# Exploring *Urban Change* through *Virtual Networks*

**Petru du Toit | TSA05 | 19.07.2018**
FINAL PRESENTATION

*Mentors*

*Jakob Merk*

*Vu Hoang*

Transsolar
academy

Fig.1: The big disparity between rich and poor in Cape Town



Fig. 2: People build their homes out of very basic, low perfroming materials

**GOAL**

=

**empower people that can't afford professional services**

*in turn, increase the level of comfort in homes*

**TARGET**

=

**build up an online platform**

*to share with greater public*

**INFORMING EDUCATIONAL TOOL**

This project aims to create a tool that empowers people that can't afford professional services such as a architects or engineers in the built environment.

The study focuses on slum areas around the periphery of Cape Town's inner city. In most of these settlements people build their homes with very limited resources. This results in their homes having a very low level comfort.

The aim of the study therefore is to suggest solutions that are small and affordable but has a big impact on the level of comfort within their homes.

Fig.1:
https://qz.com/africa/1273676/south-africas-inequality-is-getting-worse-as-it-struggle-to-create-jobs-after-apartheid/

Fig. 2:
https://www.theguardian.com/global-development-professionals-network/2014/may/14/south-africa-cape-town-slum-

PART 01 ——————→ EXPOSING THE PROCESS
*...getting to a sloution*

PART 02 ——————→ THE PRODUCT
*...the solution*

Transsolar
**academy**

Part 01

Exposing the process. Let's check out the flow of work and the methodology applied to get to a solution

*PART 01* ⟶ EXPOSING THE PROCESS

*...getting to a sloution*

*PART 02* ⟶ THE PRODUCT

*...the solution*

Transsolar
**academy**

a

**GOAL+ VISION**

an **IDEA . . .**

Initially, I had quite a strong vision and goal.

a

## GOAL+ VISION

an *IDEA . . .*

01. **OPEN SOURCE**
02. **FLEXIBLE**
03. **TECHNICAL**
04. **URBAN RENEWAL**
05. **COMFORT**
06. **COMMUNITY**
07. **EASY TO BUILD**
08. **MATERIALS**
09. **CO LIVE/HOUSE**
10. **SUSTAINABLE**
11. **FINANCIAL MODEL**
12. **LOCALLY SOURCED**

However, from this I had many ideas and approaches that I explored.

It was clear that the process definately was not a linear one. My thought processes were sporadic in nature.

From the singular idea and vision, many ideas and explorations were looked into.

Transsolar
**academy**

a
**GOAL+ VISION**

an *IDEA . . .*

and even more ideas...

**01.** OPEN SOURCE
- easy to use
- act as education
- sharing platform
- connecting others
- virtual
- developing 24/7
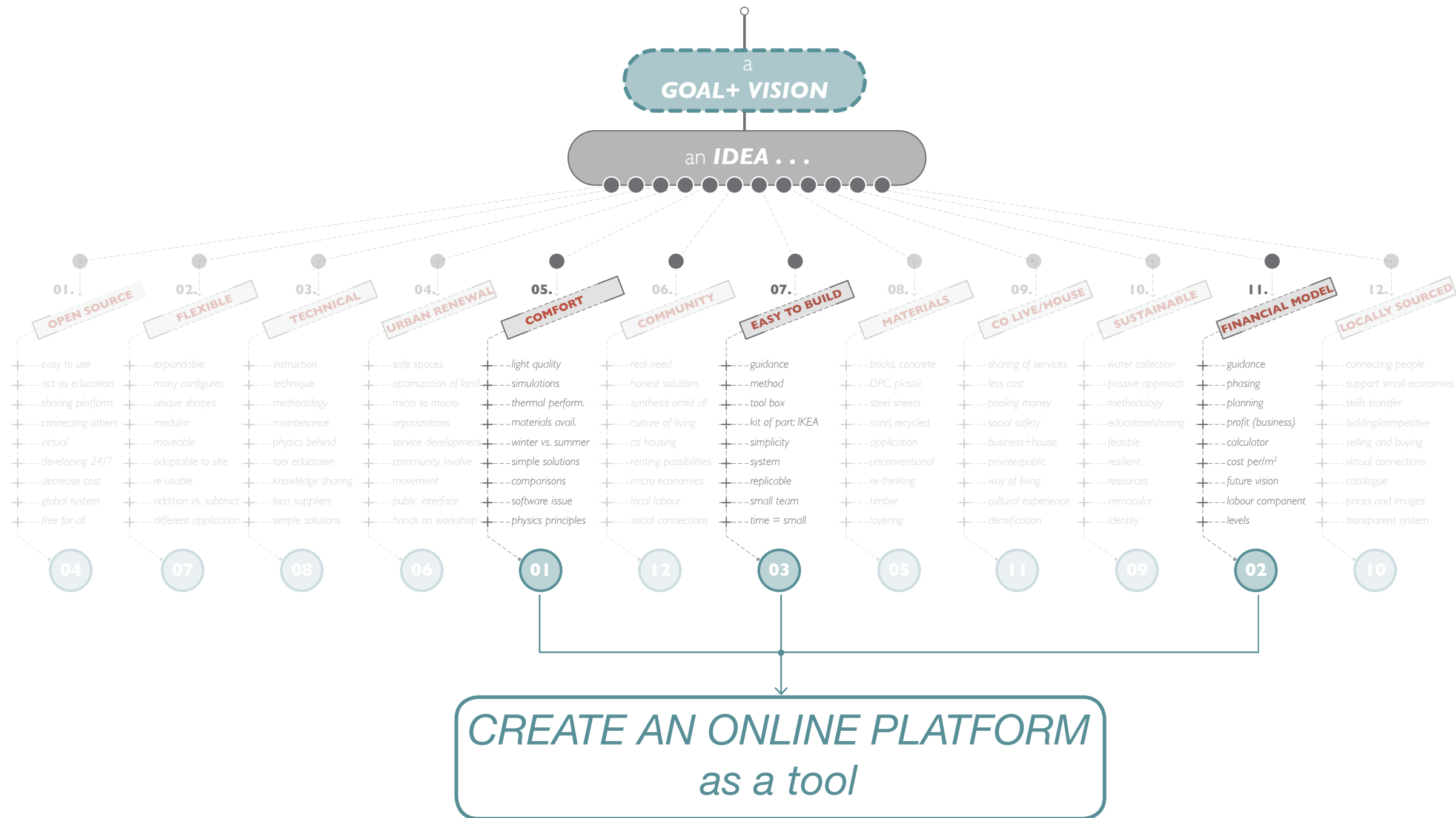- decrease cost
- global system
- free for all

**04**

**02.** FLEXIBLE
- expandable
- many configures
- unique shapes
- modular
- moveable
- adaptable to site
- re-usable
- addition vs. subtract
- different application

**07**

**03.** TECHNICAL
- instruction
- technique
- methodology
- maintenance
- physics behind
- tool eductaion
- knowledge sharing
- loca suppliers
- simple solutions

**08**

**04.** URBAN RENEWAL
- safe spaces
- optimization of land
- micro to macro
- organizations
- service development
- community involve
- movement
- public interface
- hands on workshop

**06**

**05.** COMFORT
- light quality
- simulations
- thermal perform.
- materials avail.
- winter vs. summer
- simple solutions
- comparisons
- software issue
- physics principles

**01**

**06.** COMMUNITY
- real need
- honest solutions
- synthesis amid all
- culture of living
- co housing
- renting possibilities
- micro economies
- local labour
- social connections

**12**

**07.** EASY TO BUILD
- guidance
- method
- tool box
- kit of part: IKEA
- simplicity
- system
- replicable
- small team
- time = small

**03**

**08.** MATERIALS
- bricks, concrete
- DPC, plastic
- steel sheets
- sand, recycled
- application
- unconventional
- re-thinking
- timber
- layering

**05**

**09.** CO LIVE/HOUSE
- sharing of services
- less cost
- pooling money
- social safety
- business+house
- private/public
- way of living
- cultural experience
- densification

**11**

**10.** SUSTAINABLE
- water collection
- passive approach
- methodology
- education/sharing
- feasible
- resilient
- resources
- vernacular
- identity

**09**

**11.** FINANCIAL MODEL
- guidance
- phasing
- planning
- profit (business)
- calculator
- cost per/m²
- future vision
- labour component
- levels

**02**

**12.** LOCALLY SOURCED
- connecting people
- support small economies
- skills transfer
- bidding/competitive
- selling and buying
- virtual connections
- catalogue
- prices and images
- transparent system

**10**

a
**GOAL+ VISION**

an **IDEA . . .**

| 01. OPEN SOURCE | 02. FLEXIBLE | 03. TECHNICAL | 04. URBAN RENEWAL | 05. COMFORT | 06. COMMUNITY | 07. EASY TO BUILD | 08. MATERIALS | 09. CO LIVE/HOUSE | 10. SUSTAINABLE | 11. FINANCIAL MODEL | 12. LOCALLY SOURCED |
|---|---|---|---|---|---|---|---|---|---|---|---|
| easy to use | expandable | instruction | safe spaces | light quality | real need | guidance | bricks, concrete | sharing of services | water collection | guidance | connecting people |
| act as education | many configures | technique | optimization of land | simulations | honest solutions | method | DPC, plastic | less cost | passive approach | phasing | support small economies |
| sharing platform | unique shapes | methodology | micro to macro | thermal perform. | synthesis amid all | tool box | steel sheets | pooling money | methodology | planning | skills transfer |
| connecting others | modular | maintenance | organizations | materials avail. | culture of living | kit of part: IKEA | sand, recycled | social safety | education/sharing | profit (business) | bidding/competitive |
| virtual | moveable | physics behind | service development | winter vs. summer | co housing | simplicity | application | business+house | feasible | calculator | selling and buying |
| developing 24/7 | adaptable to site | tool eductaion | community involve | simple solutions | renting possibilities | system | unconventional | private/public | resilient | cost per/m$^2$ | virtual connections |
| decrease cost | re-usable | knowledge sharing | movement | comparisons | micro economies | replicable | re-thinking | way of living | resources | future vision | catalogue |
| global system | addition vs. subtract | loca suppliers | public interface | software issue | local labour | small team | timber | cultural experience | vernacular | labour component | prices and images |
| free for all | different application | simple solutions | hands on workshop | physics principles | social connections | time = small | layering | densification | identity | levels | transparent system |

04 — 07 — 08 — 06 — **01** — 12 — **03** — 05 — 11 — 09 — **02** — 10

**CREATE AN ONLINE PLATFORM**
*as a tool*

However, eventually I realized that I needed to decide on three main focus areas that I would address in such a short time.

