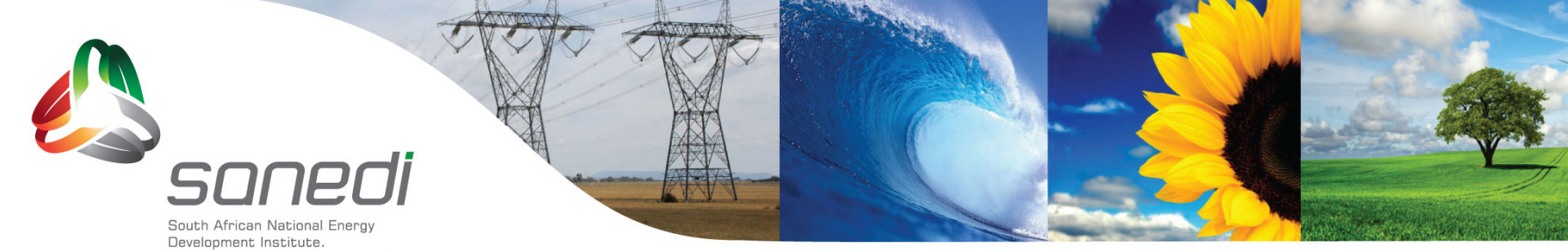


sanedi
South African National Energy Development Institute.

Cool Surfaces Project

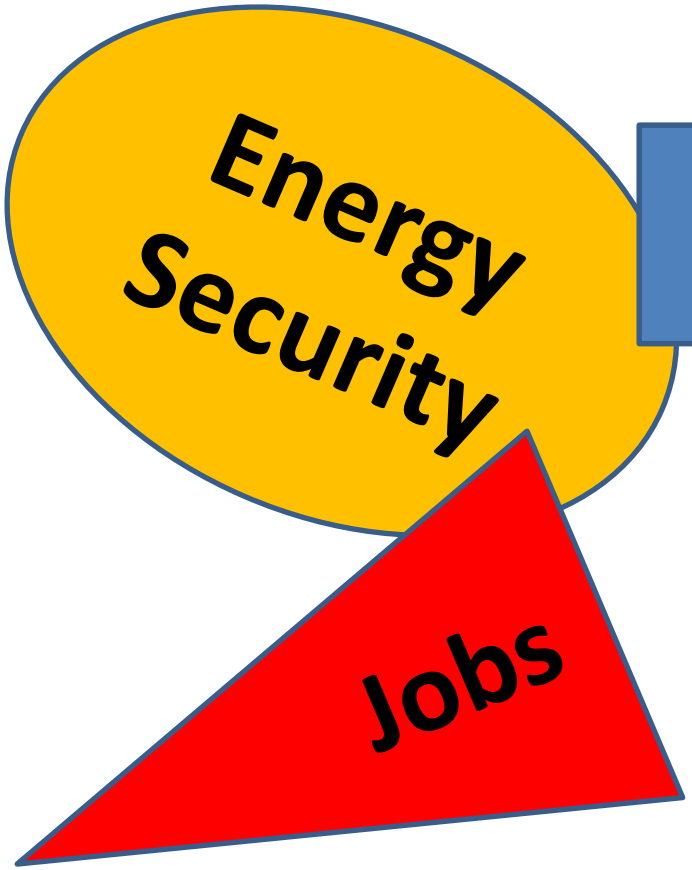
Introduction

What Problems are we Solving?

- Climate Change Mitigation – RSA commitments
- Reduce Electricity Loads on fragile grid
- Reduce Cost of cooling – HVAC & A/C
- Social Upliftment – Indoor thermal Comfort
- Health for vulnerable
- Reduce Building Maintenance
  - Waterproof,
  - Fire Retardant
  - Inexpensive Low-tech
- Unemployment & unskilled
- Too few RSA owner Manufacturers

What Problems are we Solving?

- Climate Change Mitigation – RSA commitments



What Problems are we Solving?

- **Social** Upliftment – Indoor thermal Comfort

Standard of Living

What Problems are we Solving?

