


# Joe Slovo Phase 3: Sustainable densification in well located areas




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CASE STUDY

# Joe Slovo, Cape Town: Sustainable low-income settlement densification in well located areas[1]

**Sustainable Energy Africa**

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## Background

Joe Slovo Phase 3 is a national flagship housing project of the Department of Human Settlements (DoHS), showcasing a new approach to sustainable housing delivery in the country under the Integrated Reconstruction and Development Programme (IRDP) initiative. This initiative was formulated to respond to the various shortcomings that were associated with its predecessor - the Reconstruction and Development Programme (RDP). The Joe Slovo settlement is situated in the suburb of Langa, 10 km East

[1] This case study draws extensively from the report: *Energy efficiency and sustainable settlements for the N2 Gateway Joe Slovo 3 Precinct – Lessons Learnt Report*. 2014. Sustainable Energy Africa, for Department of Human Settlements, South Africa. Unless referenced otherwise, information is sourced from this document.

of Cape Town CBD, on City-owned land off the N2 highway a few kilometres from the Cape Town International Airport. It is closer to areas of economic opportunity than many low-income settlements and has well-developed transport links, in particular a taxi rank and pre-existing railway system. Joe Slovo informal settlement has existed for almost two decades on the site and is an established community, and the housing project will accommodate all community members. This is not a straightforward task given a finite amount of land and a dense informal housing pattern, which was one of the reasons an alternative approach to conventional, lower-density stand-alone housing had to be pursued. Like many informal settlements dotted around the country, Joe Slovo was named after an anti-apartheid struggle icon, the first democratic housing minister in South Africa.

## The N2 Gateway Project

The City of Cape Town developed Joe Slovo Phase 1 in 2005 as part of the N2 Gateway[2] programme. The first of the housing initiatives in Joe Slovo comprised 705 rental units ranging in size from 30m$^2$ to 48m$^2$, which is a typical size for state-subsidised housing. Phase 2 comprises of 567 bonded (mortgaged) homes that border Phase 1. Phase 3A, B & C, the last and largest part of this project, will see the construction of 2886 subsidised homes on the remaining 27 hectares of this land. The staged approach was necessary because in clearing the land prior to construction, people removed from the informal settlement needed to be relocated to a temporary residential area not far away in Langa. Relocation of the entire community at once was not feasible. In this case study we focus on Phase 3 of this housing development project, as this is where the innovative approaches have been implemented. Because of the potential benefit of these innovations, the National Department of Human Settlements considered it important to monitor their impact in some detail with a view to possibly introducing them as standard practice around the country.


*Figure 1: The location of Joe Slovo Phase 3A low-income housing settlement in Cape Town*

[2] N2 Gateway programme: the upgrading of settlements and infrastructure along the N2 highway – one of the main 'gateways' into Cape Town.

### *Former informal settlement structure*

The 19 year old existing Joe Slovo informal settlement comprises 7946 residents, residing in 2748 shack structures built in an informal, high density spatial arrangement. People are poor, and 77% are unemployed. No permanent structures exist and people live in cramped conditions with few vehicle-access ways on the site. This represents a problem for access by emergency vehicles, for example in the event of response to the fires that occur in such settlements. The informal settlement is electrified, and the average shack size is between 6 and 20m$^2$. Often more than one family lives in the lager shacks. Taxis are the most common form of transport.

*Figure 3: Aerial view of the original Joe Slovo informal settlement next to the N2 highway*

*Figure 2: Joe Slovo informal settlement, showing electrification infrastructure*

### *Beneficiaries of Joe Slovo*

A total of 588 units of the planned 2,886 units have been constructed at the time of writing and handed over to approved beneficiaries of Phase 3. The new houses are delivered to beneficiaries earning between R0 and R3,500 per month, and cost them nothing. These houses are targeted at people who lived in the former informal settlement on the site, although some backyard shack-dwellers from Langa will also be accommodated. According to the original plans of the N2 Gateway the intended beneficiaries of these houses were 70% former informal settlement dwellers and 30% backyard dwellers from the Langa Township.