I settled on the following three focus areas for my time at Transsolar. It was derived that the solution or product needed to propose something which address:

1. Comfort within homes

2. Easy to build

3. Financial model linked to the solution.

Transsolar **academy**
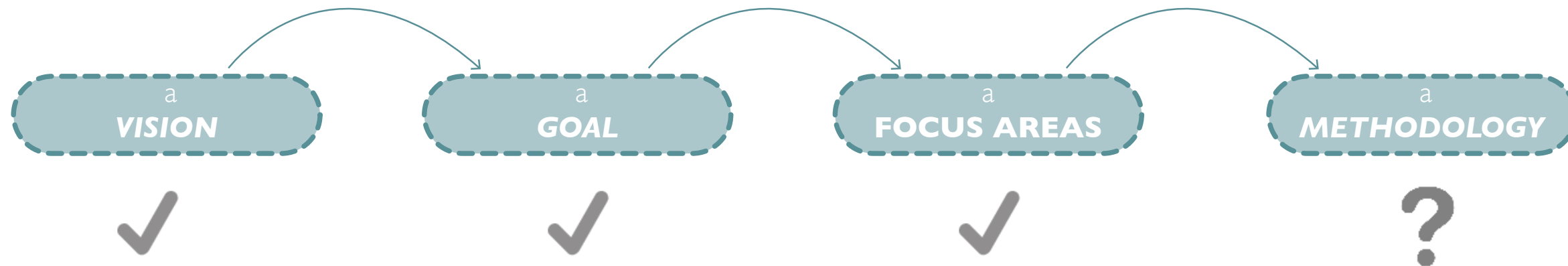
With my goal, vision and 3 focus areas in place, the next step was so set out a clear methodology to successfully deliver my vision.
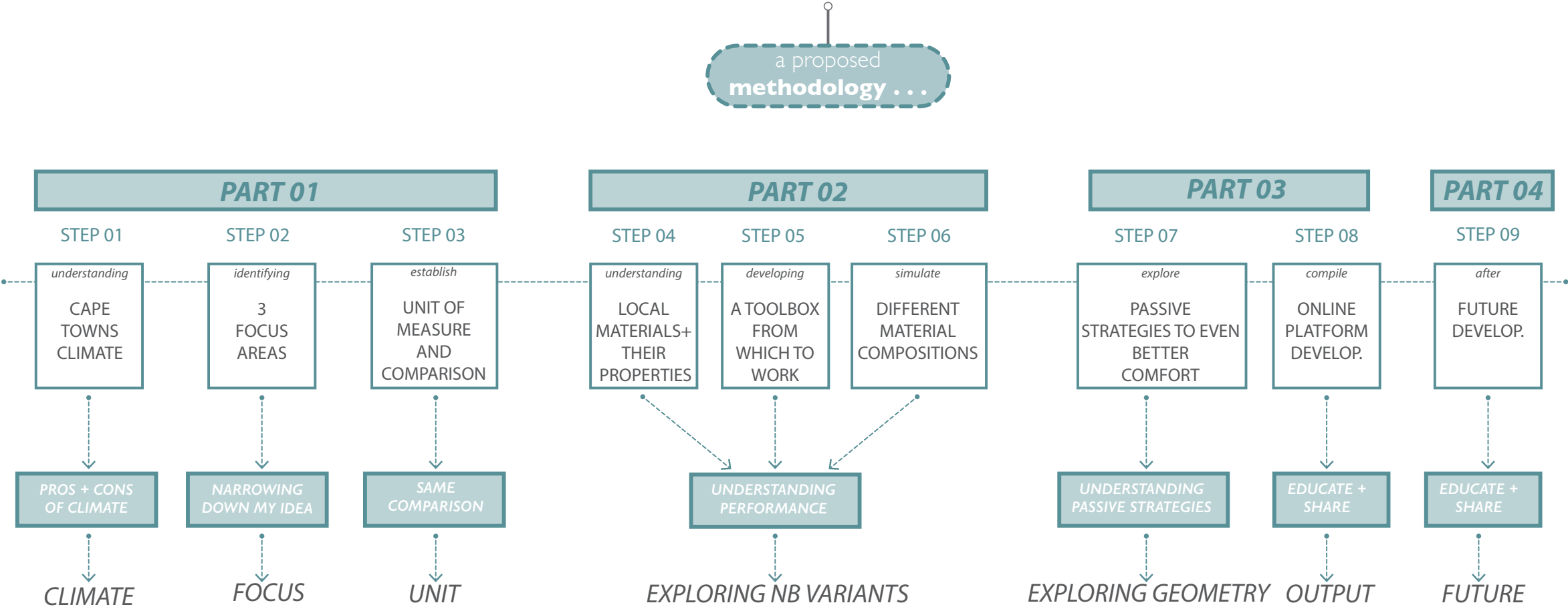


a
*VISION*

a
*GOAL*
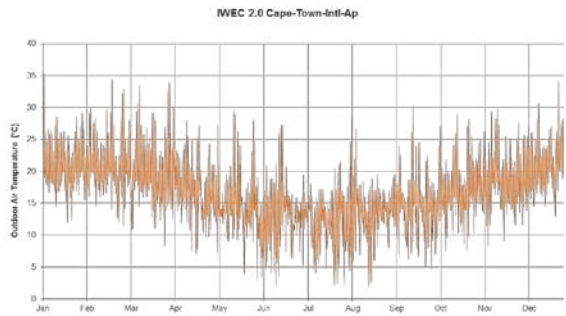
a
**FOCUS AREAS**

a
*METHODOLOGY*

✓   ✓   ✓   ?

Transsolar
**academy**

# Setting out an
# APPROACH

a proposed
**methodology . . .**

| PART 01 | | | PART 02 | | | PART 03 | | PART 04 |
|---|---|---|---|---|---|---|---|---|
| STEP 01 | STEP 02 | STEP 03 | STEP 04 | STEP 05 | STEP 06 | STEP 07 | STEP 08 | STEP 09 |
| *understanding* | *identifying* | *establish* | *understanding* | *developing* | *simulate* | *explore* | *compile* | *after* |
| CAPE TOWNS CLIMATE | 3 FOCUS AREAS | UNIT OF MEASURE AND COMPARISON | LOCAL MATERIALS+ THEIR PROPERTIES | A TOOLBOX FROM WHICH TO WORK | DIFFERENT MATERIAL COMPOSITIONS | PASSIVE STRATEGIES TO EVEN BETTER COMFORT | ONLINE PLATFORM DEVELOP. | FUTURE DEVELOP. |
| *PROS + CONS OF CLIMATE* | *NARROWING DOWN MY IDEA* | *SAME COMPARISON* | | *UNDERSTANDING PERFORMANCE* | | *UNDERSTANDING PASSIVE STRATEGIES* | *EDUCATE + SHARE* | *EDUCATE + SHARE* |
| *CLIMATE* | *FOCUS* | *UNIT* | | *EXPLORING NB VARIANTS* | | *EXPLORING GEOMETRY* | *OUTPUT* | *FUTURE* |

Transsolar
**academy**

# Understanding
# CAPE TOWNS CLIMATE

As a starting point Cape Town's climate was investigated and evaluated. Three main factors were concluded:

1. Big day/night swing – potential for thermal mass

2. High level of radiation

3. High wind speeds

The idea was to work with the strengths of the local climate.

ANNUAL AMBIENT TEMPERATURE

NORTHERN INSOLATION

SOUTHERN INSOLATION

WIND FREQUENCY



2°C- 36°C

**BIG DAY/NIGHT TIME SWING**
*Possibly, potenial to make use of*
**THERMAL MASS**
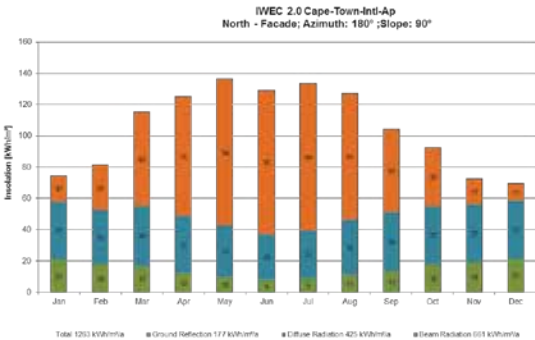
**HIGH LEVEL OF RADIATION**
*on the northern facade =*
*big role on the comfort*
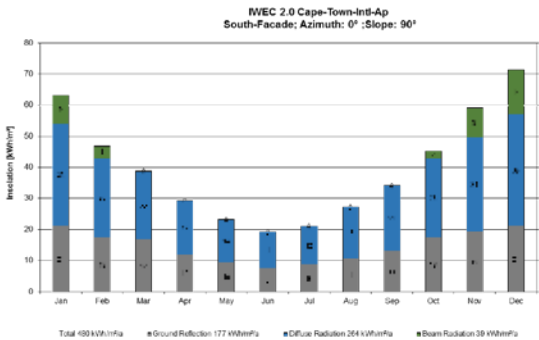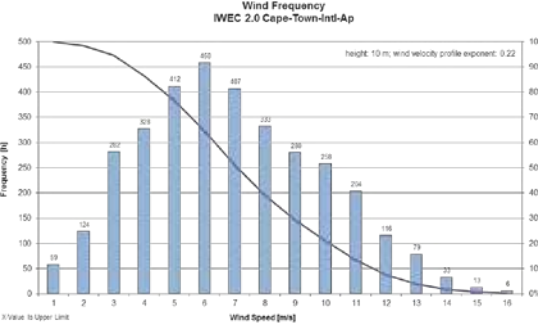
**HIGH WIND SPEEDS**
*will plays a role in the comfort*