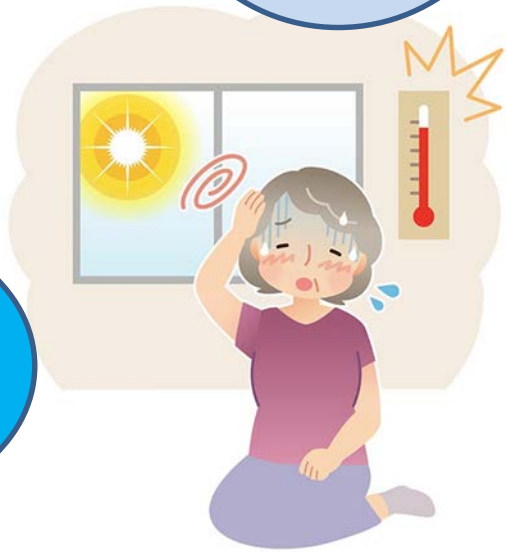
- Reduce **Electricity Loads** on fragile grid
- Reduce **Cost** of cooling – HVAC

What Problems are we Solving?

Health of the Vulnerable

Sick

Infants



Elderly

Overheated Work places and schools

What Problems are we Solving?

- Reduce Building Maintenance
- Waterproofing

What Problems are we Solving?

- Fire Retardant

What Problems are we Solving?

