



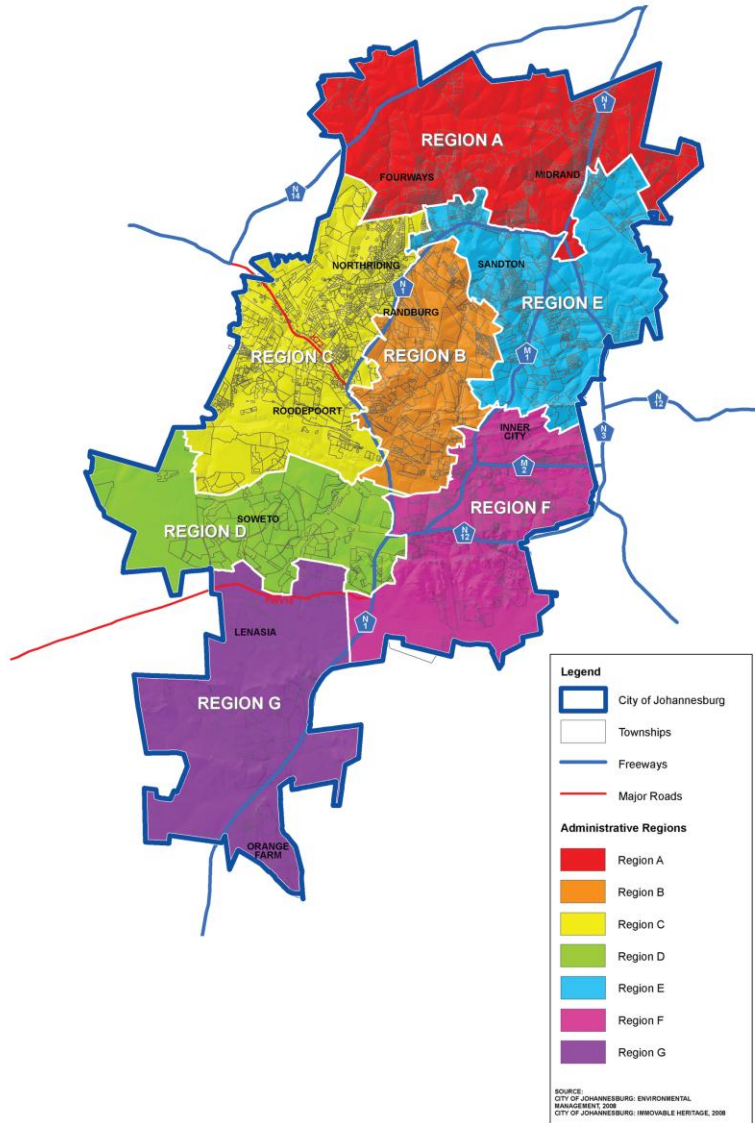
a world class African city

Cosmo City Climate Proofing Project



Challenges and Successes in Sustainable Energy Housing

Linda Phalatse



- **Most populous city in SA: 4.4 million inhabitants growing at 3.16% per year (Stats-SA, 2011)**
- **1 165 014 households (Stats-SA, 2011)**
- **18.8% of households reside in informal dwellings (Stats-SA, 2011)**
- **Proportion of households living in formal and informal dwellings in Johannesburg are both above the national average (CoJ,2010)**
- **Johannesburg target of providing 100 000 housing units in the 2006-11 Mayoral Term. Reached 58 960 at December 2009 (58%) (CoJ,2010)**



a world class African city

Johannesburg Stats

- 17% of South Africa's Gross Domestic Profit
- There are more than 6 million trees within the City.
- 98.7% of the city's population has access to water.
- 90.6 % of the City's inhabitants have access to sanitation

The economy of Johannesburg is the largest economy in the country and accounts for approximately 47% of Gauteng's economy.

1.2 million trees are located within the City parks and along its pavements and 4.8 million trees are located on private properties. The City is therefore sometimes quoted as the largest forest in the world.

