CREDIBLE CARBON

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Project Name: Cato Manor

Project Location: Borough Road, Cato Manor, Durban

Commencement date: December 2011

Project Period: Annual crediting of carbon

Borough Road, Cato Manor

GHG Savings

The estimated GHG savings for the 30 houses as detailed in this report is **110.7 tonnes CO_2/annum.** These saving are realized by the following interventions in RDP houses in Cato Manor:

- The installation of solar water heaters (SWH),
- The installation of insulated ceilings,
- The distribution of Wonderbags, and
- The use of CFLs.

Project Developer

Carbon Programmes (Pty) Ltd
www.carbonprgrammes.co.za

Methodologies Involved

Solar water heaters (SWH)

Type I.J

This methodology is applicable to the installation of residential SWH systems. The SWH system displaces electricity or fossil fuel that would otherwise have been used to produce hot water. This methodology is applicable to retrofit projects that replace existing electric of fossil fuel based water heating systems in existing households. Emissions savings are determined from the hot water consumption rate and the temperature at which the hot water is supplied.

Thermal Performance Improvement

Type IIE

This methodology is applicable to energy efficiency and fuel switching measures for buildings and is relevant where it is possible to directly measure and record the energy use within the project boundary.

Use of CFLs

Type IIC

This methodology is applicable for demand–side energy efficiency programmes for specific technologies. Typically the replacement of incandescent light bulbs with CFLs is seen as a demand side energy intervention.

Brief Description of the Project

Background and site location

In 2009 a collaboration of South African and Dutch architects and artists built a small structure in the Cato Manor area in Durban, in a cul-de-sac just off the Borough Road. 'uMuthiMAYCHE', as it has come to be called, is a rehearsal space for local musicians that opens up as a small podium and tuck shop. It was developed by the RAW Foundation (Dutch) working with Dala [Durban] and the local Sukuma Arts

Centre, with funding from the Netherlands Architecture Fund. The aim was to utilise the space between the government-built houses and build a prototype for community structures. The local community was involved the process and the building is made entirely from second-hand/ ‘recycled’ materials sourced from the surrounding area.

Construction of the ‘Umuthi MAYCHE’ building in 2009. (Photos by Doung Jahangeer - Dala, and Bartjan Hooft -RAW Foundation.

uMutiMAYCHE is located in a low-income area which is fairly typical of urban contexts in South Africa. The cul-de-sac street of RDP homes around this building has been identified as the location for this retrofit project. The short cul-de-sac street in this image (see below) is the proposed project area, with the cadastral boundries of the 30 possible beneficiary housing units outlined in white.
There are a total of 30 housing units (made up of semi-detached buildings with two homes connected) leading off this street.

Project implementation

The team who conceptualized, designed and implemented the Kuyasa project will be managing the retrofit in Cato Manor, in conjunction with Durban-based Khanyisa Projects who also bring relevant expertise and value to this project.

Energy efficiency aspect of the retrofit:

- **Solar Water Heaters.** The model proposed is an affordable, SABS-approved, 100-litre, low pressure, evacuated tube type with no electrical backup connection. The evacuated tubes are imported, but all other components are produced in South Africa. The local content by total value is greater than 85%. This product is selected for its superior performance qualities. It delivers balanced cold/hot pressure, ‘safe’ tempered water at 50-60C, and (importantly) will last a very long time, with a life-time guarantee against corrosion.

- **Ceilings**. Insulated material (Isoboard) will be used to provide a ceiling to improve thermal performance in the home. The ceiling board and other materials for this are produced in South Africa.
- **Wonderbags™**. This is a heat-retention/ insulation cooker that saves energy, time and makes the kitchen a safer place. Used an average of three times a week, a Wonderbag™ can save 0.59 tons of carbon per year per house. Wonderbags™ will be provided for each home, along with training on how to use them.
- **Efficient lighting.** The project will replace existing incandescent light bulbs with Compact Fluorescent Lighting (CFL) light bulbs. Houses will also be provided with safe electrical reticulation to plug and light points. Professional standards and SABS approved materials and products will be used.

Aerial view of project site

Technologies Used

Solar Water Heaters

Make of low pressure solar geyser	Xstream Vacustream
Country of origin	RSA
Storage capacity	100 litre
Product description	Vacustream. Electrical optional extra
Type of storage tank	Open to vent

Overall tank length	1 100mm
Overall tank width	465 mm
Overall thank height	485 mm
Mass of tank (empty)	11 kg
Inner vessel material	Epoxy vinyl ester resin and class E-glass
Inner vessel material thickness	Minimum 3 mm, design pressure 3 bar
Type of corrosion protection lining	Not needed material used in manufacturing has non corrosive properties
Solar Absorption	12 x 47 x 1500 mm '3-Hi' evacuated tubes
Insulation and Heat loss	Minimum 50MM high density polyurethane to comply with SABS minimum standing heat-loss

Ceiling insulation

IsoBoard thermal insulation is a high density, rigid, extruded polystyrene insulation board, having a 100% closed cell structure. IsoBoard has been tried and tested internationally since 1970, and manufactured in South Africa since 1995, using a fully automated extrusion process, in accordance with international specifications and standards.