*Figure 4: Aerial view showing the entire Joe Slovo settlement, and the areas covered by Phases 3A, B and C. Phases 1 and 2 are in the unshaded areas within the blue line to the left*

## Sustainable design elements of Joe Slovo Phase 3 and their impact

The Joe Slovo 3 development includes the following sustainable settlement principles:

(i) higher density is achieved by having double-storey, attached units rather than stand-alone houses
(ii) travel time and cost to access work opportunities and other amenities is reduced due to being in a well-located area (i.e. not on marginal land on the outskirts of the city where many low-income settlements are located)
(iii) reduced service infrastructure material use and costs (water, storm water drains, sewage, electricity) per household due to densification
(iv) mixed use land zoning allowing for trading, working, urban agriculture and recreation
(v) improved thermal performance of buildings through insulated ceilings, roof overhangs and duplex block design (i.e. reducing external wall exposure)
(vi) improved energy services through energy efficient water heating via gravity-fed solar water heaters (150 litre low-pressure evacuated tube solar water heating systems).

These are discussed in more detail later.

### *Design differences to typical RDP housing delivery*

Among the identified shortcomings of the RDP housing delivery programme was a perpetuation of the apartheid spatial form where low income communities were peripherally located with little supporting transport and other infrastructure development. Some planners have expressed their sympathy with the first housing delivery programmes which were forced to buy land on the periphery of cities as this was the cheapest and land available to government and could be procured quickly. Nevertheless, this has led to a situation, 20 years after democracy, where most poor people are on marginal and poorly located land. This situation, and the scarcity of urban land closer to economic activities and amenities has strengthened the argument for higher density, well located residential urban environments. As a response to this, the BNG initiative therefore aimed to integrate peripheral housing developments into cities as well as to ensure that future housing development occur on well-located land.

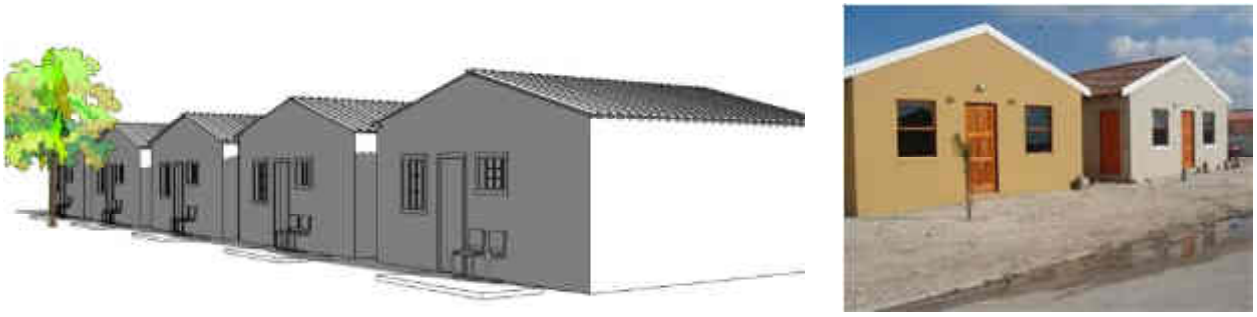

*Figure 5: Typical conventional government-delivered RDP houses*

The Joe Slovo 3 settlement design needed to take the BNG principles further if it was to create a sustainable settlement and accommodate all of the residents of the pre-existing informal settlement. An alternative design approach to the standard 40m$^2$, single storey, free-standing house on a single plot (see Figure 5) had to be applied. The new approach adopted made it possible to achieve a much richer urban settlement design whilst offering more families access to individual homes. The design concept is primarily based on a hierarchy of public open spaces and clusters of 12 to 18 double storey attached units, arranged around courtyards or communal backyards. The design, detailing and specifications of the Joe Slovo 3 buildings are more complex than those of standard subsidy housing.