Non-motorized transport plays a vital role in building social cohesion, achieve a low carbon city-region and reducing transport costs, but is currently not a preferred mode of transport for commuters. Rather non-motorized transport is currently the choice of the wealthy and the necessity of the poor.

In 2013 the 98.7% of the city's inhabitants had access to piped water within a distance of less than 200m from their dwelling.

Between 2001 and 2011 the access to sanitation within the City has increased from 88.1% to 90.6%.

Why sustainable energy in low income housing?

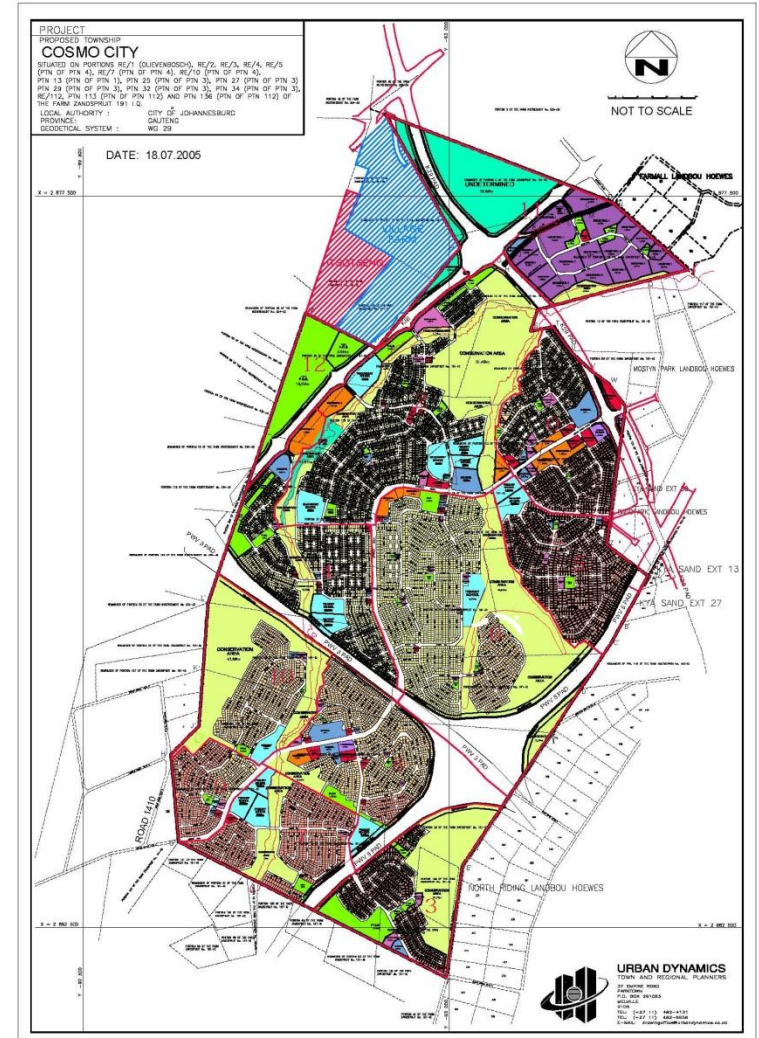


Millions of RDP housing units will be built over the next years – a critical window for implementing sustainable energy design or an opportunity lost?

Why sustainable energy in low income housing?