*Identifying*
# 3 FOCUS AREAS

the
**FOCUS AREA**

**01**
*COMFORT+ENERGY*

**02**
*EASY TO BUILD+ATTAIN*

**03**
**FINANCIAL MODEL**

THERMAL PERFORMANCE

LIGHT

COMPONENTS + MODULAR

INSTRUCTIONAL

PRE-DESIGNED

PHASING OPTIONS

COSTING

TIME

**SOLUTION OR PRODUCT OUTPUT**

**01**
Highest possible level of comfort with limited resources

**02**
Small change that has big impact

**03**
Affordable solutions
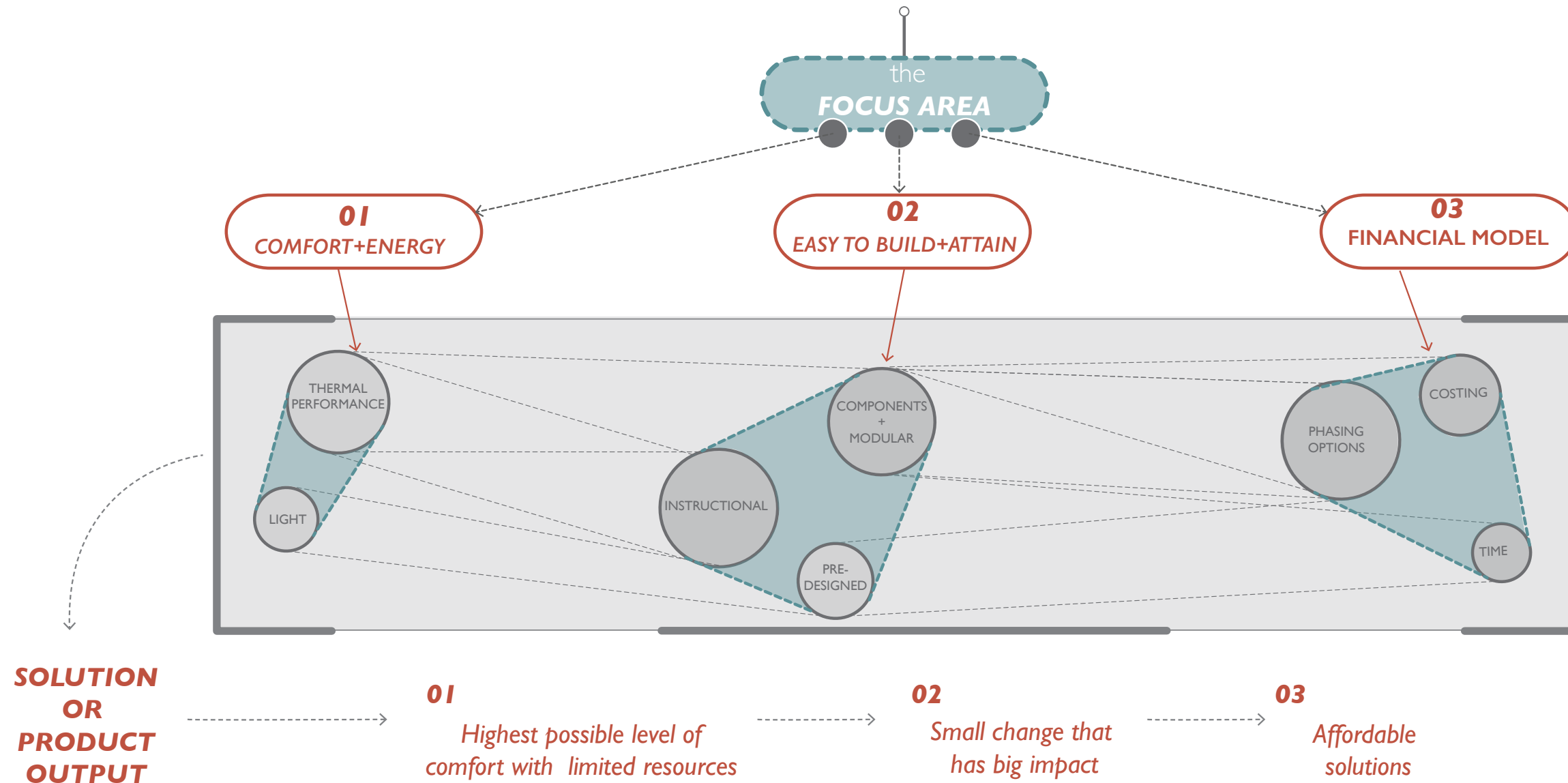
The 3 focus areas were revisited. It became clear that the tool will need to:

1. Deliver the highest level with limited resources.

2. Small, manageable changes that have a big impact

3. Affordable solutions that the users can really attain

Transsolar
**academy**

# A UNIT OF COMPARISON AND MEASURE

*How am I going to measure and compare my results/findings...*

## CRITERIA AND INDICATORS

**01**  **Comfort**

*Percentage of time in comfort*

**%**

**02**  **PMV chart**

*Predicted mean vote*
*"cold,"*
*"cool"*
*"slightly cool"*
*"neutral"*
*"slight warm"*
*"warm"*
*"hot"*

**+3/-3**

**03**  **Practicality**

*Relatable to anyone*
*"super difficult"*
*"difficult"*
*"moderate"*
*"easy"*
*"very easy"*

**1-5**

**04**  **Financial**

*Cost pertaining to different materials and configurations:*

*Online cost calculator*
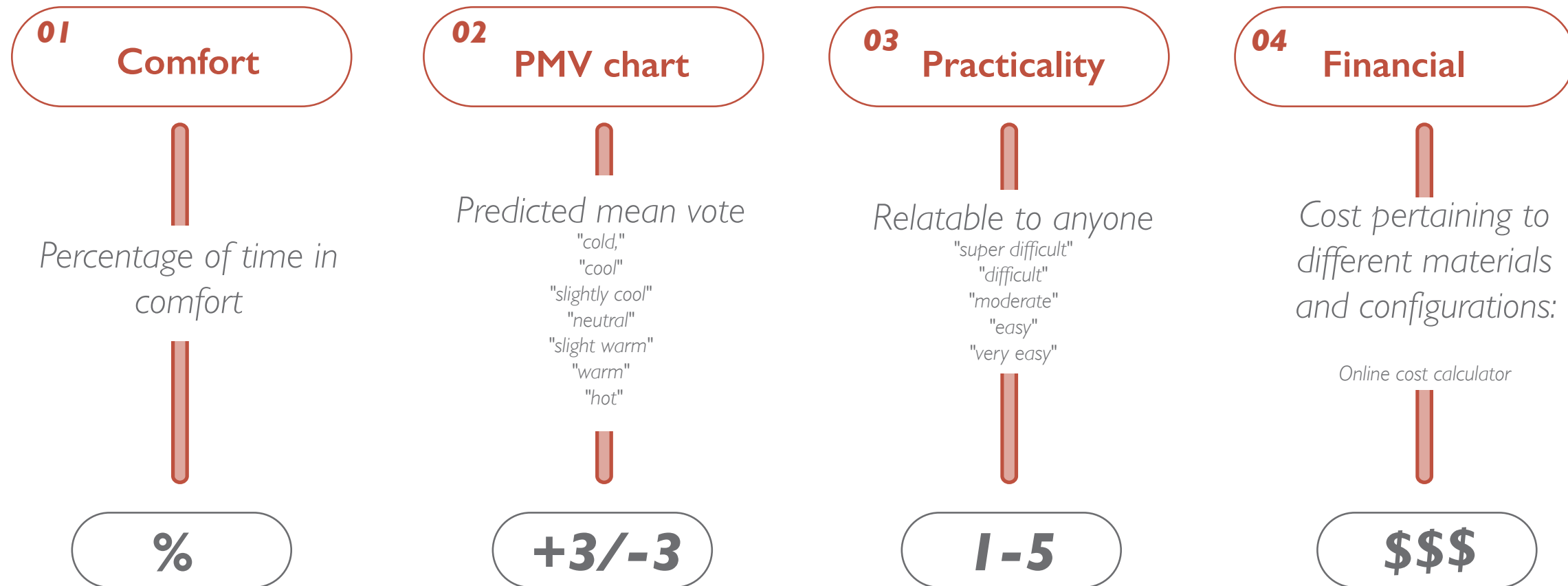
**$$$**

As a way of comparing my research and simulation results 4 comparison indicators were used to compare and evaluate all findings:

1. Percentage of time

2. PMV – Predicted Mean Vote

3. Practicality – how easy it is to build and work with the materials

4. Financial aspect tied to the respective materials

Transsolar **academy**

# *Understading*
# LOCAL MATERIALS + PERFORMANCE PROPERTIES



**BASE CASE_SHACK**



Following the methodology, the next step was to understand what materials are locally available and what their performance abilities are.

This was a vital exploration as it reminded me that the materials need to be affordable and easily available to anyone.

Apart from that the Base-Case model was established that would be used for all simulations and studies.

