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Major projects report

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www.claybrick.org.za

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Technical Excellence

Clay brick PERFORMANCE highlighted in research

Setting the SUSTAINABILITY benchmarks in the RSA

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Review of Programme 2014/5

LONG TERM PROJECTS

- Environmental Life Cycle Assessment – completed
- Thermal Performance Study - completed
- Socio-economic Life Cycle Assessment – in progress
- Sustainability trade off tool – SBMI – testing on hold
- Relationship with Think Brick & T-value/CR value projects

ROUTINE PROJECTS

- Monitoring SABS for standards development
- Marketing support

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Target audiences of our studies

Who they are and how or why they will use them?

- Clay brick manufacturers; to assess the advantages of the various firing technologies, and their own performance against peers. Each contributor will receive a report.
- Manufacturers of other building materials: to provide a data baseline on clay bricks to compare with their own products
- Built environment professionals: to empower professionals to make informed decisions when designing and specifying walling materials such as clay bricks
- Academic & Government: to provide substantiated information on clay bricks as a walling material
- Government and other stakeholders with vested interests in the environmental impacts associated with RSA clay bricks

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Environmental Life Cycle Assessment

What is it?
Where is it?
Who will it educate?
When and how will we see benefits?

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What is an Environmental LCA?

The biggest single project **ever undertaken** by the CBA!

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What is an Environmental LCA?

A Life Cycle Assessment is generally divided into 4 steps:

1. Goal and scope definition. e.g. Cradle to Grave
2. Inventory of applicable data, also known as the Life Cycle Inventory (LCI) is gathered at each stage
3. Impact assessment of the processes involved, also known as the Life Cycle Impact Assessment (LCIA),
4. Environmental performance improvement assessment.

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The Survey!

- Full population field survey completed
- 102 stand alone clay brick manufacturers assessed
- 6 firing technologies employed in the country:

Kiln Technology	Clamp	Tunnel	TVA	Hoffman	VSBK	Zigzag
Use	68%	20%	6%	2%	2%	2%

- Clamp, TVA, Hoffman, VSBK, Zigzag – Coal fired
- Tunnel – Natural Gas or refined oil fired

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The Stages - Cradle to Gate!

Each Life Cycle stage was exhaustively analysed for its environmental impacts

Raw materials & energy inputs

Extraction of clay → Stockpiling of clay → Clay Preparation → Clay Mixing → Extrusion → Drying → Firing → Off packing & Stacking

Emissions & Production Waste

Fired brick, at gate of plant

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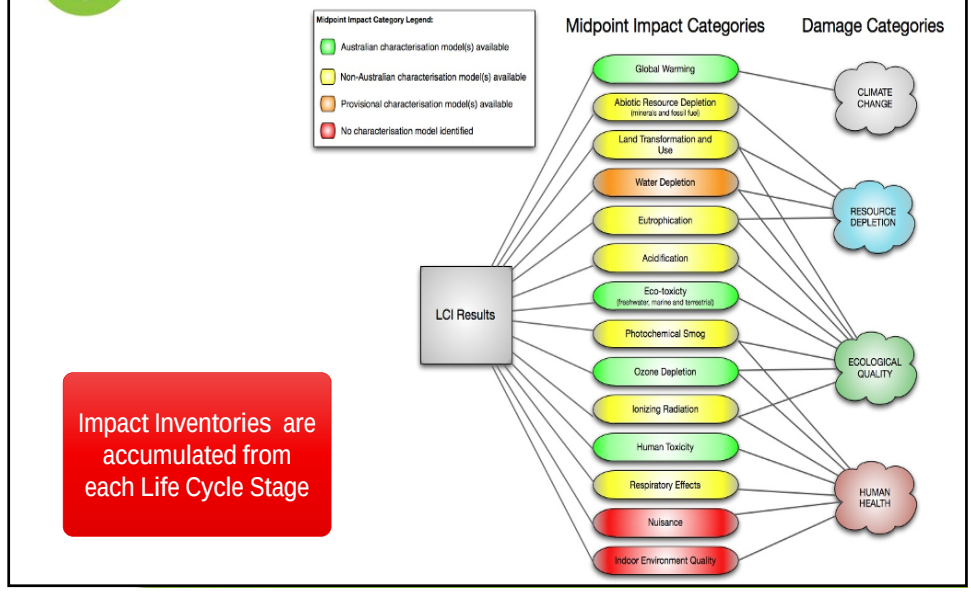
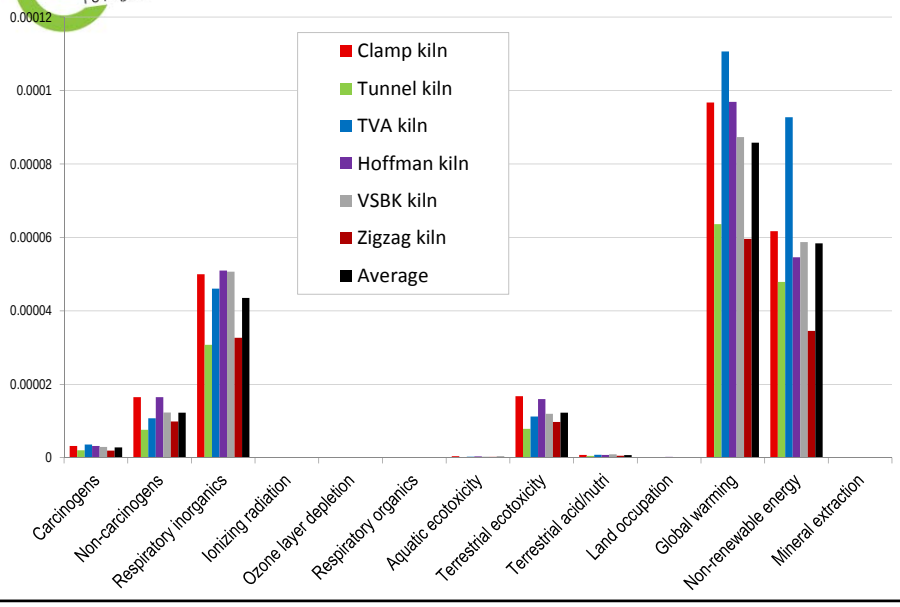
What methodology is followed?