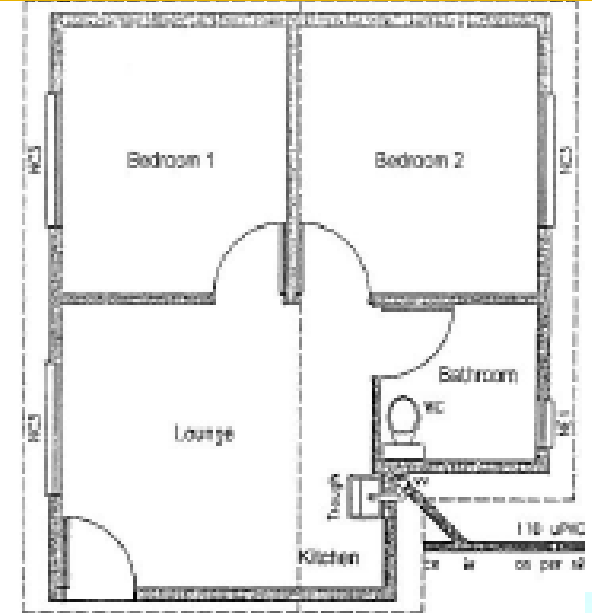
- **Poor spend up to 30% of income on energy services (SEA, 2010)**
- **Housing subsidy in Gauteng does not include the provision of ceilings or geysers (54% of households in SA do not have geysers) (Draft SA National SWH Framework and Implementation Plan, 2009)**
- **Energy inefficient materials = high levels of energy consumption for space heating = indoor and outdoor air pollution and health costs (coal and paraffin burning)**
- **Housing backlog estimated at over 2.1 million (President's Coordinating Council, 2012)**
- **Large volumes have potential to stimulate renewable energy (RE) and energy efficiency (EE) local manufacture**
- **Sustainable energy projects limited to small-scale pilot projects = one large scale roll out of solar water heating in low-income housing in Nelson Mandela Bay (120 000 units in 2010)**

- **R3.5 billion mixed income housing development**
- **Emerged out of need to accommodate residents of informal settlements in the area (Zevenfontein and Riverbend)**
- **Covers an area of approx 1100 hectares, +/- 300 ha zoned for open spaces and conservation**
- **30 km northwest of central Joburg**
- **Approx 5000 low-income houses have been occupied to date**
- **Environmentally sensitive area: river system, a ridge and relatively undisturbed grassland**
- **Environmental Management Plan for construction and operational phases**



Cosmo City RDP house specs

- **36 m2, four rooms- two bedrooms, lounge/kitchen and bathroom**
- **Many houses not north facing to maximise on space and the no. of units built**
- **No geyser, ceiling, shower or bath in the standard house**
- **One cold water point in kitchen**
- **Incandescent and CFL light bulbs (Eskom roll out)**
- **One double plug supplied – homeowners wire and light the homes themselves. Illegal wiring problem**
- **Pre paid water and electrical meters with free basic allowance of 10 kilolitres (up from 6 kilolitres) and 50 kWh per month**



Wiring from one double plug



Lighting



Current energy use practices – Cosmo City

Space heating

- **Cosmo City survey 34 households: 65% of respondents (22 out of 34 households) do not use space heating within their households during cold weather mainly due to financial constraints (CoJ, 2012)**
- **Other households in survey: electric heaters (21%), paraffin flame stoves (0.06%), and electric stoves (0.06%). Imbawulas (coal burning) not commonly used**

Water heating

- **Heat water using two-plate stoves and electric kettles**
- **Low water consumption – often use less than their monthly free basic of 10 kilolitres**
- **Electricity costs significant proportion of household income – average R100-R300 in the winter months**

Climate Proofing Programme

A photograph showing several hands of different skin tones cupped together, holding water. The water is splashing and creating ripples. The background is a solid green color.

*Creating more liveable, resource
efficient and resilient
communities*

Climate Proofing Programme - Aims

- **Demonstrate the effectiveness of interventions to lobby for alterations to standard RDP house designs – RE and EE must be incorporated at the design stage**
- **Reduce electricity costs for households**
- **Enhance comfort and quality of life for residents by giving households access to hot water and improving the thermal efficiency of homes**
- **Contribute to job creation and skills development by training and employing the local community to install the interventions**
- **Promote behaviour change by creating awareness of energy conservation through the project**
- **Protect the environment and mitigating climate change through renewable energy generation (solar energy) and reducing South Africa's over dependency on coal**

Project background – phase 1 SWH roll out

- **Phase 1: Installation of 170 SWH units in ext 2 of Cosmo City**
- **Approx R15 000 per unit incl installation. High pressure, flat plate systems, 100 litres**
- **A few residents have requested electrical back ups as water in some instances isn't hot enough on cloudy or cold days**