Transsolar **academy**

# *Understading*
# LOCAL MATERIALS + PERFORMANCE PROPERTIES

## MATERIAL MATRIX

| MATERIAL | M | LAYER | THICKENESS | K-VALUE | SPECFICI HEAT CAPACITY | R-VALUE | U-VALUE |
|---|---|---|---|---|---|---|---|
| NAME | | | (m) | Thermal conductivity (kJ/hr.m.k) | (kJ/kg.K) | Thermal resistance (K.m²./W) | Thermal transmittance (W/m².K) |
| METAL SHEETS | M1 | CORR_SHEET | 0.002 | 0.002 | | 0.00015 | |
| TIMBER | M2 | TIMBER | 0.05 | 0.016 | 2.38 | | |
| NATURAL ROCK/STONE | M3 | STONE | 0.2 | | | | |
| CORO BRICKS | M4 | BRICK | 0.11 | 0.7 | 0.841 | 0.15 | |
| SAND | M5 | SAND | 0.15 | 0.32 | 0.78 | 0.47 | 2.13 |
| PLASTIC | M6 | PLASTIC | 0.1 | | | | |
| CONCRETE | M7 | CONCRETE | 0.250 | 1.4 | 1 | 0.55 | 0.55 |
| STRAWBALES | M8 | STRAW | 0.4 | 0.22 | | 1.82 | 0.8 |
| ISOTHERM INSULATION | M9 | ISO_INSU | 0.1 | 0.05 | | 2.04 | 0.5 |
| ISOBOARD CEILING | M10 | ISO_CEIL | 0.05 | 0.0864 | | 2.083 | 0.48 |
| AIR SUS. | M11 | AIR_SUS | 0 | | | | |
| CLAY ROOF TILES | M12 | CLAY_TILES | 0.03 | | | | |
| SCREED | M13 | SCREED | 0.01 | | | 0.5 | |
| RAMMED EARTH | M14 | RAM_EARHT | 0.3 | | | | |

In the table on the left a material matrix was generated. The matrix compares the materials properties (U-value, K-value, heat capacity etc.)

From this I had a better understanding of the nature of the materials.

Transsolar
academy

# Understading
## LOCAL MATERIALS + PERFORMANCE PROPERTIES

| MATERIAL | Attainability | Cost | Time to build | Structural performance | Good thermal mass | Good insulation |
|---|---|---|---|---|---|---|
| NAME | (*****) | $-$$$$$ | (0-5) | (0-5) | (0-5) | (0-5) |
| METAL SHEETS | ***** | $ | 1 | 0 | 0 | 1 |
| TIMBER | ***** | $$ | 3 | 3 | 2 | 2 |
| NATURAL ROCK/STONE | ***** | $ | 3 | 3 | 4 | |
| CORO BRICKS | ***** | $$ | 3 | 4 | 4 | |
| SAND | ***** | $$ | 2 | 0 | | 4 |
| PLASTIC | ***** | $ | 3 | 1 | | |
| CONCRETE | ***** | $$$ | 5 | 5 | 5 | |
| STRAWBALES | ***** | $ | 3 | 1 | 1 | 4 |
| ISOTHERM INSULATION | ***** | $$ | 2 | 0 | | 5 |
| ISOBOARD CEILING | ***** | $$ | 2 | 0 | | 4 |
| AIR SUS. | N.A. | N.A. | N.A. | | | |
| CLAY ROOF TILES | ***** | $$$ | 2 | | | |
| SCREED | ***** | $$ | 3 | | | |
| RAMMED EARTH | ***** | $$ | 4 | | | |

As a continuation of the matrix the materials were even further explored in terms of their:

1. Attainability

2. Costs

3. Time to build/work with the material

4. Structural performance

5. Thermal mass

6. Insulation properties

Transsolar academy

*BASE CASE_SHACK*

an initial
**PROPOSAL**
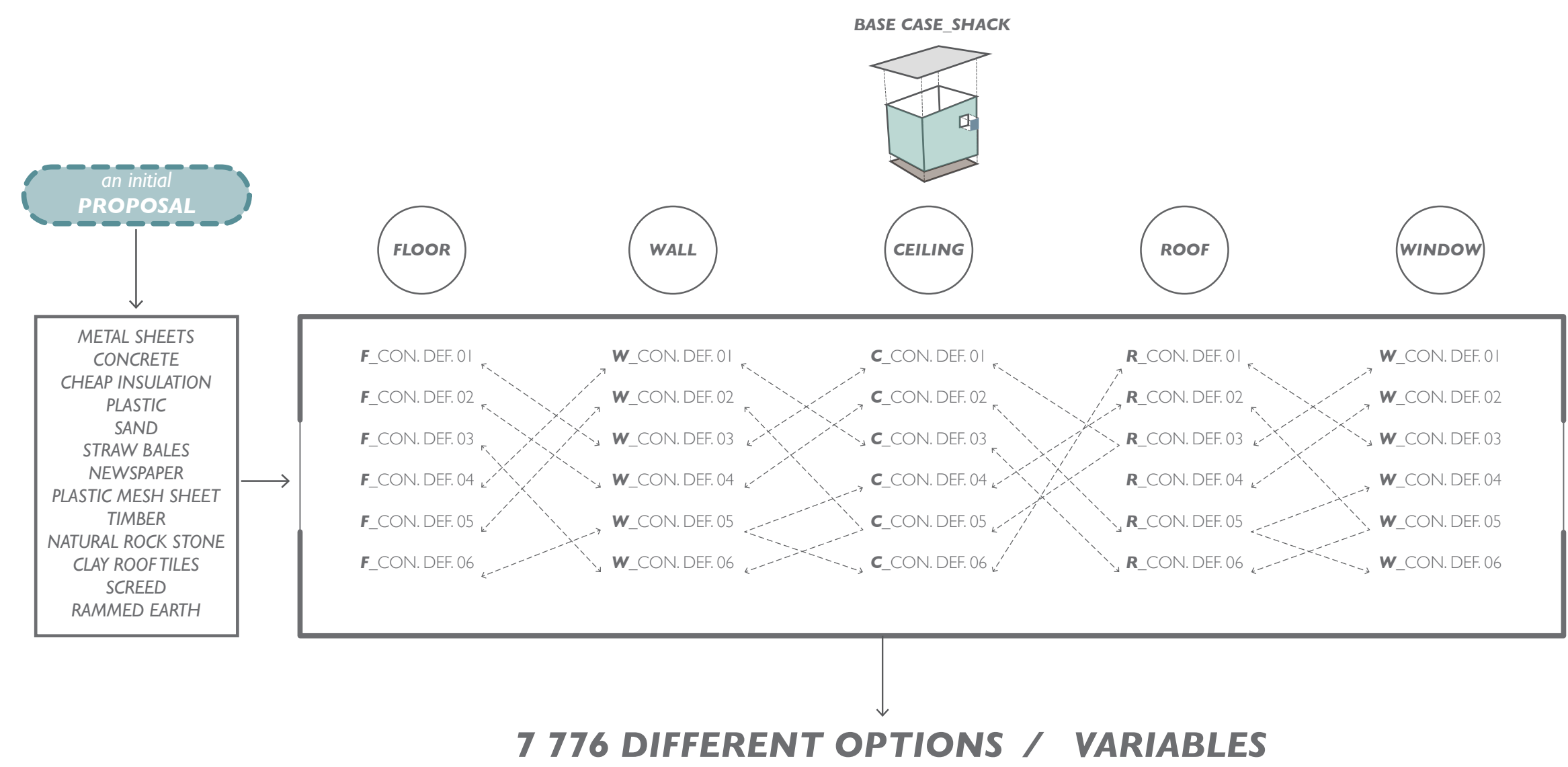
The next step in the process was looking at the different comfort levels that are derived by using different materials for different parts of the building.

In essence, the idea was to set up different configurations for each:

Floor
Wall
Ceiling
Roof
Window

This would then be simulated on the set up Base-Case model.

7776 simulations would need to be run...

| FLOOR | WALL | CEILING | ROOF | WINDOW |
|---|---|---|---|---|

METAL SHEETS
CONCRETE
CHEAP INSULATION
PLASTIC
SAND
STRAW BALES
NEWSPAPER
PLASTIC MESH SHEET
TIMBER
NATURAL ROCK STONE
CLAY ROOF TILES
SCREED
RAMMED EARTH

| **F**_CON. DEF. 01 | **W**_CON. DEF. 01 | **C**_CON. DEF. 01 | **R**_CON. DEF. 01 | **W**_CON. DEF. 01 |
|---|---|---|---|---|
| **F**_CON. DEF. 02 | **W**_CON. DEF. 02 | **C**_CON. DEF. 02 | **R**_CON. DEF. 02 | **W**_CON. DEF. 02 |
| **F**_CON. DEF. 03 | **W**_CON. DEF. 03 | **C**_CON. DEF. 03 | **R**_CON. DEF. 03 | **W**_CON. DEF. 03 |
| **F**_CON. DEF. 04 | **W**_CON. DEF. 04 | **C**_CON. DEF. 04 | **R**_CON. DEF. 04 | **W**_CON. DEF. 04 |
| **F**_CON. DEF. 05 | **W**_CON. DEF. 05 | **C**_CON. DEF. 05 | **R**_CON. DEF. 05 | **W**_CON. DEF. 05 |
| **F**_CON. DEF. 06 | **W**_CON. DEF. 06 | **C**_CON. DEF. 06 | **R**_CON. DEF. 06 | **W**_CON. DEF. 06 |

## 7 776 DIFFERENT OPTIONS / VARIABLES

Transsolar
**academy**

# Simulate
# DIFFERENT MATERIAL COMPOSITIONS

**BASE CASE_SHACK**

**an initial PROPOSAL**

| FLOOR | WALL | CEILING | ROOF | WINDOW |
|-------|------|---------|------|--------|

METAL SHEETS
CONCRETE
CHEAP INSULATION
PLASTIC
SAND
STRAW BALES
NEWSPAPER
PLASTIC MESH SHEET
TIMBER
NATURAL ROCK STONE
CLAY ROOF TILES
SCREED
RAMMED EARTH

| **F**_CON. DEF. 01 | **W**_CON. DEF. 01 | **C**_CON. DEF. 01 | **R**_CON. DEF. 01 | **W**_CON. DEF. 01 |
| **F**_CON. DEF. 02 | **W**_CON. DEF. 02 | **C**_CON. DEF. 02 | **R**_CON. DEF. 02 | **W**_CON. DEF. 02 |
| **F**_CON. DEF. 03 | **W**_CON. DEF. 03 | **C**_CON. DEF. 03 | **R**_CON. DEF. 03 | **W**_CON. DEF. 03 |
| **F**_CON. DEF. 04 | **W**_CON. DEF. 04 | **C**_CON. DEF. 04 | **R**_CON. DEF. 04 | **W**_CON. DEF. 04 |
| **F**_CON. DEF. 05 | **W**_CON. DEF. 05 | **C**_CON. DEF. 05 | **R**_CON. DEF. 05 | **W**_CON. DEF. 05 |
| **F**_CON. DEF. 06 | **W**_CON. DEF. 06 | **C**_CON. DEF. 06 | **R**_CON. DEF. 06 | **W**_CON. DEF. 06 |

## 7 776 DIFFERENT OPTIONS / VARIABLES

Wait...