- Unemployment – low tech, easy to apply

Skills Development

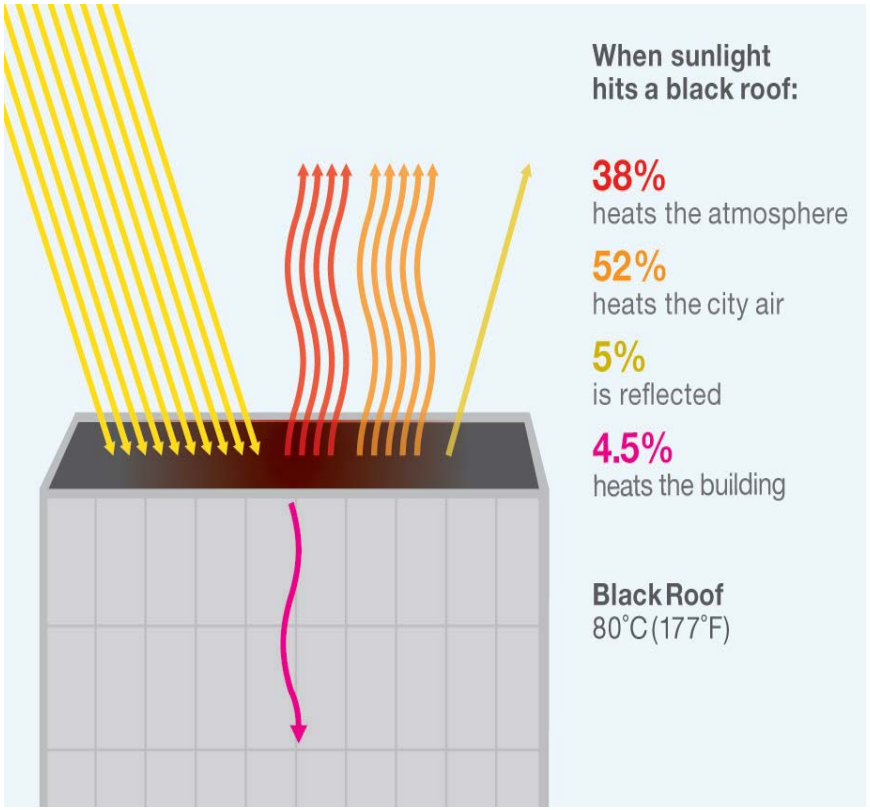
JOBS

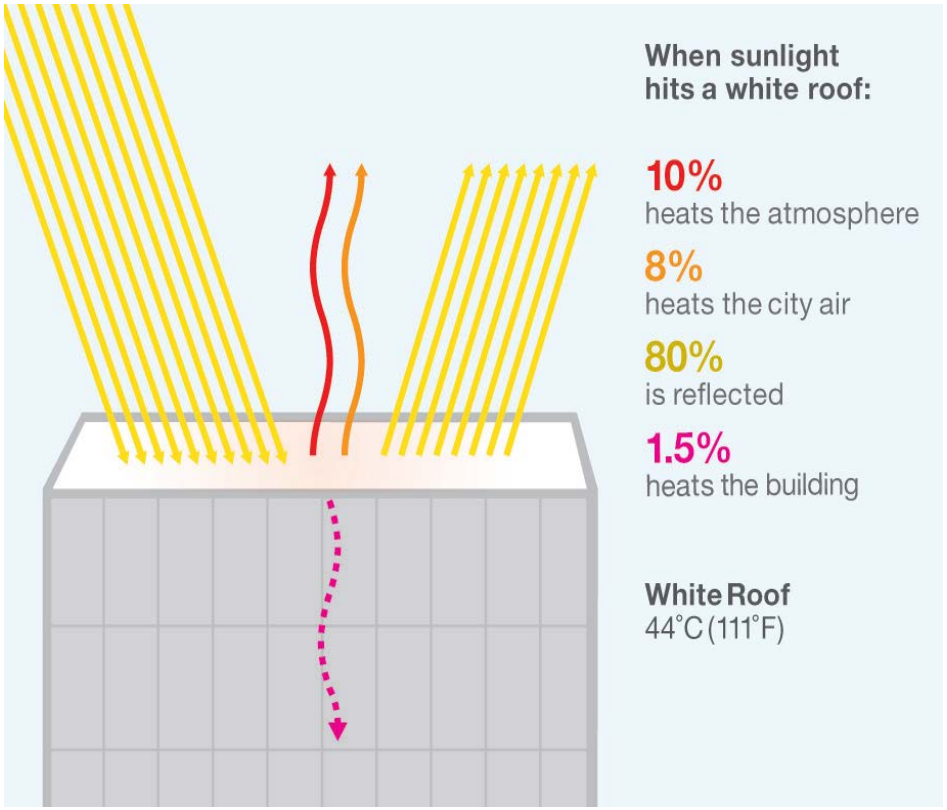
Cool Surfaces can create Sustainable & Resilient Urban Areas

Building Scale	• Up to 20% reduction in cooling demand on top floors • Improve thermal comfort and productivity in un-air conditioned buildings (eg. Homes, warehouses, schools etc)
Urban Scale	• Improved air quality – an opportunity for a $10 billion ZAR energy & health cost reduction in USA alone. • Reduced peak electricity demand and avoided adoption of air conditioning. • Great resiliency to heat events and climate change.
Global Scale	• Offset warming effects of 24 gigatons of CO_2 - equivalent to taking 500 coal power plants offline for 20 years. • Every 100 square meters of white roof – equivalent to 0.6 tons of CO_2 offset per year.