Impact Inventories are accumulated from each Life Cycle Stage

What are the results?



How will be realise the benefits?

Impact category	Unit	Clamp kiln	Tunnel kiln	TVA kiln	Hoffman kiln	VSBK kiln	Zigzag kiln
Carcinogens	kg C2H3Cl eq	0.00814187182	0.00515270238	0.00914432242	0.00810108319	0.00740174035	0.00494895102
Non-carcinogens	kg C2H3Cl eq	0.04179494533	0.01924037599	0.02722045075	0.04174778801	0.03121938537	0.02493596800
Respiratory inorganics	kg PM2.5 eq	0.00050607152	0.00031152649	0.00046630180	0.00051658791	0.00051313439	0.00033100031
Ionizing radiation	Bq C-14 eq	0.95778904968	0.87568105819	1.47786014650	0.95269570147	0.88766456935	0.70541212302
Ozone layer depletion	kg CFC-11 eq	0.00000000231	0.00000002563	0.00000006306	0.00000000214	0.00000002325	0.00000000447
Respiratory organics	kg C2H4 eq	0.00006524754	0.00006338587	0.00011973057	0.00006239477	0.00007652521	0.00005091368
Aquatic ecotoxicity	kg TEG water	105.98043708710	49.67749359286	71.51193973201	100.06760550541	75.14769218295	59.86290295702
Terrestrial ecotoxicity	kg TEG soil	29.00857705030	13.61790345944	19.42756200867	27.65754251567	20.72826918385	16.88049252341
Terrestrial acid/nutri	kg SO2 eq	0.01010265927	0.00669882367	0.01028512930	0.01018422481	0.01204490957	0.00687164138
Land occupation	m2org.arable	0.00230413453	0.00102737484	0.00136042437	0.00280970463	0.00154183512	0.00134446857
Aquatic acidification	kg SO2 eq	0.00495749005	0.00287197839	0.00431997412	0.00502342044	2946.07543864364	0.00309953269
Aquatic eutrophication	kg PO4 P-lim	0.00022195075	0.00009246189	0.00012782492	0.00019299887	0.00014416268	0.00011668318
Global warming	kg CO2 eq	0.95767137052	0.62968446268	1.09531140811	0.95959069180	0.86473851230	0.59010540565
Non-renewable energy	MJ primary	9.37276444377	7.27880994028	14.09074193091	8.29797312289	8.92813950914	5.25028238457
Mineral extraction	MJ surplus	0.00054846740	0.00038724835	0.00061989745	0.00050976788	0.00049208661	0.00044508894