"7776 simulations would need to be run..."

That is way to many! I needed to reconsider. I needed to simplify the approach.

I also realized that I needed to take into account other factors such as:

1. WWR (window to wall ratio)

2. Orientation of window

3. Glazing type

It became evident that these factors play a big role in the level of comfort within the houses.

Transsolar
academy

# Simulate
# DIFFERENT MATERIAL COMPOSITIONS

**BASE CASE_SHACK**
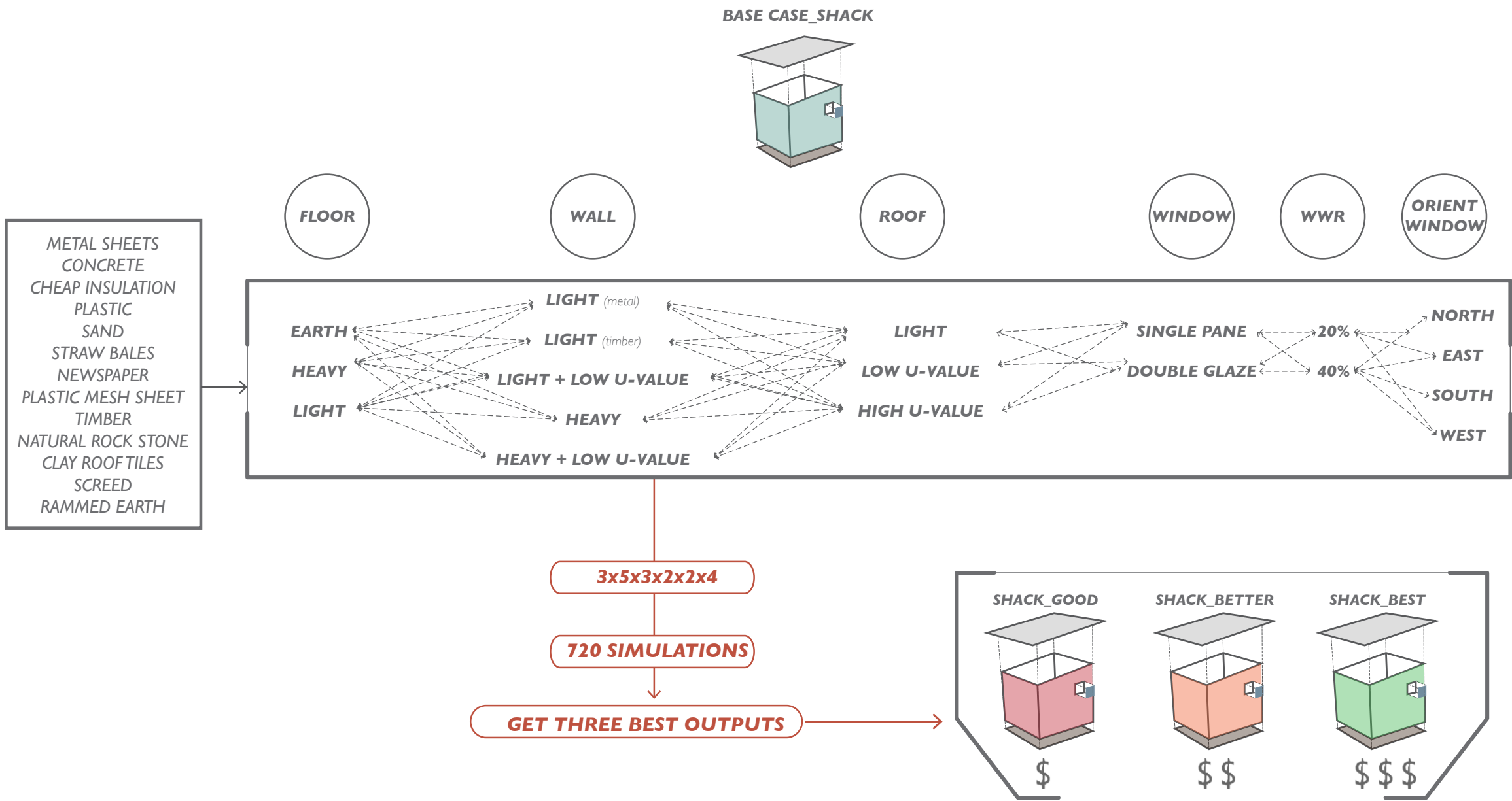
The configuration for each building part (floor, wall, roof) was simplified to being a either 3-5 characteristics seen in the table on the left.

Additionally factors such as the window type, WWR and orientation of window was incorporated into the list of variants.

This drastically decreased the number of simulations. From these simulations three cases were picked and classified according to their performance and cost to build:

1. Shack_Good
2. Shack_Better
3. Shack_Best

| FLOOR | WALL | ROOF | WINDOW | WWR | ORIENT WINDOW |
|---|---|---|---|---|---|

METAL SHEETS
CONCRETE
CHEAP INSULATION
PLASTIC
SAND
STRAW BALES
NEWSPAPER
PLASTIC MESH SHEET
TIMBER
NATURAL ROCK STONE
CLAY ROOF TILES
SCREED
RAMMED EARTH

LIGHT *(metal)*

EARTH      LIGHT *(timber)*

HEAVY      LIGHT + LOW U-VALUE      LIGHT      SINGLE PANE      20%      NORTH

LIGHT                          LOW U-VALUE      DOUBLE GLAZE      40%      EAST

           HEAVY               HIGH U-VALUE                           SOUTH

HEAVY + LOW U-VALUE                                                   WEST

**3x5x3x2x2x4**

**720 SIMULATIONS**

**GET THREE BEST OUTPUTS**

**SHACK_GOOD**      **SHACK_BETTER**      **SHACK_BEST**

$      $ $      $ $ $

# Simulate
## DIFFERENT MATERIAL COMPOSITIONS

GET THREE BEST OUTPUTS

SHACK_GOOD  SHACK_BETTER  SHACK_BEST

$  $ $  $ $ $

OR . . .

FLOOR    WALL    ROOF    WINDOW    WWR    ORIENT WINDOW

EARTH                LIGHT (metal)                          SINGLE PANE ←--→ 20%        NORTH
                     LIGHT (timber)                         LIGHT                       EAST
HEAVY                LIGHT + LOW U-VALUE        LOW U-VALUE        DOUBLE GLAZE ←--→ 40%  SOUTH
LIGHT                HEAVY ←-------→  HIGH U-VALUE                                        WEST
                     HEAVY + LOW U-VALUE

UNIQUE HOME

comfort    PMV
  %        +3/-3
 $$$        1-5
 Cost     Practicality

Even though we were able to propose to the user an array of solutions, the idea initially was to give the user more freedom and power as they can't really afford professional services.

The next step was to take the same set of variants and to develop a database of results.

This gives the user the opportunity to choose how each part of the building is constructed, where the window is situated and which WWR is used.

This was done due to the complex nature that every site poses. Each context is so different, and therefore each house has different requirements.

Transsolar academy

*Explore*
## PASSIVE STRATEGIES TO IMPROVE THE COMFORT

**01.** ✓

DEVELOPED A
TOOL BOX
OF MATERIALS

**02.** ✓

3 LEVELS
OF OPTIONS
+
DATABASE
OF VARIANTS

**03.** ?

INFORMATIVE
STRATEGIES
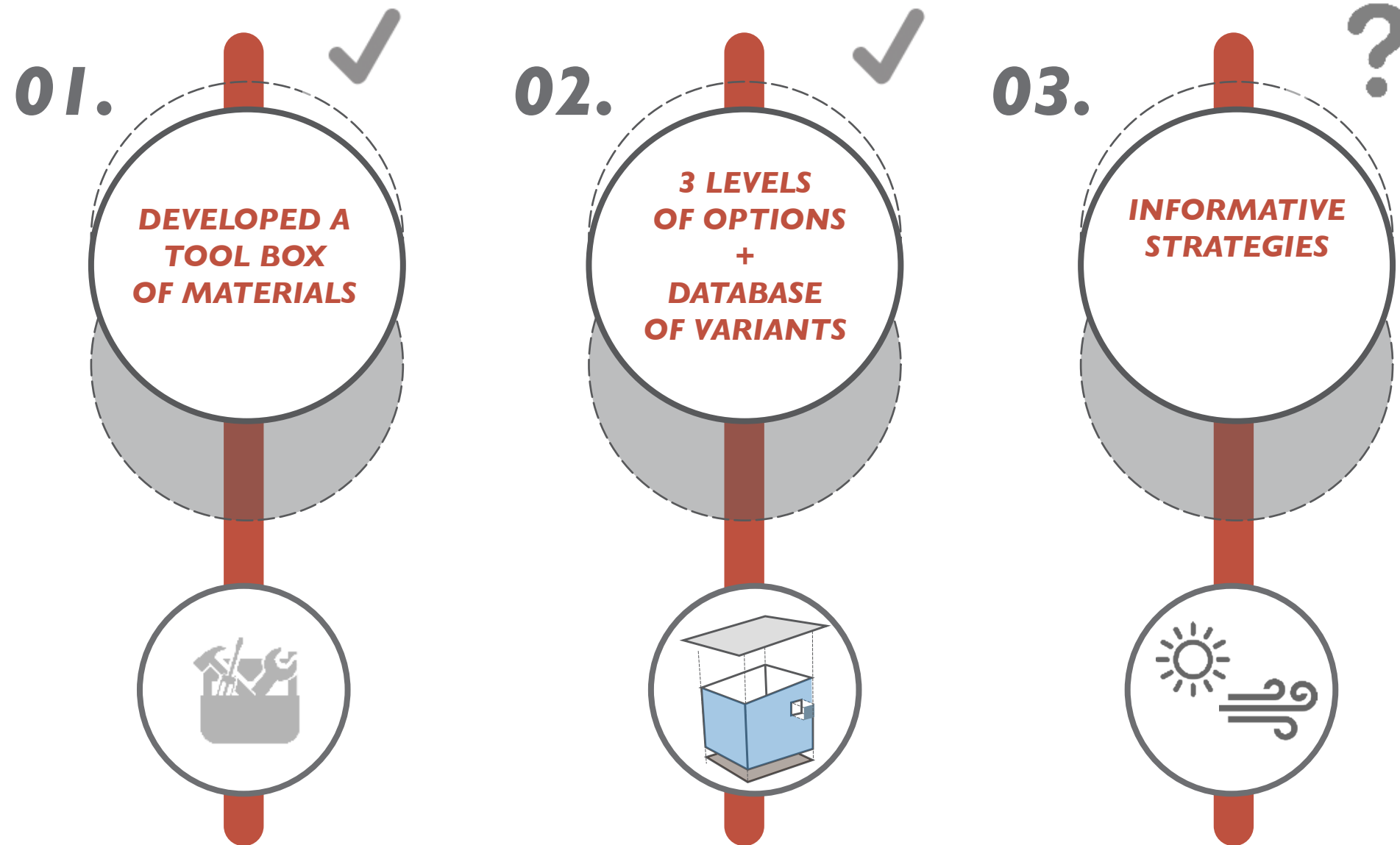
OK, so now we have:

