Cost Housing Energy Upgrade Project, Khayelitsha, South Africa

SouthSouthNorth

Summary

The project is a retrofit activity which entails the installation of solar water heaters, ceilings and ceiling insulation and compact fluorescent light bulbs (CFLs) in existing RDP (Reconstruction and Development Programme) houses in Kuyasa, Khayelitsha, Cape Town. The proponent is the City of Cape Town Metropolitan Local Authority. The project is largely funded with public monies, with a percentage coming from CDM carbon revenue. The objective of the project is to alleviate energy poverty by providing the poor with access to renewable, and energy efficient technologies. The target audience includes households, as well as local authorities and housing departments. The project reduces GHG emissions, brings about an energy cost saving of approximately SA R 600, improves the thermal performance of the houses, reducing the need for indoor space heating with fuels such as paraffin, which cause negative respiratory health impacts and hold fire-related risks.

End-user area	Target Audience	Technical
<input type="checkbox"/> New buildings	<input type="checkbox"/> Citizens	<input checked="" type="checkbox"/> Energy efficiency
<input type="checkbox"/> Refurbishment of buildings	<input checked="" type="checkbox"/> Households	<input type="checkbox"/> Heating
<input type="checkbox"/> Transport and mobility	<input type="checkbox"/> Property owners	<input type="checkbox"/> Cooling
<input type="checkbox"/> Financial instruments	<input type="checkbox"/> Schools and universities	<input type="checkbox"/> Appliances
<input type="checkbox"/> Industry	<input type="checkbox"/> Decision makers	<input checked="" type="checkbox"/> Lighting
<input type="checkbox"/> Legal initiatives (municipal regulations, directives, etc)	<input checked="" type="checkbox"/> Local and regional authorities	<input type="checkbox"/> CHP
<input type="checkbox"/> Planning issues	<input type="checkbox"/> Transport companies	<input type="checkbox"/> District Heating
<input type="checkbox"/> Sustainable communities	<input type="checkbox"/> Utilities	<input checked="" type="checkbox"/> Solar energy
<input type="checkbox"/> User behaviour	<input type="checkbox"/> ESCOs	<input type="checkbox"/> Biomass
<input type="checkbox"/> Education	<input type="checkbox"/> Architects and engineers	<input type="checkbox"/> Wind
<input checked="" type="checkbox"/> Other - Reconstruction and Development Programme Housing	<input type="checkbox"/> Financial institutions	<input type="checkbox"/> Geothermal
	<input type="checkbox"/> Other	<input type="checkbox"/> Hydro power
		<input type="checkbox"/> Other

Introduction

The project is situated in Kuyasa, Khayelitsha. Khayelitsha is a large, mainly informal settlement about 30km from the centre of Cape Town, South Africa, with a complex social, economic and political history, with the majority of its inhabitants trapped in chronic poverty. The low cost housing units in Kuyasa have been built under the once-off RDP (Reconstruction and Development Programme) national housing subsidy. Each housing unit is 30m² in area, is electrified but has neither ceilings nor water heaters. Lighting is provided by incandescent bulbs. Thus, energy service

bench marks such as thermal comfort and warm water on demand are not met. The energy profile of the resident of Kuyasa is characterised by multiple fuel use (e.g. paraffin, wood) for space and water heating. The introduction of renewable and energy efficient technologies bring about GHG emissions reductions and energy cost savings for the households.



Objectives

The project activity aims to improve the thermal performance of the existing and future housing units, improve lighting and water heating efficiency. This will result in reduced current and future electricity consumption per household, significant avoided CO₂ emissions per unit.

Improved end-use energy efficiency combined with the use of solar energy for water heating will result in measurable avoided pollutant emissions and measurable energy consumption savings. This contributes to 'energy poverty' alleviation.

Methodology

End-users targeted by the project

Low-income households in South Africa.

End-user area

All sites for low-cost housing in South Africa.

Target audience of the case study;

Housing departments & policymakers in developing countries.

Technologies

The technologies required for the three retrofit interventions in this project are locally available. Technical feasibility has also been assessed and approved by local energy experts.

Phases

The Project is being developed under the Kyoto Protocol's article 12 Clean Development Mechanism, and hence employs the UNFCCC methodology. The interventions constitute three project activities which fall under the following simplified small-scale CDM Project Activity categories:

- Type I Renewable Energy Projects: Type I.C. Thermal Energy for the user,; Installation of Solar Water Heaters;
- Type II Energy Efficiency Improvement Projects: Type II.C. Demand – Side Energy Efficiency Programmes for Specific Technologies: Retrofitting with Compact Fluorescent Light bulbs; and
- Type II Energy Efficiency Improvement Projects: Type II. E. Energy Efficiency and Fuel Switching Measures for Buildings: Introduction of ceiling insulation and ceilings.