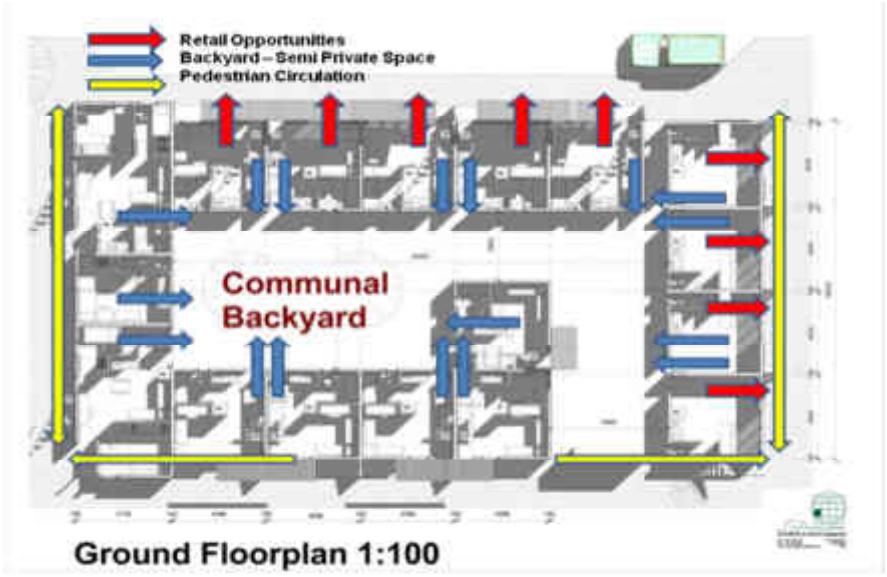


*Figure 6: The layout of one of the housing units at Joe Slovo*

The design introduced a network of streets, pedestrian walkways and public open spaces that provide choice as well as mobility. Pedestrian routes are also seen as spaces in which people interact and socialise. A pedestrian-friendly environment was a major focus of the new design. Motor vehicles are restricted to roads, and retail activities were considered in the design (see Figure 6).

*Figure 7: Joe Slovo double storey, attached housing design*

## Financial assessment of Joe Slovo Phase 3 implementation

Joe Slovo Phase 3 has been funded through the Integrated Reconstruction and Development Programme (IRDP), which is specifically aimed at replacing existing informal settlements with formal RDP housing. Within this programme, it is acceptable to combine the infrastructure costs and the top structure costs to

come to a total allocation per household for the development. For Joe Slovo Phase 3 this was crucial, as the top structure was quoted as R94 000 per household as opposed to the top structure subsidy of R72 000. In order to come in on budget, this meant that the remaining subsidy allocation for infrastructure in Joe Slovo Phase 3 was only R6 000 as opposed to R28 000 for a typical RDP house. This breakdown is summarised in the table below:

| | **Typical IRDP allocation/household** | **Joe Slovo 3 allocation/household** |
|---|---|---|
| Top structure | R72,000 | R94,000 |
| Infrastructure | R28,000 | R6,000 |
| **TOTAL** | **R100,000** | **R100,000** |

The additional cost of the Joe Slovo top structure is primarily due to:

i. Additional bricks per household
ii. An additional concrete slab for the second storey of each house
iii. A wooden staircase for each house

Some savings were achieved from the reduced roof size, but these were minimal in comparison to the additions listed above.

In order to come in within budget, the infrastructure costs had to be reduced substantially. The key to achieving this lay in the large scale pedestrianisation of the Joe Slovo development. The cost of roads and kerbs make up the majority of the infrastructure costs. Laying of water and sewerage pipes is generally a minimal cost in comparison.

In order to lay a road, a base course of 150mm topped by expensive bitumen is required. In addition kerbs would need to be laid to provide a pedestrianised section. In comparison to this, a pedestrianised road only requires a 40mm base course and cheaper 50mm blocks on top. It is also not as wide as a typical road, with the pedestrianised roads in Joe Slovo reduced to between 3 and 3.5 metres. This reduces the cost for roads to approximately 1/3 of a typical RDP development. The infrastructure costs were further reduced by the fact that the densified nature of the Joe Slovo Phase 3 design meant that the length of house frontage to service per plot was now 4m as opposed to a typical RDP plot length of 10m.

These two factors – pedestrianisation of the majority of Joe Slovo's roads and the densification of the development ensured that the infrastructure costs were reduced sufficiently to come within budget.

An indicative calculation is provided below to show how the costs were reduced:

Infrastructure allocation per household: R28 000

House frontage length reduction: 60%

Revised Infrastructure allocation per household: R11 200

Reduction in road building costs due to pedestrianisation: 66%

Revised infrastructure allocation (assuming R2000 water and sewerage per stand): R5 200

The pedestrianisation and densification savings worked out in such a way that there was sufficient additional budget to pave the open courtyards within the development, providing a neater and more visually cohesive impact.