1. A toolbox of materials

2. 3 proposed set up solutions

BUT, how do we solve the passive strategies such as increased daylight or better natural ventilation in these houses

Transsolar **academy**

# PASSIVE STRATEGIES TO IMPROVE THE COMFORT

**...Passive strategies** that can show user how to **enhance the comfort** inside their space
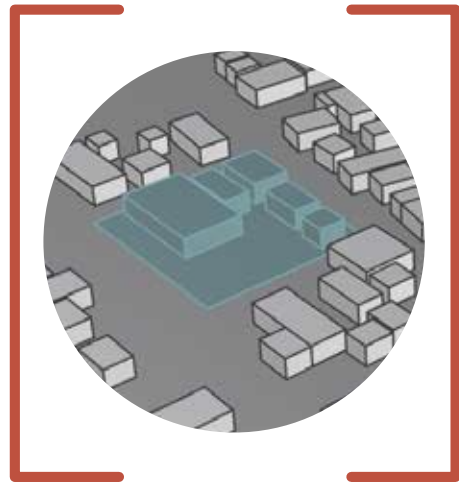
## FURTHER ENHANCEMENTS + STRATEGIES

*when applicable and how to's...*
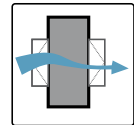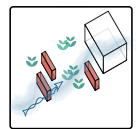


| AIR MOVEMENT | DAYLIGHT | SEASONAL |
|---|---|---|
| Natural ventilation | Direct / Indirect shading | Winter vs. summer strategies |
| Wind walls | Skylights | |
| Night flushing | Overhangs | |

The next part of the project focus on passive strategies and how simple changes can be made to enhance the quality of comfort inside the homes.

3 main areas were focused on:

1. Air movement

2. Daylight

3. Seasonal adaptation

Transsolar academy

**01.**
Catalogue of options to choose from

**02.**
Method of construction: do's/dont's

**03.**
How much is will cost

**04.**
What level of comfort is achieved

**05.**
Application of passive strategies
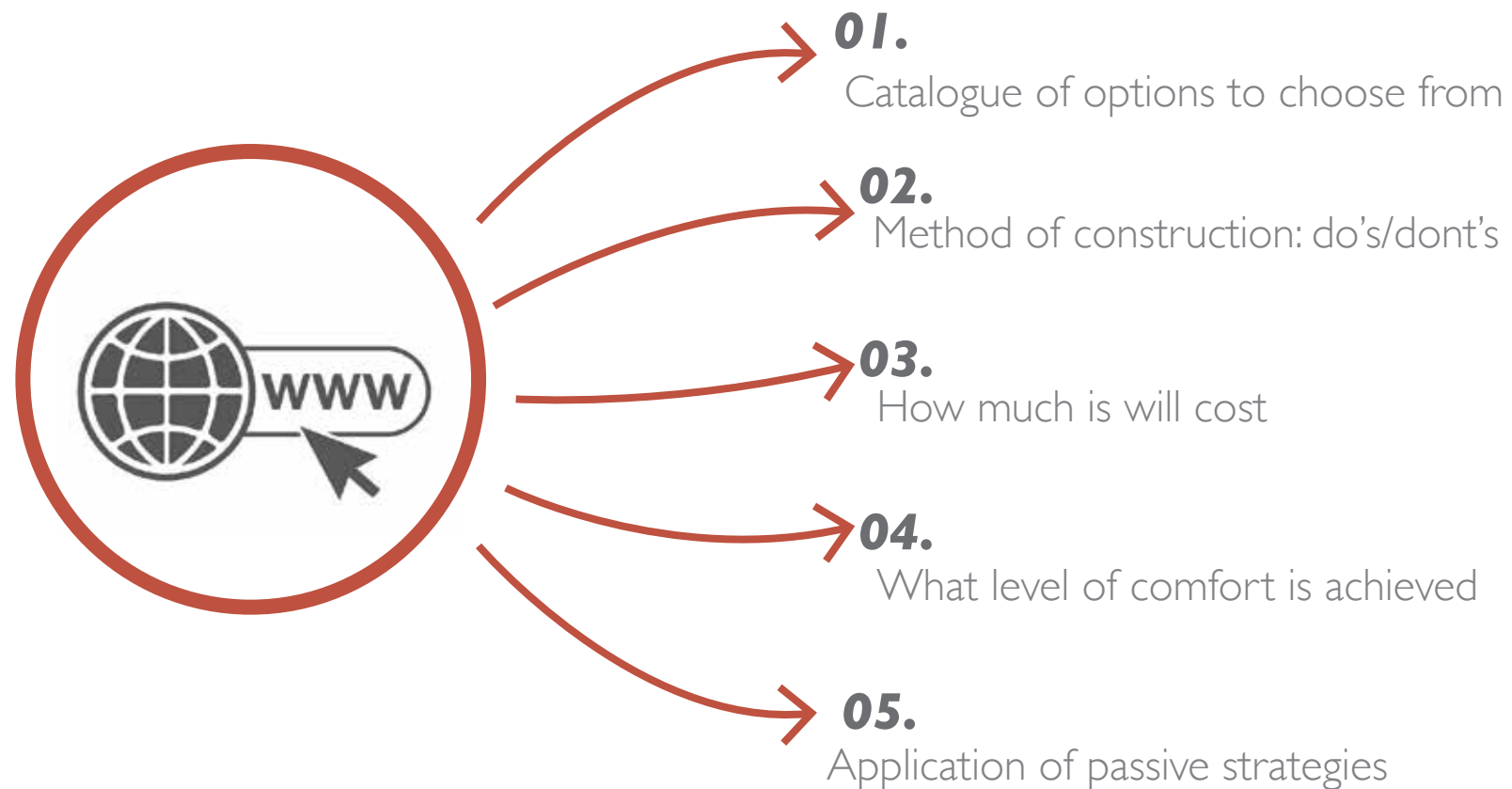
The last part of the project was about creating a virtual platform that shares all the findings.

It was designed in such a way that is user friendly and intuitive. The tool was designed not only to proposed solutions, but to also educate the user about building, materials, performance and the influence small changes can make.

Transsolar
**academy**

PART 01 ⟶ EXPOSING THE PROCESS
...getting to a sloution

PART 02 ⟶ THE PRODUCT
...the solution
https://petru858.wixsite.com/startsmall

Part 02:

Are visualizations of the online tool (in the form of a website) that was designed for the user.

The next ew pages are direct creenshots from the website that was created for the user to use.

Transsolar
academy

# START SMALL.

Let's work togethet to make your first **START SMALL.** move...
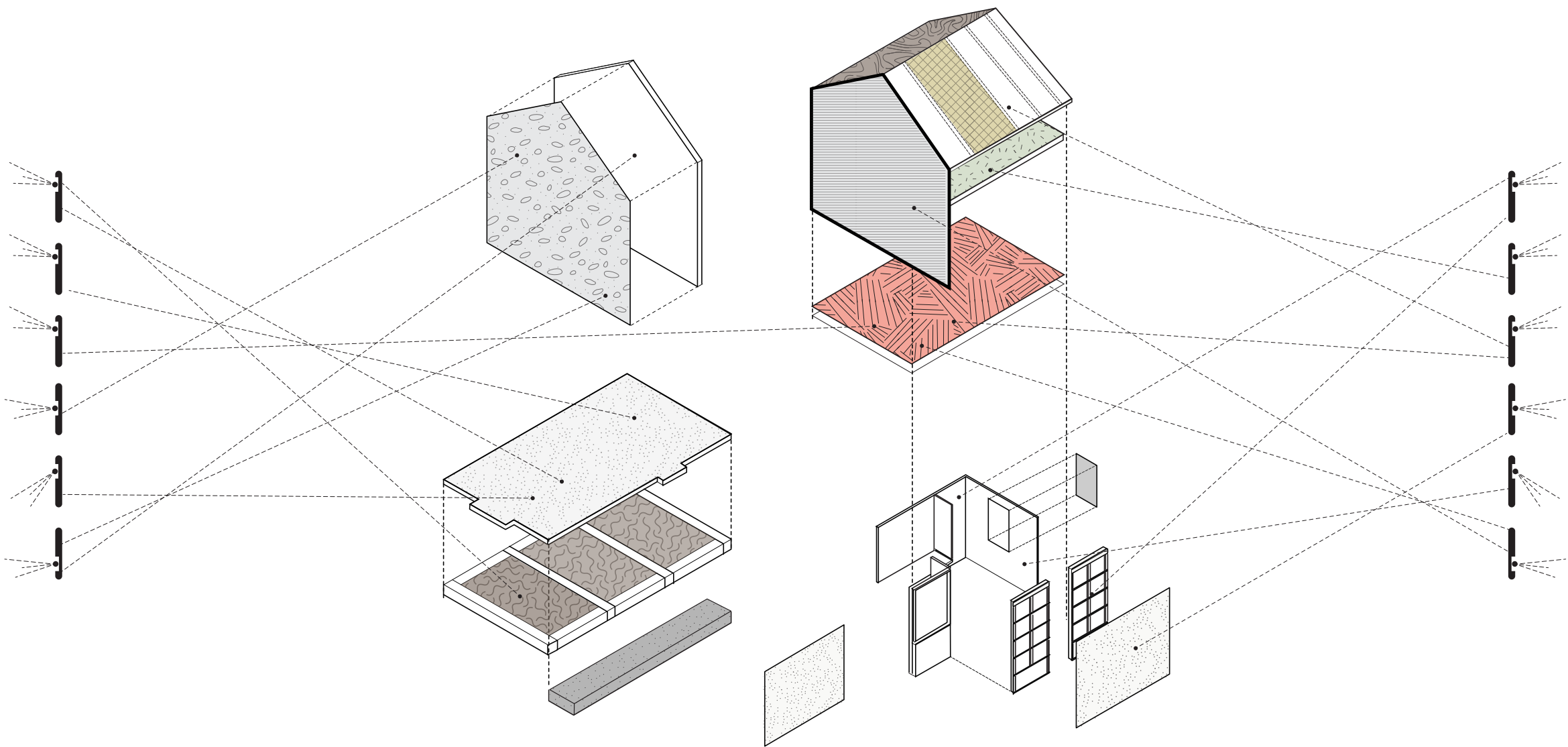