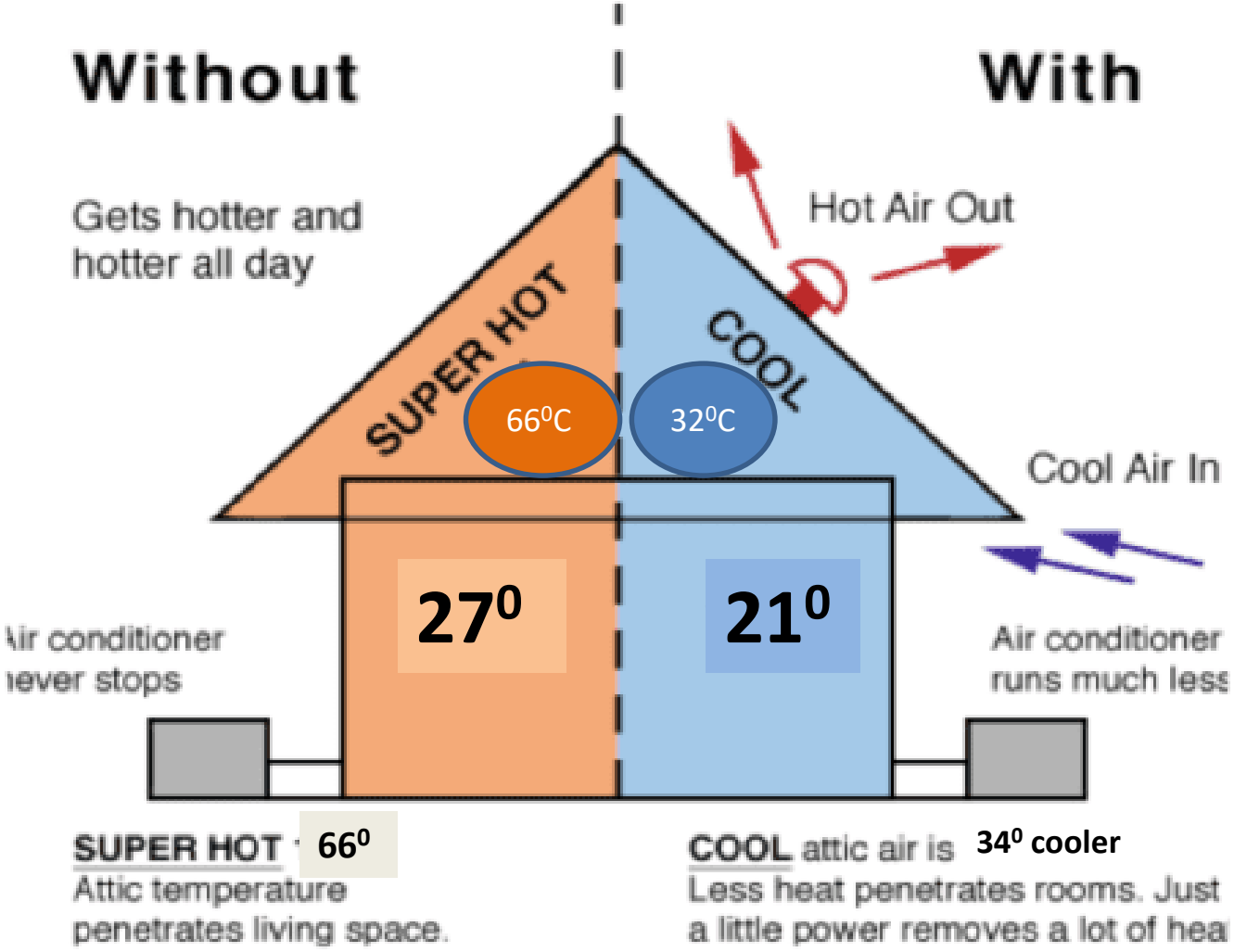
Understanding Cool Surfaces

Cool Roofs – Coating on roofs and walls





HVAC Efficiency & Cool Roofs



Reading Cool Surface quality

- Cool surfaces' efficacy is rated by how much light - solar reflectance (SR) & heat thermal emittance (TE) is prevented from passing the coating.
- Both SR and TE are rated on a scale from 0.0 to 1.0.

Hot **Cold**

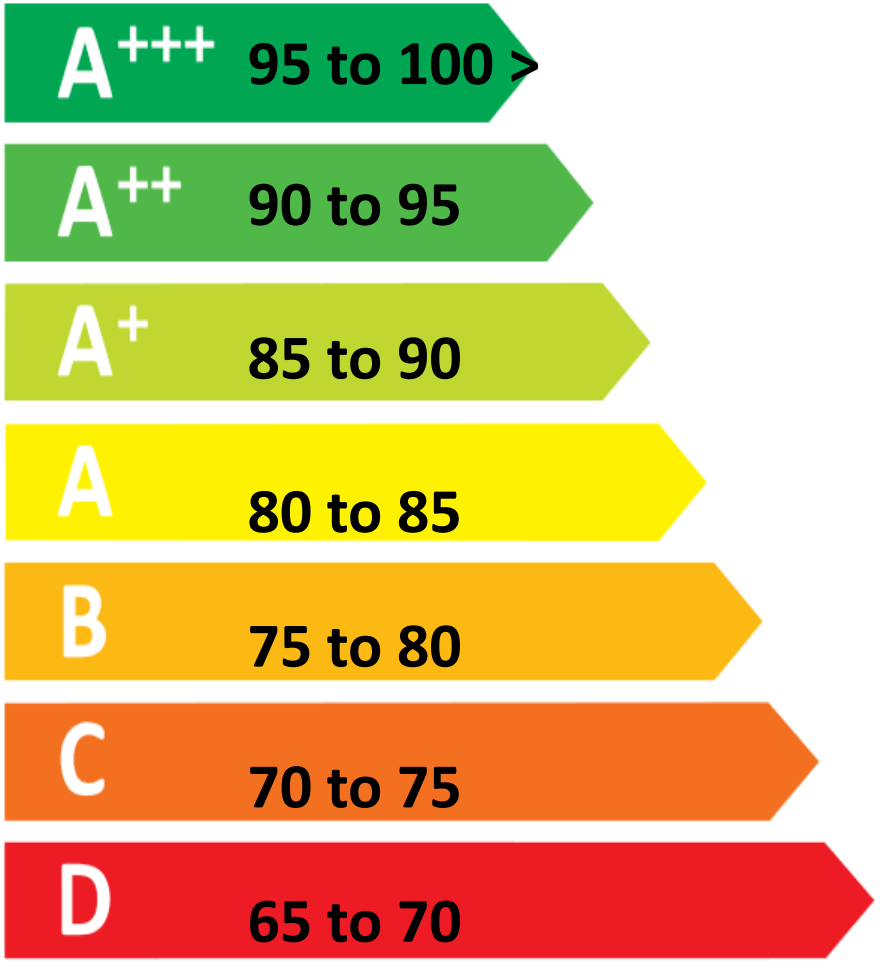
0 - 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 - 0.9 – 1 fraction

