



Sustainable Energy Africa

“SOUTH AFRICAN CITY SOLUTIONS TO CLIMATE CHANGE”

**URBAN ENVIRONMENTAL MANAGEMENT PROGRAMME
TECHNOLOGIES/PROJECTS SHOWCASED AT THE COPENHAGEN
CLIMATE EXCHANGE**

December 3rd – 6th, 2009

Introduction

The **South African Government** regards climate change as one of the greatest threats to our planet and our people. Strategies and policies in all spheres of government have been developed to respond to this challenge, at the heart of which lies the issue of poverty and need for economic development based on low carbon approaches.

The **Danish Government** has supported South Africa for many years. One of its areas of support is through the Urban Environment Management Programme (UEMP) which is being run in partnership with the **Department of Water and Environment Affairs**. The programme builds the institutional capacity of South African cities to improve service delivery to the poor through effective environmental resource management.

“The objective of the programme is to improve the livelihoods of more than 2 million poor households in the 5 big South African Metros (eThekweni, Ekurhuleni, Cape Town, Johannesburg and Sedibeng.”

(Dan E Fredriksen, Ambassador, Royal Danish Embassy)

Sustainable Energy Africa (SEA) is a national NGO that has pioneered the integration of sustainable energy approaches into urban development in South Africa. SEA has been involved in the implementation of projects showcased within the exhibition through the provision of technical information, facilitation, institutional development and capacity support to the UEMP partner cities.

This document gives an overview of the climate change work done by the UEMP programme in four South African cities (eThekweni, Ekurhuleni, City of Johannesburg, and City of Cape Town). This work was showcased at the **Copenhagen Climate Exchange Programme in December 2009**. The theme of the exhibition was “South African City Solutions to climate change”. Sixteen technologies were showcased and are described below.

City of Johannesburg

Climate Proofing Urban Communities: Cosmo City

The objective of the project is to contribute to building a livable and climate-resilient human settlement through:

- Assisting low-income communities to save on electricity costs by using the sun to heat water, installing efficient, compact fluorescent light bulbs and ceilings, which help reduce heating costs.
- Enhancing household members’ quality of life by increasing the thermal comfort of homes through provision of ceilings.
- Contributing to job creation and skills development through employing community members in the ongoing maintenance of the technologies post installation.

- Encouraging behaviour change around energy use and awareness of climate change in communities
- Reducing the City's carbon footprint through the above interventions.

The first phase of the project began in 2007 and involved the roll out of solar water heaters to 170 homes. The scope of the Cosmo City project will increase in phase two which began in January 2010. In this next phase, solar water heaters, insulated ceilings and compact fluorescent lamps will be installed in 600 homes. A variety of greening and water conservation measures will also be undertaken, including fruit and indigenous tree planting on homeowner stands, the promotion of community vegetable gardening and the piloting of rainwater harvesting.

The installation of the Solar Water Heaters, CFLs and insulated ceilings will result in an estimated saving of 1, 645 tonnes of carbon dioxide emissions per year.

REA VAYA – Bus Rapid Transit System for Johannesburg

Rea Vaya is the Bus Rapid Transit (BRT) system for the City of Johannesburg, which was implemented to deal with the increasing transport problems faced in Johannesburg today.

The initiative represents a major turning point in how the City deals with congestion, pollution and greenhouse gases as a result of transportation.

The new fleet will run on low-sulphur diesel resulting in improved air quality resulting in an estimated saving of 1.6 million tons of CO₂ equivalent emissions by 2020.

City of Cape Town

Darling Wind Farm

The Darling Wind Farm (DWF) is a partnership between the Central Energy Fund, the Development Bank of Southern Africa, the private sector Darling Independent Power Producer and the South African and Danish Governments, to establish South Africa's first commercial wind farm. An expected annual 13.2 GigaWatt hours of Green Electricity from DWF will be generated by 4 1.3 MW wind turbines near Darling and injected onto the national grid managed by Eskom. From there it will be "wheeled" through the national grid to a substation at Atlantis where it will be introduced onto the City's electrical network and then sold onward to "willing buyers". This Green Electricity will replace electricity normally generated by Eskom's power stations. The DWF project will contribute towards the Government's target of 10 000 GWh/year renewable energy consumption by 2013 and towards the City of Cape Town's target of sourcing 10% of its energy from renewable sources by 2020.