Welcome to the homepage of the online tool. It's called:

Start Small.

The homepage gives the user an initial visualization and conceptualization of the tool.

It aims to express the essence of the project.

Transsolar
academy

# START SMALL.


Fig. 3: Siblings outside a typical shack in Cape Town


Fig. 4: Disparity between the poor and rich in such close proximity


Fig. 5: Slum area street-scape
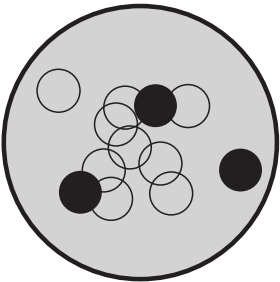
## THE PROBLEM

is that in South Africa, 5 million people live in shacks. 90% of these shacks have a very low level of comfort
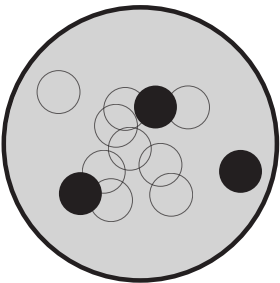
## OUR GOAL

is to empower people living in these shacks with a tool such as **START SMALL.** to increase their comfort level in their homes.
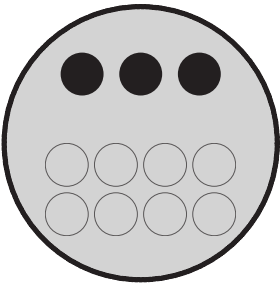
## THE SOLUTION

is achieved through research and computationl simulations that aims to find attainable, sustainable and educating solutions.

Transsolar
academy

# START SMALL.

We have developed different ways to mak your first
**START SMALL.** move...
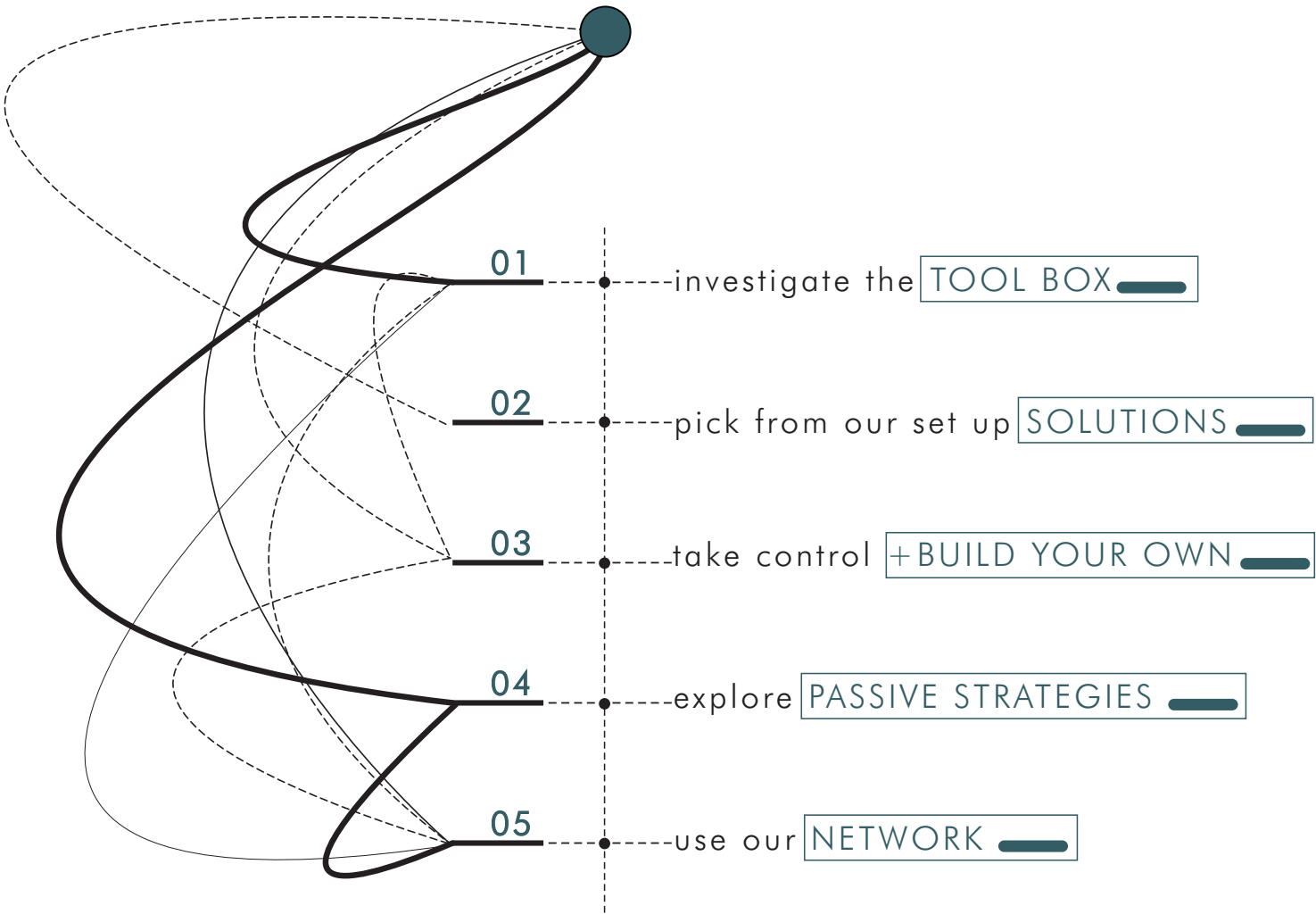
Start Small. was designed to
be as intuitive as possible.
Additionally, the tool needed to
offer the user a "menu" with a
variety of options that gives him
or her the freedom to choose
their own way to a better solution.

Each of the 5 options had a
hyper link that takes you to the
respective topics.

01  investigate the TOOL BOX ▬

02  pick from our set up SOLUTIONS ▬

03  take control +BUILD YOUR OWN ▬

04  explore PASSIVE STRATEGIES ▬

05  use our NETWORK ▬

Transsolar
academy

# START SMALL.

**START SMALL.** has explored the potential of local and accessible materials.



ISO therm
corrugated steel
clay bricks
ISO board
clay roof tiles
concrete
local timber
natural ground

the material tool box

04
07
06
05
02
01
03

+ the variables explored

| 01 | Orientation |
| 02 | WWR |
| 03 | Window Type |
| | Roof construction |
| 04 | |
| 05 | Wall construction |
| 06 | Floor construction |
| 07 | Practicality |
| 08 | Cost |
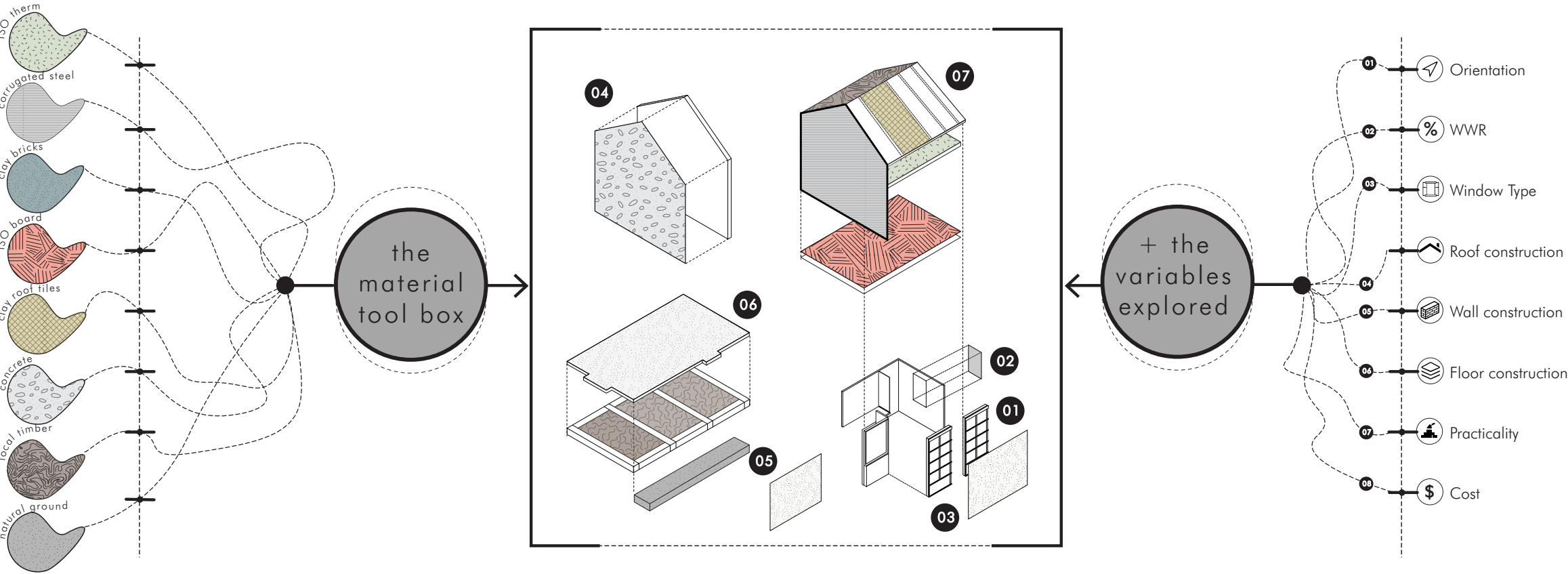
+toolbox tab

An overview of what materials were investigated.