- Solar reflectance **(SR)** + Thermal Emittance **(TE)** = Solar Reflectance Index **(SRI)** normally expressed as a percentage

Hot **Cold**

0 – 10 - 20 - 30 - 40 - 50 - 60 - 70 - 80 - 90 – 100 %

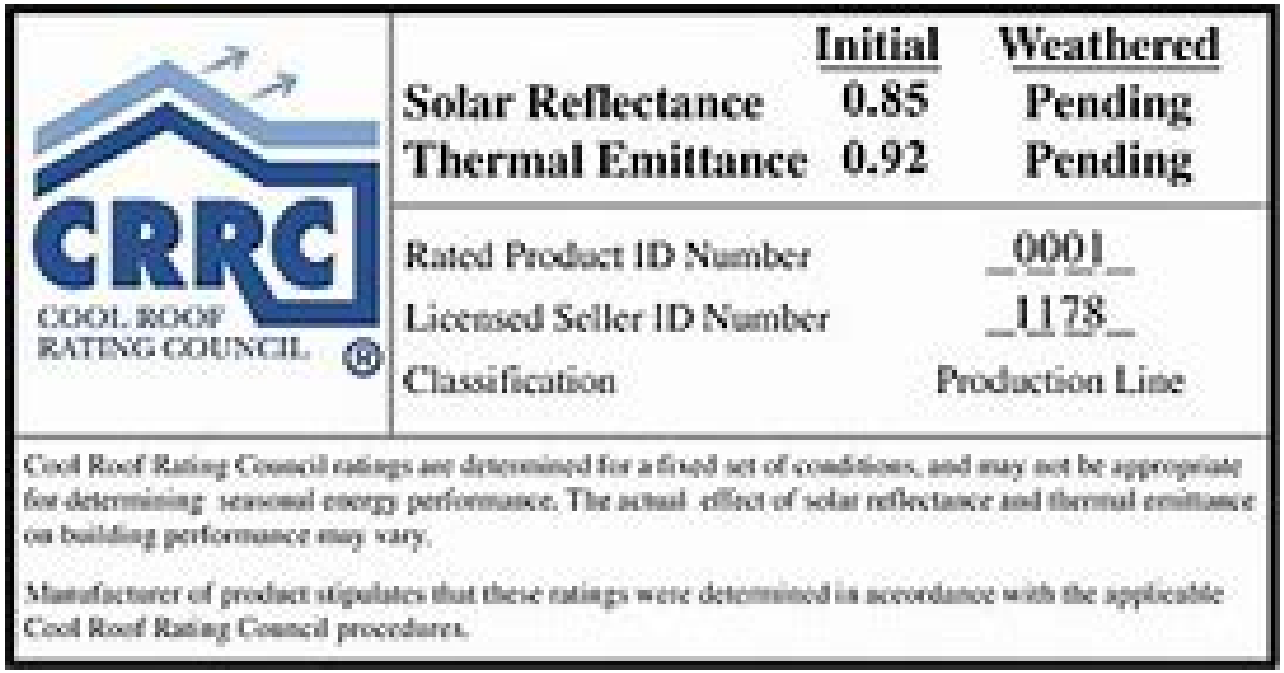
Proposed Rating Label SRI (0-100%)



International Cool Coating Label

Solar Reflectance Index 65	Minimum SRI 0,65	Range 0 to 100 %
Thermal Emittance Heat	Minimum TE 0,65	Fraction 0.0 to 1.0
Solar Reflectance Light	Minimum SR 0,65	Fraction 0.0. to 1.0

Example of a Cool Coating Label



Colour and the Cool Roof

- Standard or dark roofs surface can reach 65^{o}C and more in summer. A cool roof under the same conditions can be more than 10^{o}C cooler.

- Colour is important. Although lighter colours work most effectively, modern cool coatings are not dependent on colour alone. The molecular structure prevents heat ingress even with deeper colour pigment. But regular white roof paint will be more effective than cool coating in dark

- Over 90% of roofs in South Africa are dark. There is great potential for energy savings by installing cool roofs.

Substrate Material and the Cool Roof

- The conductivity of materials from which the substrate (roof, walls or road) is comprised plays a critical role in passive energy cooling.

- Materials that are highly heat conductive absorb solar energy deeper into the substrate and hold onto that heat for much longer periods.

- As more solar radiation strikes the surface the energy accumulates and becomes hotter and hotter, holding onto the heat for much longer periods of time.
- Compare gravel (cooler)to metal corrugated zinc (warmer).