Over 20 years, the DWF will result in a saving of 370 million litres of water and an estimated saving of 258 100 tons of carbon dioxide emissions (based on Eskom generation data, year 2005/2006).

Joe Slovo Integrated Sustainable Low Income Housing



This pilot project seeks to fully integrate energy efficiency within the subsidised housing sector.

The chosen project, Joe Slovo Phases 3B and 3C is part of a larger 'N2 Gateway' project managed by Thubelisha Homes on behalf of the National Department of Housing with Sobambisana contracted as a turnkey developer.

Poor households spend up to 30% of their income on energy sources. The Danida funding is earmarked to develop and pilot affordable energy efficient low-income house designs and materials with the view to primarily contributing to poverty reduction by reducing the cost of heating houses and improving indoor air quality and to inform policy for future subsidized housing projects. The energy efficiency interventions which have now been rolled out in 50 houses built last year have included pergolas for shading, solar water heaters, roof overhangs to protect against the harsh summer sun, larger windows and orientation towards the north to maximize winter sun and ceilings. A further 3000 efficient houses will be built during 2010.

Green Fleet

Danida supported interventions which contributed towards the City of Cape Town's electricity department winning the award for managing the most environmentally friendly vehicle fleet in South Africa include:

- the implementation of a comprehensive maintenance strategy;
- purchasing vehicles based on size requirements and the use of the vehicle;
- keeping them the original white (not re-painting to municipal yellow) resulting in financial savings and reducing VOC emissions from the painting of the vehicles;
- installation of vehicle tracking system in all vehicles, allowing management to keep tabs on all the vehicles as well as affording extra protection for the employees;
- establishing a network of vehicle repair companies across the entire metropole so that broken down vehicles could be taken to the nearest agent. This helped minimise vehicle downtime, cutting down on excessive mileage and reducing fuel consumption;
- annual measure of vehicle emissions to ensure that all vehicles comply with emission limits (currently 95% of vehicles passed and those that failed will be repaired to ensure that they meet the standards).

All new purchases will meet the highest emission and fuel efficiency standards. The plan is to replicate the green practices across the entire City of Cape Town fleet of 6 000 vehicles.

These interventions resulted in a 22% reduction in fuel usage of the fleet, despite a 9% increase in the total size of the fleet to 740 today.

Kewtown: Food gardening and Tree planting

Statice Heights, with an unemployment rate of 70%, predominantly amongst young, unskilled men, was chosen as the pilot site for the first ever delivery of holistic greening interventions in South Africa. This initiative aims to address the need for safe playing areas for children and green, open park space for the community generally, through greening based on local employment and skills development programmes. The initiative has the full support of the Departments of Housing and Water and Environment, who are working together with Green Communities to ensure the project's long term success.

Green Point Stadium – Part of the Green Goal Programme for Host City Cape Town

The following energy-efficiency interventions have been included in the design of the new stadium as part of the requirements for the Record of Decision as part of the Environmental Impact Assessment:

- Energy-efficient lighting and automatic switches and sensors;
- Energy-efficient heating, ventilation and cooling systems (including minimal pip runs and heat exchange)
- Insulation of hot-water pipes
- Maximum use of daylight.

The following energy-efficiency measures were included in the Green Point Stadium design:

- The building is raked outward to shade itself, while a mesh fabric cladding allows 30% light filtration. The fabric allows for natural ventilation, while the white colour reduces thermal radiation;
- The translucent glass roof facilitates natural lighting
- The open concourse at podium level facilitates natural ventilation and the 5 meter gaps between the inner and outer skins of the facade provides for passive ventilation through a stack effect
- A water-cooled variable refrigerant - volume cooling system is used for air conditioning. This system present significant energy savings over individual air-conditioning modules.
- CFLs are used where possible
- Where halogens are used, they are 45% more efficient than the standard fitting
- A Building Management System (BMS) allows for control and monitoring of air conditioning and lights in different areas and ensures these are shut down when the stadium is not in use.