Phase 1, the 2309 existing RDP houses in Kuyasa, Khayelitsha, is complete. There is the potential for this project to be expanded to include phases 2 and 3. Phase 2, still in the conceptual planning stage, consists of the construction of residential units in Town 3, Village 2, alongside the houses in Phase 1. The number of dwellings to be constructed in this and the third phase will be determined by the EIA currently underway. It is estimated that the area will ultimately include more than 4000 housing units if the whole of an allocated 100 ha is found to be suitable by the EIA for housing.

In July 2002, a demonstration phase of the CDM project activity was initiated, whereby 10 household beneficiaries were selected by the community to have their houses retrofitted with solar water heaters (including showers, hot taps and drains), ceilings, ceiling insulation and efficient lighting (CFLs). The demonstration houses serve a dual purpose, one being a demonstration to the local community of the performance and efficiency of the interventions and another being a means for the establishment of the baseline methodology. These demonstration houses have been monitored over a period of six months by means of data loggers which have been installed in the houses. The change in patterns of behaviour in terms of energy consumption was also be monitored over the same period.

The generic methodologies for determining the energy baselines have been defined in Appendix B for Small-scale Project activities. The Project baseline for these three project activities includes the envisaged suppressed demand of anticipated future levels of household activity that will result from advances in the provision of energy services and improved access to energy services as a result of development and the implementation of poverty alleviation strategies. A future level of activity includes increased energy consumption and the use of additional technological appliances.

Thus the baselines for Kuyasa assume that:

- Houses would have used electrical geysers for hot water heating,
- Houses would not have been insulated, thus would have no ceilings or ceiling insulation, and
- Households would have used incandescent light bulbs.

Public participation has formed an integral part of the project design ever since its inception. This has been catered for in the structure of the project design team, via:

- Project facilitators, who deal with liaison and capacity building within the local community;
- Community representatives, who are selected by a dedicated stakeholder forum.

Financial resources and partners

Outflows:

- Upfront Capital cost: R12.5m (€1,550,625)
- Ongoing Maintenance Costs R0.9m (NPV over 10 years at 20%)

Current Anticipated Inflows:

- Carbon Income R3.2 m (NPV over 21 years at 15%, price of carbon is €8)
- Provincial Housing Dept research grant R4m
- Dept Environmental Affairs and Tourism (DEAT) Poverty Alleviation Grant R3m
- Community repayment scheme R2m (R30/hh/month, NPV at 20% over 3 years).

Stakeholders: Current project shareholders include the City of Cape Town, the Kuyasa community and SSN. Given the potential for project replication on a national scale, national grant funding streams are being considered as a priority. Other funding sources include: a community contribution, a bridging finance source based on returns from CDM revenues, donor/grant funding and the City of Cape Town.

Finding / Outcomes

Baseline CO2 Emissions per annum:

- Electric geysers : 1.288 CO2 tonnes/hh/year
- Incandescent light Bulbs: 0.294 CO2 tonnes/hh/year
- Energy needed to reach a level of thermal comfort in an uninsulated house: 6.86 CO2 tonnes/hh/year

Project CO2 Emissions per annum:

- Solar Water Heaters: 0 CO2 tonnes/hh/year
- Compact Fluorescent Light Bulbs: 0.066 CO2 tonnes/hh/year
- Energy needed to reach a level of thermal comfort in an insulated house: 5.53 CO2 tonnes/hh/year.

Overall, 2.85 CO2 tonnes/hh/year avoided as a result of the project

OTHER BENEFITS:

This project has a particularly high rating in terms of local social sustainable development.

Social

Savings in the cost of energy, estimated at R625.83/household/annum for the homeowners.

The improved thermal performance and the installation of ceilings will provide health benefits to homeowners.

The co-benefits of improved respiratory health profiles for the local residents will further offsets local, national government and state enterprise spending.

Economic

The installation of these interventions will provide employment for and increase the capacity of local artisans, who will therefore also be able to assist with the maintenance of the technology interventions.

Regional and local job creation will furthermore be increased, due to the use of locally manufactured solar water heaters.

Environmental

This project contributes strongly towards local environmental sustainability; and the mitigation of global climate change.

Lessons learned and repeatability

The project achieves poverty alleviation by bringing down the energy costs of low-income households, many of which use up to 25% of their income on energy services. The CDM does not allow for the use of ODA (Official Development Assistance), and thus local public funds need to be dedicated to the project. The development of a suitable financial model for the project presents a major challenge, which is as yet, not resolved. The project has high replication potential in developing countries that are able to use the CDM to co-finance the interventions.

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