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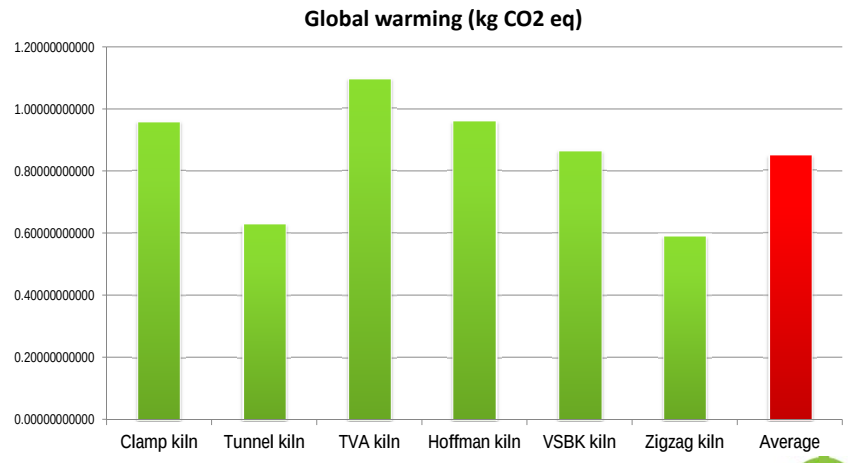
How can we improve?



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How will we realise the LCA benefits?

- A Road Show is planned which will cover all major RSA centres and we need to invite all the Clay Brick Publics
- The Sustainable Building material Index may have traction and we are putting this out there for other industries to follow LCA
- Following a Process of Continuous Improvement at each factory and using the LCA to benchmark each factory
- Promoting all of the properties of brick and
  - Specifically solid masonry for Offices and day-time occupancy buildings
  - Promoting thermal insulation into cavity walling for residential buildings
- Selling the Thermal Performance study and the good results

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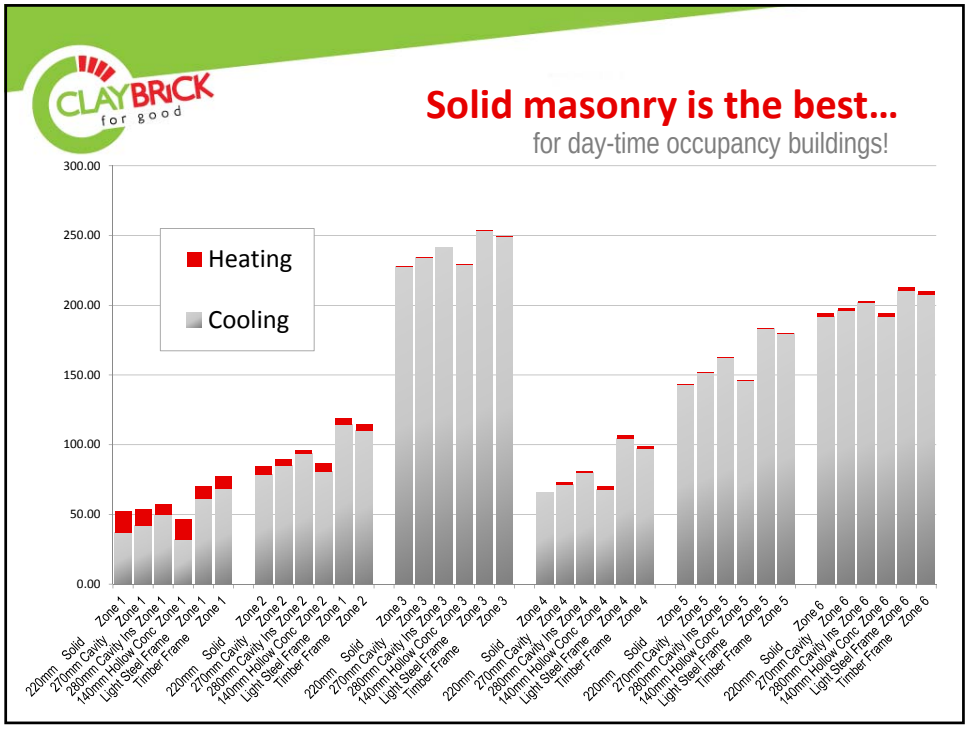
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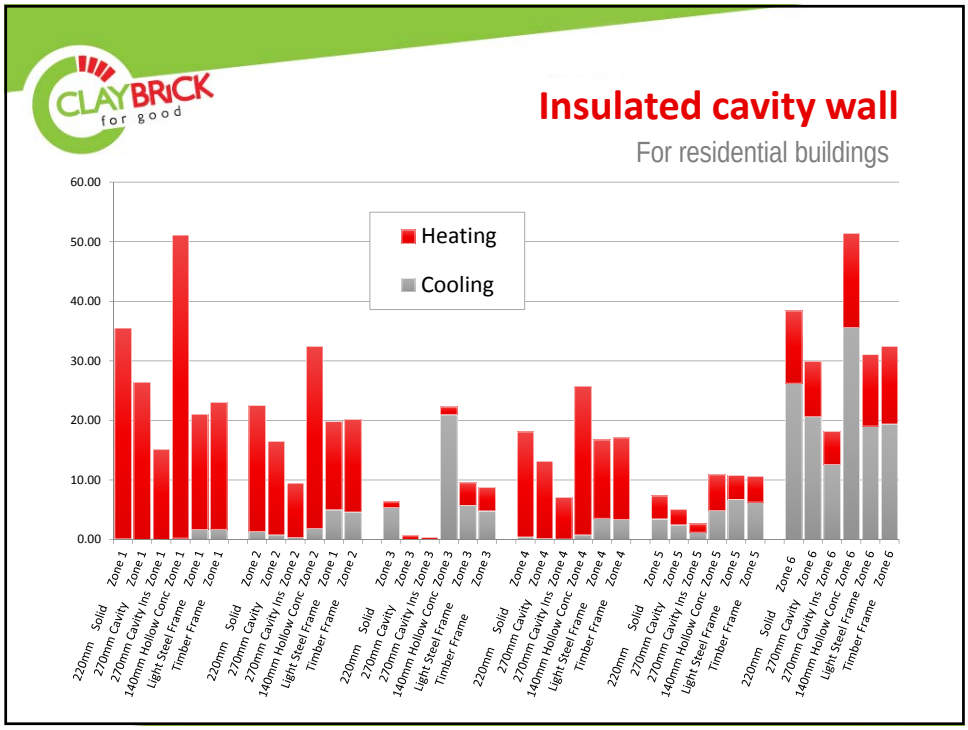
Solid masonry is the best...
for day-time occupancy buildings!
Heating
Cooling
300.00
250.00
200.00
150.00
100.00
50.00
0.00
220mm Solid
270mm Cavity
270mm Cavity Ins
140mm Hollow Conc
Light Steel Frame
Timber Frame
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Zone 6