Cool Surfaces Project Roadmap

Achieved to Date

1. Cool Surfaces SABS adoption of Standards
2. Selection from Products Available
3. Pilot Projects and Data Collection
4. Certified skills development Training for local workforce
5. Establishment of Industry Association (SACSA)
6. EE Building Benchmarking and Simulation Modelling
7. Implement large scale project to address UHI.
8. Incrementally develop a CS Database of all rated product
9. Establishment of open source CS Studies Database Platform

On-site testing of CS coating performance

LBNL lecturing to professional architects

16 Training Courses and Workshops over the last 4 years has skilled 142 people (paint applicators, lab technicians, M&V specialists , Simulators)

Capacity building

Sharpeville Primary School GDID pilot

Thusanang Day Care site

Locals employed to complete project

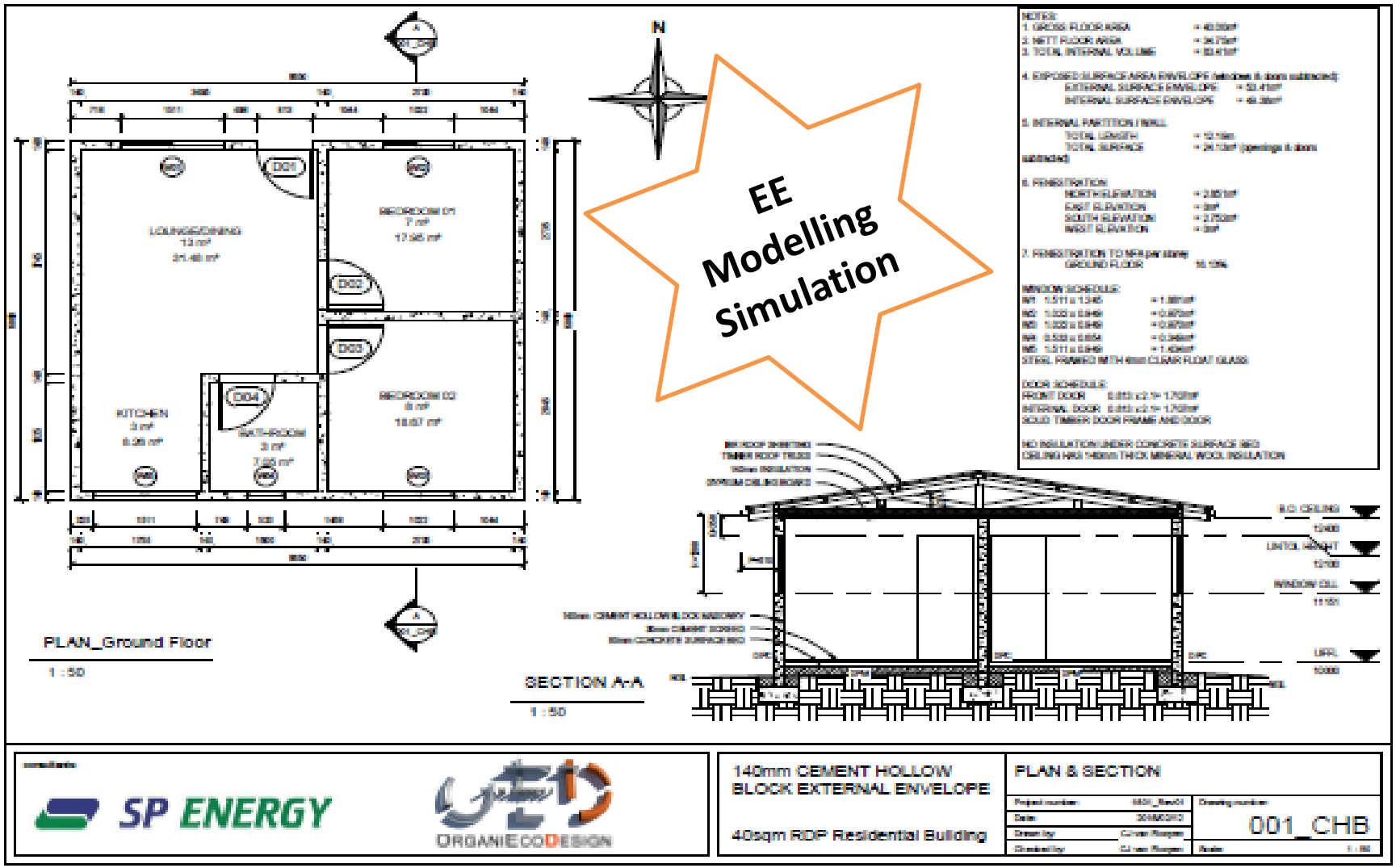
25000sqm of Roofs coated in Sternham

Local youth completing practical exam in !Kheis

Completed Projects

1. !Kheis Pilot project, Duineveld Township, plot 954:	GPS- 28°54'02.2"S 21°59'03.6"E
2. Sharpeville i. Emanuel Primary School:	GPS - 27.53.00.49 E 26.04.33.27 S