## Sustainable energy interventions

### *Solar water heaters*

*Figure 8: Solar water heaters at Joe Slovo, showing different orientation of units*

With support from international donors[3] and top-up funding from the Western Cape Provincial Government[4], solar water heaters (SWH) were installed on all households. The roof structure needed to be reinforced with one additional truss to ensure that the weight of the SWH would not affect the structural integrity. Joe Slovo 3 roofs are pitched at 17 degrees, with various components of the roof sloping in each of the 4 directions. The SWH stands are at 30 degrees. This means that there is generally a tilt of 45 degrees for the North, West and East facing roofs, which optimises winter sun well, when the hot water is most needed. The SWHs on the South facing roofs have been mounted facing north, resulting in a 13 degree pitch facing North – still providing adequate solar radiation. Due to Joe Slovo being a double storey development, the SWH installation is more demanding for the contractor, requiring additional plant hire (cherry pickers) and incurring additional costs.

Employment benefits were structured into the SWH installation programme, with community members being used in the installation teams and to undertake community training on the use and benefits of SWHs. In addition, community members have been included in the ongoing maintenance provisions.

The community survey undertaken after the residents had been living in the units for some months indicated that, of all the interventions in Joe Slovo, the SWH was the most appreciated. Prior to the installation of the SWHs households used an average of 8 kettles per day for water heating. The SWHs installed were found to produce 30 to 40 degree water in winter, with 79% reporting that they have hot water all the time (this is significant because they have no electrical backup). Winter is Cape Town's rainy season and its very cold during this period, radiation levels are lower than in summer although on clearer days you get hot water from the SWHs. In the absence of hot water from the SWHs residents revert back to using kettles and pots to heat up the water. Residents use hot water 3 to 10 times per day with a typical consumption of 20 to 80 litres her household.

[3] The support was provided by the Danish International Development Agency (DANIDA)
[4] Western Cape Provincial Government provided an additional R17 491 per system.

### *Efficient lighting*

Energy efficient CFL lights were provided in the new houses. However an exchange programme for CFLs that need replacing is necessary to avoid households simply purchasing the cheapest replacement – an incandescent light – as is common amongst poor households. The common courtyard area has solar PV powered lighting that was provided by the SWH contractor. The houses are delivered with an insulated ceiling which has been standard for subsidy houses in the coastal zone areas for several years, and has recently been made mandatory for all houses throughout the country.

### *Thermal design features*

The housing units of Phase 3 have been designed with thermally efficient features. The houses are double storey, and have shared walls which have been plastered and painted on the outside. There are roof overhangs to shade windows in summer but allow solar gain in winter, and orientation is north-facing as far as is possible in a complex development. The thermal design was optimised with the help of a computer modelling package.