- CO₂ monitors in the parking garage control the ventilation fans.

Other environmentally friendly interventions at the Green Point Stadium, included:

- Close proximity to public transport infrastructure (train and bus) reduces reliance on private cars and cuts down on harmful emissions
- Water-efficient fittings on showers, taps and toilets (multi-flush rather than dual-flush, which could realise up to 70% reduction from toilets)
- Water-wise landscaping in the urban park and around the stadium as well as rainwater harvesting and storage for irrigation and toilet flushing.
- 95% of demolished components from the old stadium have been salvaged, recycled or reused.

eThekwini

Landfill gas

The Durban municipality plans to generate electricity from rubbish, reducing greenhouse gas emissions. The project will capture methane rich landfill gas from three landfill sites to provide fuel for the production of electricity. The gas is captured by sinking wells up to 40m deep in the landfill waste sites and through interconnecting pipes linked to an underground main gas collector and extracted via a roots blower system which maintains a partial vacuum in the pipes resulting in the gas being sucked out of the landfill and piped to the gas generating engine. At correct conditions the combined output of the unit should generate 6MW.

By displacing electricity from the grid the project reduces emissions related to coal-fired power production which include sulphur oxides, nitrogen oxides, and particulates. It also reduces the adverse impacts related to transportation of coal and coal mining (dust and acid mine drainage). Near the landfill sites the project improves the air quality by further reducing the amount of landfill gas released into the atmosphere and thus reducing the risk of exposure of neighboring residents to odor and improving ground water quality.

The three sites are:

- 1) La Mercy located 35km north of Durban.
- 2) Bisasar Road some 7km from the Durban Central Business District and;
- 3) Mariannahill located in the western area of Durban in the Metro area formerly called the Inner West City Council.

Income will come from two sources. Firstly by selling electricity generated from methane under a long-term power purchase agreement to Durban municipality; and secondly by selling its reduction in CO₂ emissions under a Emissions Reduction Purchase Agreement with the World Bank administered Prototype Carbon Fund as certified Emission Reductions.

LED Traffic Lights

Some new traffic lights are being made out of arrays of light emitting diodes (LEDs). These are tiny, purely electronic lights that are extremely energy efficient and have a very long life. Each LED is about the size of a pencil eraser, so hundreds of them are used together in an array. The LEDs are replacing the old-style incandescent halogen bulbs rated at between 50 and 150 watts. LED units have three big advantages:

- LEDs are brighter. The LED arrays fill the entire “hole” and have equal brightness across the entire surface, making them brighter overall.
- LED bulbs last for years, while halogen bulbs last for months. Replacing bulbs costs money (trucks and labour costs) and it also ties up traffic. Increasing the replacement interval can save a city a lot of money.
- LED bulbs save a lot of energy.

With old-style bulbs, one traffic signal costs about R1 a day to operate, or about R365 per year. There are perhaps eight signals per intersection, so that’s almost R2920 per year in power per intersection. A big city has thousands of intersections, so it can cost millions of rands to power all the traffic lights. With LED bulbs the power consumption drops by a factor of five or six. A city can easily save millions a year by replacing all of the bulbs with LED units. These low-energy bulbs also open the possibility of using solar energy to power the lights.

Buffelsdraai Community Reforestation Project

The objective of the Buffelsdraai Community Reforestation Project is to plant 62,500 trees which will sequester a portion of the 307 000 tonnes of CO₂ that will be emitted by Durban hosting the 2010 FIFA Soccer World Cup.

This project is a joint venture between the Environmental Management Department of eThekweni Municipality, Durban Solid Waste, Wild lands Conservation Trust and the Danish Embassy (DANIDA) which is sponsoring the 62,500 trees. The indigenous trees are planted in the buffer zone of the Buffelsdraai regional landfill site. The collection of seeds and propagation of seedlings is conducted by local community members who are trained as ‘trepreneurs’. The seedlings they produce are traded at local ‘tree-stores’ for goods (groceries, school fees, bicycles etc). Nine local community members are also employed permanently on site to oversee the holding nursery and to plant out the seedlings. The benefits of this project include the sequestration of carbon, biodiversity restoration, improved catchment management and the protection of water resources as well as the socio-economic upliftment of local communities.