ii. Kgomoco Primary School:	GPS - 27.52.03.61 E 26.41.06.55 S
3. Hammanskraal: Thusanang Day Care Centre:	GPS - 25o22'09.85S 28o13' 20.45 E
4. Kimberley Old Magistrates' Court House:	GPS - 28o44'09.25'S 24o45'53.68'E
5. !Kheis Municipality Offices, Grobblershoop:	GPS - 28o53'44.03"S 21o58'59.46"E
6. !Kheis Cool Surfaces Scale up - Sternham:	GPS - 28o54'26.18''S 22o00'15.24''E

Established 10 nominal building types RSA

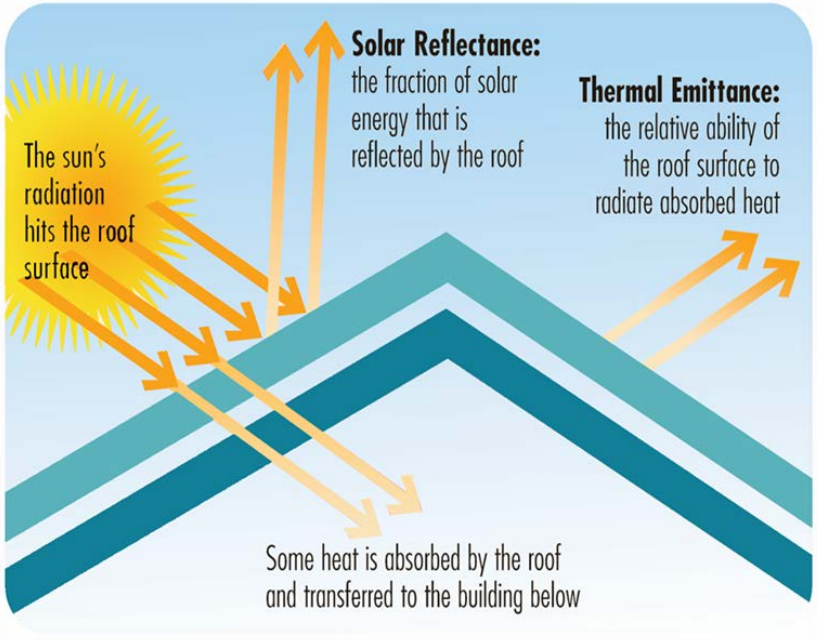


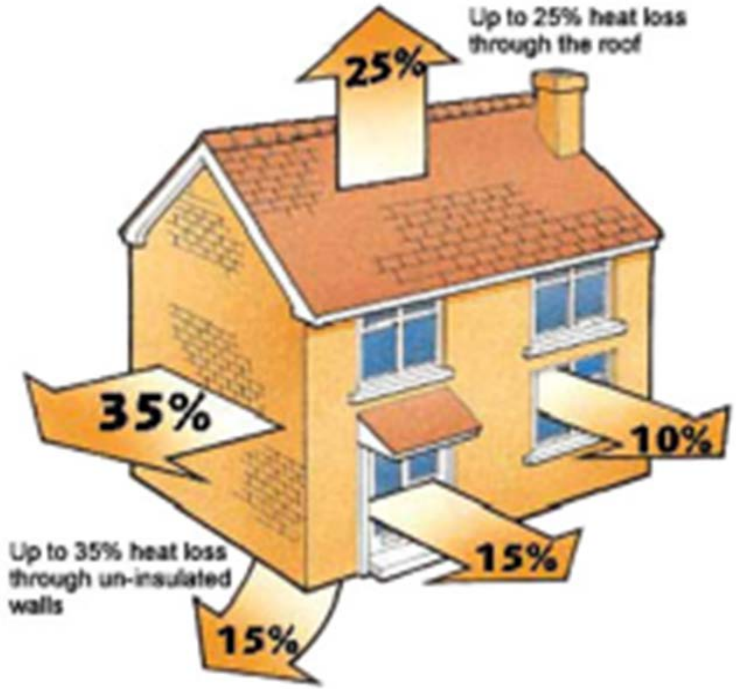
Cool Surfaces Project Roadmap

- **1**. Collaboration of Cool Coatings & Insulation project to maintain SANS 10400 XA standards for insulation and prevent R-value offset by cool coatings.
- **2.** Cool Paving pilot to address black tar roads
- **3.** Duplicate scaled-up project in each energy zone. (25000m2 roof area coated per project)
- **4**. Establish EE Building Lab in RSA for Testing, Rating and Labelling

Cool Surfaces Project Roadmap

1. **Collaboration of Cool Coatings & Insulation** project to maintain SANS 10400 XA standards for insulation and prevent R-value offset by cool coatings.