Phase 2 – funded by the Danish International Development Agency (DANIDA)

Solar Water Heaters

- Installation of 700 SWH units – low pressure, evacuated tubes – 110 litre
- Approx R4 400 incl installation. Lower prices have meant larger roll out is possible
- Eskom rebate of R4240

Insulated ceilings and CFLs

- Installation of 700 Isoboard ceilings
- Distribution of 2100 CFLs
- Isoboard: Extruded polystyrene rigid foam with good insulating properties, acts as both a ceiling board and insulator. Provides an attractive finish to the interiors



Phase 2 – funded by the Danish International Development Agency (DANIDA)

Greening

- Indigenous tree and shrub planting
- Fruit tree planting
- 700 homes 'greened' in new area prone to erosion and stormwater issues
- Planting by local community and residents



Consultation and education

Stakeholder consultation

- Gold Standard processes followed for consultation including initial consultation meeting and feedback to stakeholders

Education and awareness

- Pre installation workshops: attended by close to 600 residents
- House-to-house consultation/awareness by 30 community based educators
- Post installation workshops after implementation in October 2010 and 2011



Job creation and skills transfer

- **80 – 100% of installation and greening teams from the local community**
- **118 local residents employed thus far (four to twelve month contracts)**
- **On the job training for all projects**
- **Maintenance of SWH for 5-year guarantee period by technician from local community, on sub contractual basis**

Challenges

Internal technical capacity

- **Technical nature of sustainable energy housing projects: Require expertise in plumbing, electricity, building structures and design, solar water heating etc.**
- **Required technical input from municipal entities (City Power, Joburg Water), NGO Sustainable Energy Africa and external service providers (hired as quality assurers).**

Budgets

- **Effective and sustainable financial models for large scale roll outs must be found, as limited budgets constrain large scale roll outs in low-income areas.**
- **Eskom rebate in place for some low pressure systems (incl Tasol system in Cosmo City) almost covers the costs of supply+installation – may kick start large scale roll outs in low income sector**

Challenges

Solar water heating industry

- Low pressure systems for low income market largely untested in SA
- Huge increase in suppliers in the last couple of years new to the market = a challenge to separate professionals from 'fly by nights'
- Lack of local solar water heater manufacturing, although increasing.

Challenges

Selection of project beneficiaries

- **5000 RDP houses but only budget to roll out to 770. Selection criteria had to clearly and consistently communicated to community with Ward Cllr support.**
- **Oldest communities were targeted first. Community regarded this method as fair.**

Local labour

- **Off all issues, local labour hiring was the most sensitive. Community acceptance of the project was very dependent on fair and transparent hiring processes.**
- **3 methods used to ensure it was fair and inclusive and all stakeholders were engaged (including through the Cosmo City Project Developer (Codevco) labour desk, through local Cosmo City organisations and by selected community representatives registering applicants)**
- **Method accepted for the most part, but high unemployment rate means that will always be those left out of the project.**

Condition of RDP houses

- **Many roofs leak in Cosmo– with the potential of damaging the new ceilings. Repair of roof leaks had to be costed into the project**
- **Cracked roofs also a danger for SWH installation (roofs must take the weight of the SWH)**
- **Poor electrical wiring also a danger for ceiling installation. Conduit installed above ceiling for safe lighting wiring**
- **Thorough audit of RDP houses needed before project design to solve these problems**