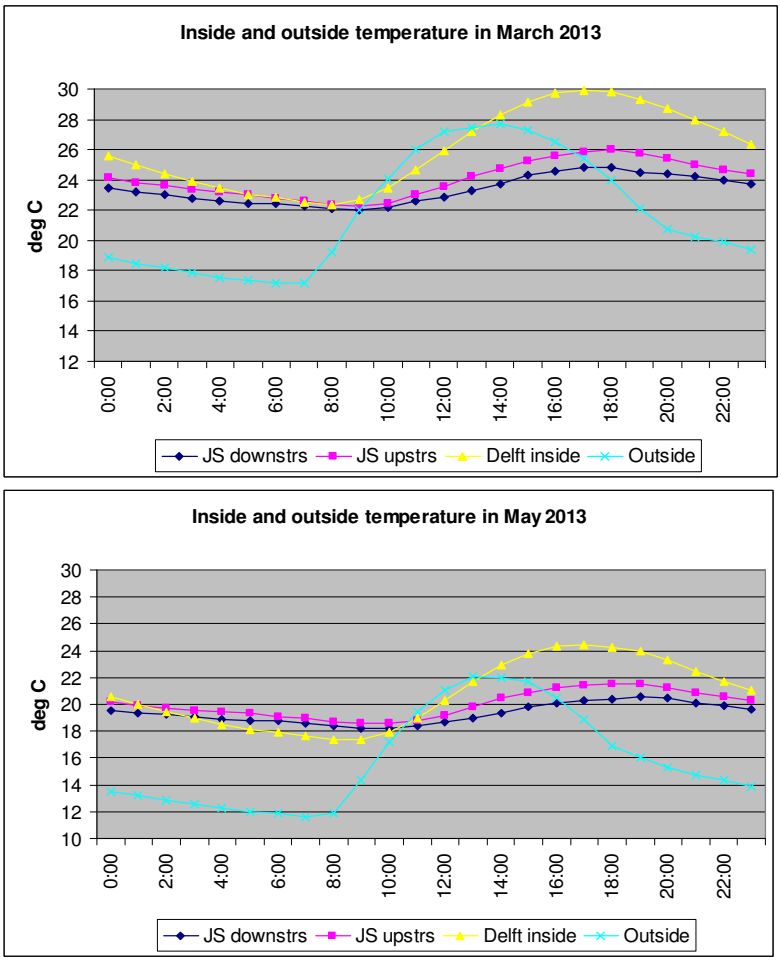


*Figure 9: Monitored indoor and outdoor temperature results for Joe Slovo and Delft (the control), showing thermal benefits of the design features in Joe Slovo over both summer (March) and winter (May) months*

The impact of the thermal design interventions was monitored post-construction and after occupation, and compared with simultaneously monitored readings from Delft, a nearby settlement with stand-alone RDP-type housing.

It was found that generally there is improved thermal comfort in the Joe Slovo houses, being cooler in summer and warmer in winter (see Figure 9). South-facing houses are generally cooler than houses oriented in other directions. This would make the house more comfortable in summer, but is not ideal in winter and results in lower temperatures compared to other houses during most of the day in the transition seasons as well. West-facing houses are generally warmer in the late afternoons, as they catch the full sun as it is setting. North-facing houses appear to have the most stable temperature, not being as cold as south-facing houses, but not as hot as east- and west-facing houses. Future developments should therefore orient houses northwards if possible for these temperature benefits. The temperature upstairs in a Joe Slovo house is generally warmer than the downstairs temperature by 0.5 to 1.5°C.

## Findings from the community surveys

Two community surveys were conducted in the settlement, one in the informal settlement prior to construction and one post-occupation of the units. The results were generally positive regarding

perceptions of the settlement type, with the design benefits of the Joe Slovo 3 being appreciated and the additional open spaces being well used for social purposes. Positive elements include improved safety and improved quality of life, although there were a few who did not like the stairs, usually the elderly, people with disabilities or with young children. Energy expenditure has generally increased in the move from shacks to formal housing as residents have also increased their ownership of electrical appliances. Ceilings were appreciated for aesthetic reasons.

Although not necessarily specific to Joe Slovo, residents of the new houses also appreciate having a secure home with security benefits and obviating concerns around floods and fires which are common in Cape Town's informal settlements. Also, residents are now free to travel without having to worry about the safety of their property – in shacks they had to make sure that there was someone at home all the time.

## Conclusion: a success story for sustainable settlements

The approach used in Joe Slovo Phase 3 appears to have significant benefits, as demonstrated by both the performance monitoring of the interventions as well as the community survey results. Many people were accommodated on well-located land close to economic opportunities and other amenities while also improving their living conditions substantially. And this appears to have been undertaken at no additional cost. The welfare benefits of the improved thermal design and SWHs appear significant, and the project was implemented in a way that resulted in community benefits – such as the employment creation aspects of the SWH installation and ongoing maintenance programmes.

The implementation was not without some challenges for the different technical teams, with the need to adopt new approaches and coordinate efforts in a greater way than with standard stand-alone housing projects. These teething problems are inevitable. The end result appears to be a significant advancement in the current practice of housing delivery in South Africa, and is one of the initiatives which is likely to shift standard practice towards more sustainable settlements, and away from energy-inefficient, low-density, stand-alone models which until recently were considered what communities want and deserve. In fact some thermal design criteria have already been introduced into the national standards for low-income housing. But such shifts will not solve the issue of obtaining well-located land for such developments, however, which is a problem the country does not appear to be close to resolving yet.

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