Cool Roofs vs Insulation

Cool Coatings	Insulation
Relatively inexpensive and easy to apply.	Relatively expensive and can be complicated to install.
Most effective for **Cooling** – heat reduction with no insulating effect.	Most effective for **Heating** – heat gain with excellent insulation effect.
Applied on only outside of building	Can be applied on outside or inside of building depending on insulation type.
Prevents absorption of heat via solar reflectance and thermal emittance	Retains heat in a contained space by acting as a barrier to heat transfer.
Cool Coatings are waterproof so condensation is not of great concern, for application in climate zones like S Cape Condensation zone. .	External insulation especially, may need to be treated separately to waterproofing and needs to avoid moisture, for application in climate zones like S Cape Condensation zone.
Addresses Climate Change mitigation and indoor thermal comfort	Does not address climate change only indoor thermal comfort

Cool Roofs vs Insulation

Cool Coatings	Insulation
Assume min SRI-value of 0.65 or greater	Assume min R-value of 48 derived from 46mm thickness.
ROI: once-off payment, renewal every 10 years. Energy savings applicable where electricity and HVAC is used.	ROI: Insulation thickness if doubled, takes 13 years to recover, triple = 17 years, quadruple 19 years to achieve similar cooling.
Can add to undesirable heat loss in extreme cold weather. The increase in fuel used on heating night and winter cold temperatures is similar to that of uncoated roofs.	The cost of insulation to achieve cooling in summer temperatures is substantial.

Cool Coatings and Insulation used together:

1. More effectively regulates thermal comfort in buildings than either technology, alone.
2. Installation costs of both technologies are more speedily recovered if used together.
3. Environmental impact and climate change mitigation is significantly improved.

Cool Surfaces Project Roadmap

2. **Cool Paving** pilot to address black tar roads

Cool Surfaces Project Roadmap

3. Duplicate scaled-up project in each climate /energy zone.
   (25000m^2 roof area coated)

Cool Surfaces Project Roadmap

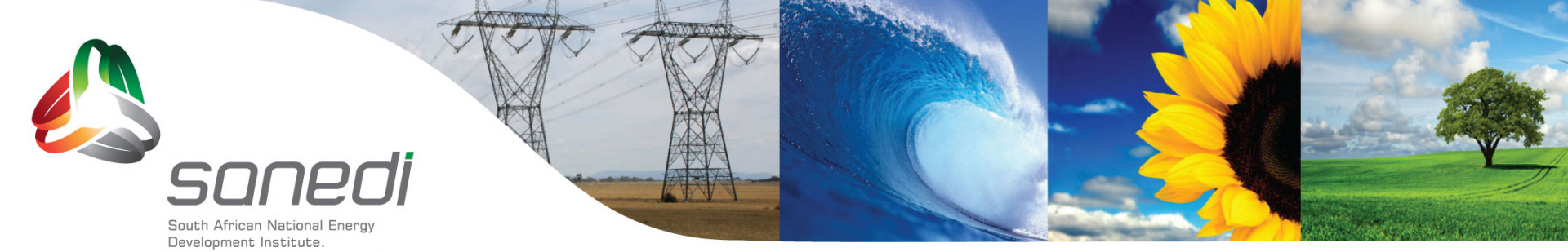
4. Establish EE Building Testing Lab in RSA for Testing, Rating, Labelling

Project Additional Funding Support

With this in mind, the Kigali Clean Energy Pro
collaboration with the Cl
(CCC

How to take Cool Surfaces Further?

- Appropriate measurement and evaluation methods for meaningful data
- Accurate accredited measuring instruments
- Accurate, sufficient 3rd-party, data collection
- Certified M&V/ M&E specialist for reliable, purposeful analysis, conclusions and recommendations.



sanedi
South African National Energy Development Institute.

THANK YOU

Denise Lundall

WWW.SANEDI.ORG.ZA

denisel@sanedi.org.za