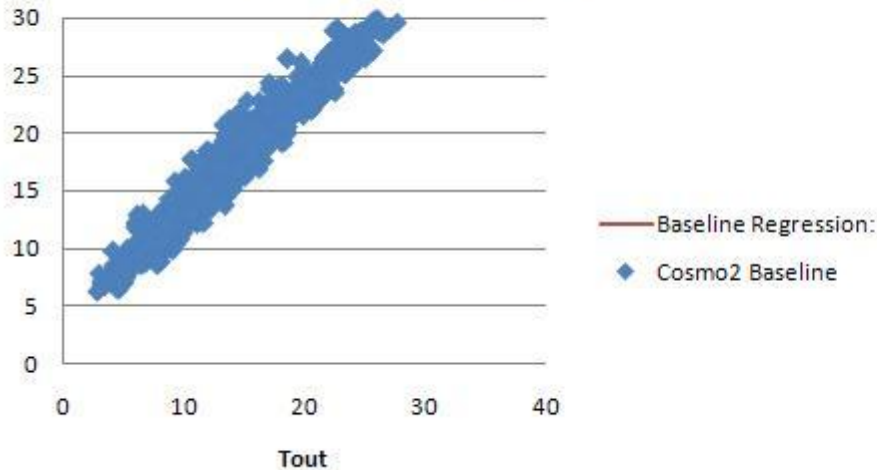
Changes to RDP design

- **Project can be used to demonstrate technologies and lobby for changes to standard RDP designs in Gauteng**

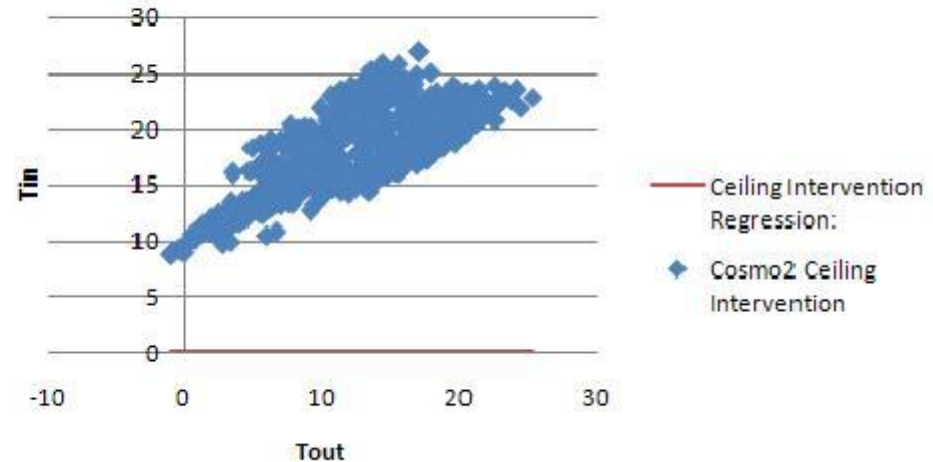
Monitoring

- **Monitoring of electricity and water consumption, indoor and outdoor temperatures to quantify improvements**
- **Results thus far indicate that homes do not get as cold with ceilings installed**

Cosmo2 Baseline



Cosmo2 Ceiling Intervention



For the baseline period (Aug 2009) the indoor temps dropped to around 5 °C. After installation, outdoor temperatures were lower (June 2010) as it was mid winter. However, indoor temps for 4 out of 5 houses hovered around 10°C.

In the baseline graphs, the relationship between the inside and outside temps makes a neat straight line. After the ceiling installation it is a more elliptical pattern. This shows hysteresis (or thermal 'memory'), which is evidence of the ceilings storing heat.

Successes

Community buy in

- Throughout local stakeholder consultation process has meant good community buy in to the project
- Ward Cllrs in full support of the project
- High turn out at community meetings and workshops

Cost effectiveness/replicability

- More cost-effective Solar Water Heater technology for phase 2 has improved replicability of the project and City has been able to roll out to more houses

Skills transfer

- High percentages of local labour have allowed for skills transfer in the community and some additional income for families

Way Forward

- **Cosmo City experience RE and EE interventions can benefit low income communities in real and measurable ways**
- **First prize is to focus on the change of RDP house design specs and funding support for increasing the subsidy allocation to allow for the upgrades**
- **Ceilings may remain the first priority as Eskom rebate may subsidise SWHs in the low-income sector for the near future**
- **Technical departments must be involved from the start in retrofit projects, including building control, water departments (SWHs) and electricity departments (ceilings)**



C40 cities celebration



THANK YOU



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