Heat Pump Project

The objective of the Malaca road heat pump project is to install and test a heat pump unit as well as determine the feasibility, real world efficiency and pay-back time period. The heat pump unit is fitted to the existing geyser system at the Malaca road electricity depot for the municipal employees to utilize. In addition to this twenty-two low flow shower heads (shower restrictors) were fitted in the employee's compound to reduce hot water consumption.



Once testing of the unit has been concluded and data analysed, the Energy Office of the Municipality will rollout heat pump units in the other eThekweni electricity depots.

Greening Durban 2010 Programme

The objective of the Greening Durban 2010 Programme is to host a climate neutral 2010 FIFA World Cup event in Durban, and to ensure that a positive environmental legacy is left by hosting the event. This includes ensuring that the event is hosted in an energy and water efficient manner, and that investment is leveraged for enhancing ecosystem goods and services supply.

The estimated carbon footprint of hosting the event in Durban is 307,000 tonnes CO₂. This includes the embodied emissions associated with the construction and upgrading of event hosting venues in the city, including the new 65,000-seater Moses Mabhida Stadium.

Through key interventions made by the Programme, the installed energy capacity of the new Moses Mabhida Stadium has been reduced by 30%, and its water footprint reduced by 74%. Interventions included:

- Taps include metering valves with aerators – ¾ litre per minute to run up to 50 seconds;
- Low flow shower heads in the changing rooms – Saving 2100KWh per year per shower head
- Rain water harvesting from 1/3 of the roof area which will be used for landscape irrigation using 700 M³ storage tank. Estimated total saving of 6000 M³ of water per year

While every avenue has been followed to reduce carbon emissions, the programme has already initiated a range of projects to sequester and offset the unavoidable carbon emissions. These include community-based reforestation, and carbon emissions reductions interventions at municipal infrastructure installations. These projects have spearheaded a new approach for Durban, in which climate impact management is an achievable target for both event hosting, and infrastructure development and management. The Greening Durban 2010 Programme will also continue to run for a 5-year legacy period post the event.

Ekurhuleni

Municipal buildings SWH

As part of a whole range of energy saving activities at the Edenvale Customer Care Centre financed by the UEMP programme under the Danish Embassy in Pretoria, the old existing water heating system at Edenvale Customer Care Center has been substituted by 3 new high efficient solar water heating systems. The project aims not only to save energy in the Customer Care Centre, but also to display to the general public that the municipality are taking active action towards reducing the CO₂ emission to the atmosphere, by reducing the energy consumption.

This intervention will result in annual savings of 17.9 tonnes of CO₂. Individual light switches installed to enable control of lighting instead of one central switch for a whole floor has also resulted in substantial energy consumption savings within the building.

Municipal Building Audits

The goals of the project are to conduct an energy audit of 21 municipal owned waste depots in the Northern, Southern and Eastern regions.

The energy audits to be conducted on each building should achieve the following objectives:

- Identify areas of energy wastage
- Propose alternatives as well as provide detailed cost effective measures improve efficiency of energy use.
- Illustrate savings potential
- Estimates of implementation costs and payback periods for each recommended action
- Document all results the audit and any other relevant information required to successfully implement recommendations

Basa Njengo Magogo : Household coal combustion

Local field workers were trained to conduct public demonstrations at schools and public places of the Basa Njengo Magogo household coal fire. This 'method' of Mbawula fire making use substantially reduces coal consumption and emissions from unburnt hydrocarbons. This contributes to 40% reduction in ambient air pollution and 80% reduction in smoke, with substantial improvements in household health.

In addition field workers conducted emissions data capture at 20 000 households/source points. The Emission Inventory was conducted to gain insight into which emission sources contribute to poor, local air quality, the trends of such pollutants concentrations and the impact on the environment. The idea is that this initial data will be updated regularly and assist the municipality to design effective strategy towards achieving reducing local and global air pollution.