Attributes of Isoboard include the following:

- Low thermal conductivity
- High resistance to water vapour diffusion and water absorption
- Uniform density distribution
- Very high compressive strength
- Ageing resistance as well as resistance to bacteria and micro organism growth

Summary of GHG saving calculations

Project baseline emissions

The baseline is defined as the situation prior to the project intervention. Furthermore, in line with the suppressed demand approach, electricity use for water, space and food heating as well as for lighting is assumed to be the minimum service level for emissions calculations.

The project baseline is defined as the following scenario:

- The heating of water using an electric geyser.
- A house with no ceiling and no insulation and the use of electricity to achieve indoor thermal comfort.
- A household where electricity is used to cook food.
- The use of incandescent light bulbs for lighting.

Emissions Source	Quantity	Energy Equivalent[1]	Emissions Intensity[2]	CO_2 Emissions
		kWh/hh/year	CO_2/kWh	tonnes/hh/year[3]
Electric geyser	1 per household	1447	0.89	1.288
Cooking		1680	0.89	1.49
No ceiling and no insulation		6939	0.89	6.89
Incandescent light bulbs	4 per household	660	0.89	0.587
Total	*Per household*	*8386*	*0.89*	*10.255*

Project activity emissions

The project activity describes the situation once the interventions have been realized.

The project activity comprises the following:

- SWH for hot water on demand.
- A house with an insulated ceiling and minimum space heating using electricity.
- A household where food is brought to the boil by using electricity and then placed in a Wonderbag to complete the cooking process.
- The use of CFLs.

Emissions Source	Quantity	Energy Equivalent	Emissions Intensity	CO_2 Emissions
		kWh/hh/year	CO_2/kWh	tonnes/hh/year
SWH[4]	1 per household	0	0.89	0
Wonderbag[5]	1 per household	1008	0.89	0.89
Insulated ceilings[6]		5595	0.89	5.53
CFLs	4 per household	74.5	0.89	0.132
Total	*Per household*		*0.89*	*6.53*

[1] The energy equivalent is how much energy is used for that particular activity
[2] The emissions intensity is that for electricity
[3] The CO_2 emissions are the product of the energy equivalent and the emissions intensity
[4] There is no electricity usage associated with a SWH.
[5] The assumption is that food will be brought to the boil using electricity and then placed in a Wonderbag.
[6] Space heating, as required, will be done using electricity even once insulated ceilings are in place.


Images showing the ceiling installation in progress and a resident standing outside her house with the newly installed SWH in the background

Emissions reduction

The difference between the baseline emissions and the project emissions represents the emission reductions due to the project activity during a given period.

Total annual CO_2 emissions avoided per household per annum	**3.69 tonnes/hh/year**
Avoided emissions due to water heating	1.29 tonnes/hh/year
Avoided emissions due to space heating	1.36 tonnes/hh/year
Avoided emissions due to Wonderbag	0.59 tonnes/hh/year
Avoided emissions due to CFLs	0.45 tonnes/hh/year
Total annual CO_2 emissions avoided per household per annum	**110.7 tonnes/year**

Assumptions Applied in Calculations

All calculations are based on the Kuyasa Low Cost Urban Housing Energy Upgrade Project (UNFCCC Ref Number: 0079) as the Cato Manor project is based on the Kuyasa project.

Parameter	Unit	Value
Emissions factor for grid electricity (weighted average)	kg CO_2/kWh	0.89
Emissions factor for paraffin	kgCO2/GJ	25
Technical transmission and distribution losses		
Cost of electricity per household	R/kWh	
Project size	Households	30
Thermal capacity factor for water	kJ/˚C/liter	4.2
Energy conversion factor	MJ/kWh	3.6
Efficiency of electric hot water storage geyser	%	70
Number of bulbs for lighting	Number	
Rating of CFL’s	Watts	11 and 16
Rating of incandescent bulbs	Watts	60

Appendices

Monitoring Plan

Data to be collected in order to monitor emissions from the project activity.

	Data type	Data variable	Data unit	Recording frequency
Solar Water Heaters	Number of systems purchased and installed from sales and installation records.	Number	Number	Post installation
Insulated ceilings	Type of insulated ceilings installed from sales and installation records.	Number	Number	Post installation
Wonderbag	Number of Wonderbags distributed to households.	Number	Number	Post installation
CFLs	Number of CFLs supplied per household.	Number	Number	Post installation