CLAYBRICK for good
Insulated cavity wall
For residential buildings
Heating
Cooling
60.00
50.00
40.00
30.00
20.00
10.00
0.00
220mm Solid
270mm Cavity
270mm Cavity Ins
140mm Hollow Conc
Light Steel Frame
Timber Frame
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Zone 6

What are the PTS conclusions?

RESIDENTIAL

- Across all climatic zones, the lowest energy usage per m² of walling is the thermally insulated 280mm clay brick cavity wall.
- In all climate zones the highest energy usage per m² of walling is the hollow concrete block wall.
- Masonry walls with increasing thermal resistance have increasingly lower energy usage in the residential sector

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What are the PTS conclusions?

NON-RESIDENTIAL

- In all climate zones but one (Zone 1 - but only marginally so), the lowest energy usage per m² of walling is the 220mm solid clay brick wall.
- In all climate zones, the highest energy usage per m² of walling for all climate zones is either the light steel frame walling, or in one case the timber frame wall.

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Progress on the Socio-Economic LCA

- G1 completed the 'Cradle to Gate' social study via the questionnaire and have reported
- Worley Parsons (WP) have been contracted to complete the 'gate to grave' phase of work and at this time the work is nearing completion
- WP will add an Economic Impact Assessment

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Think Brick Co-operation?

- CBA has paid Think Brick to access Newcastle University thermal study data in order to apply the data to a CR Method validation project. This bolsters the SANS204 rules on high mass walling. Previously the work is based on modelling rather than in-situ data.
- Opportunity to entrench CR method of SANS204 and Clay brick into the RSA Standards and Energy Regulations
- Hot box results from Think Brick will boost the set of test results and help us determine whether our tests are rubbish
- Australian experience in negotiating the changes in the BCA should be valuable

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How will we realise the benefits?
ROADSHOW
SUSTAINABLE BUILDING MATERIAL INDEX
PROMOTING THE GOOD NEWS FROM THE THERMAL PERFORMANCE STUDY
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