Additionally, this page gives the user an overview of the variables that were tested, simulated and explored throughout the study.

The hope is for the user to start understanding that the building can function as a kit of parts which is adaptable and inter-changeable.

Transsolar
academy

# START SMALL.

**START SMALL.** has identified three prescribed solutions for you. Let's compare it to the performacne of a typical shack
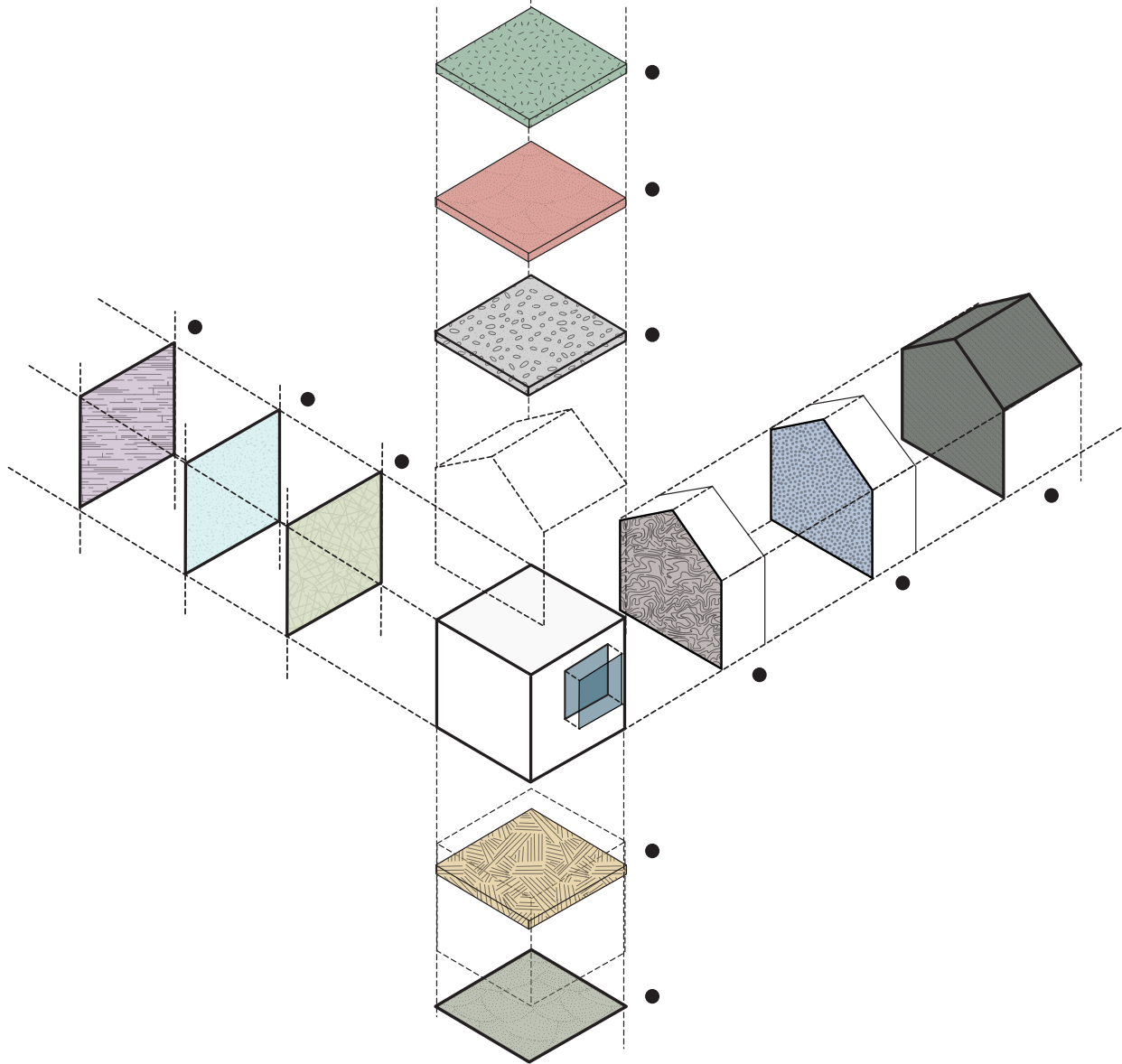


level 01
## SHACK

level 02
## GOOD

level 03
## BETTER

level 04
## BEST

Transsolar
academy

# START SMALL.

THE PERFORMANCE OF A
## TYPICAL SHACK

Orientation   Window Wall Ratio %   Window Type   Roof Construction   Wall Construction   Floor Construction   Practicality   Cost level

LEVEL 01
LEVEL 02
LEVEL 03
LEVEL 04
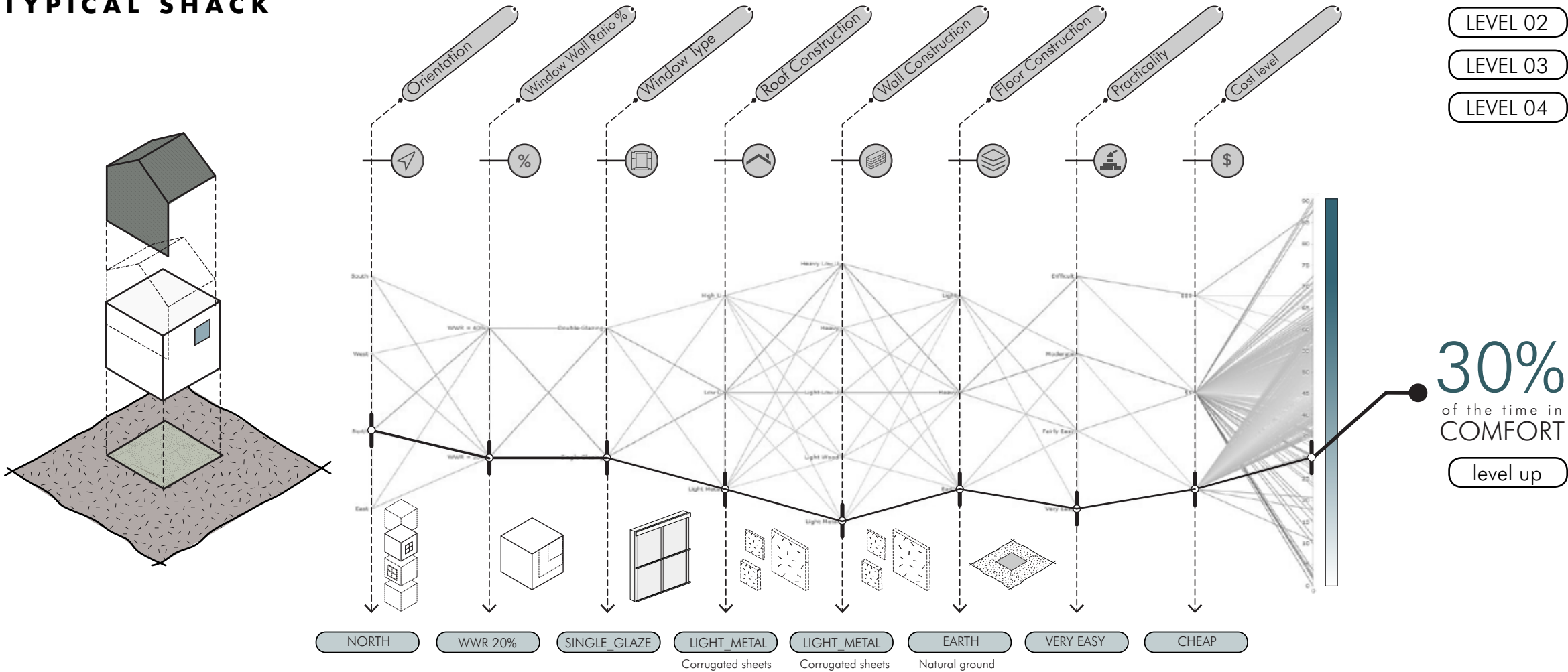
+setup solutions tab

LEVEL 01

Inputs:

North Orientation
WWR 20%
Single glazing
Light metal Roof
Light metal wall
Earth floor
Easy to build
Cheap

Output:

30% comfort of the time

**30%**
of the time in
COMFORT

level up

| NORTH | WWR 20% | SINGLE_GLAZE | LIGHT_METAL | LIGHT_METAL | EARTH | VERY EASY | CHEAP |
|-------|---------|--------------|-------------|-------------|-------|-----------|-------|
|       |         |              | Corrugated sheets | Corrugated sheets | Natural ground |  |  |

Transsolar
academy

# START SMALL.

THE PERFORMANCE OF THE
## CHEAPEST SOLUTION



LEVEL 01
LEVEL 02
LEVEL 03
LEVEL 04

Orientation   Window Wall Ratio %   Window Type   Roof Construction   Wall Construction   Floor Construction   Practicality   Cost level

**62%**
of the time in
**COMFORT**

level up

| NORTH | WWR 20% | SINGLE_GLAZE | LOW U | HEAVY | GROUND | VERY EASY | CHEAP |
|-------|---------|--------------|-------|-------|--------|-----------|-------|
|       |         |              | Gypsum, Air Sus, | Concrete | Air Sus, Timber |           |       |
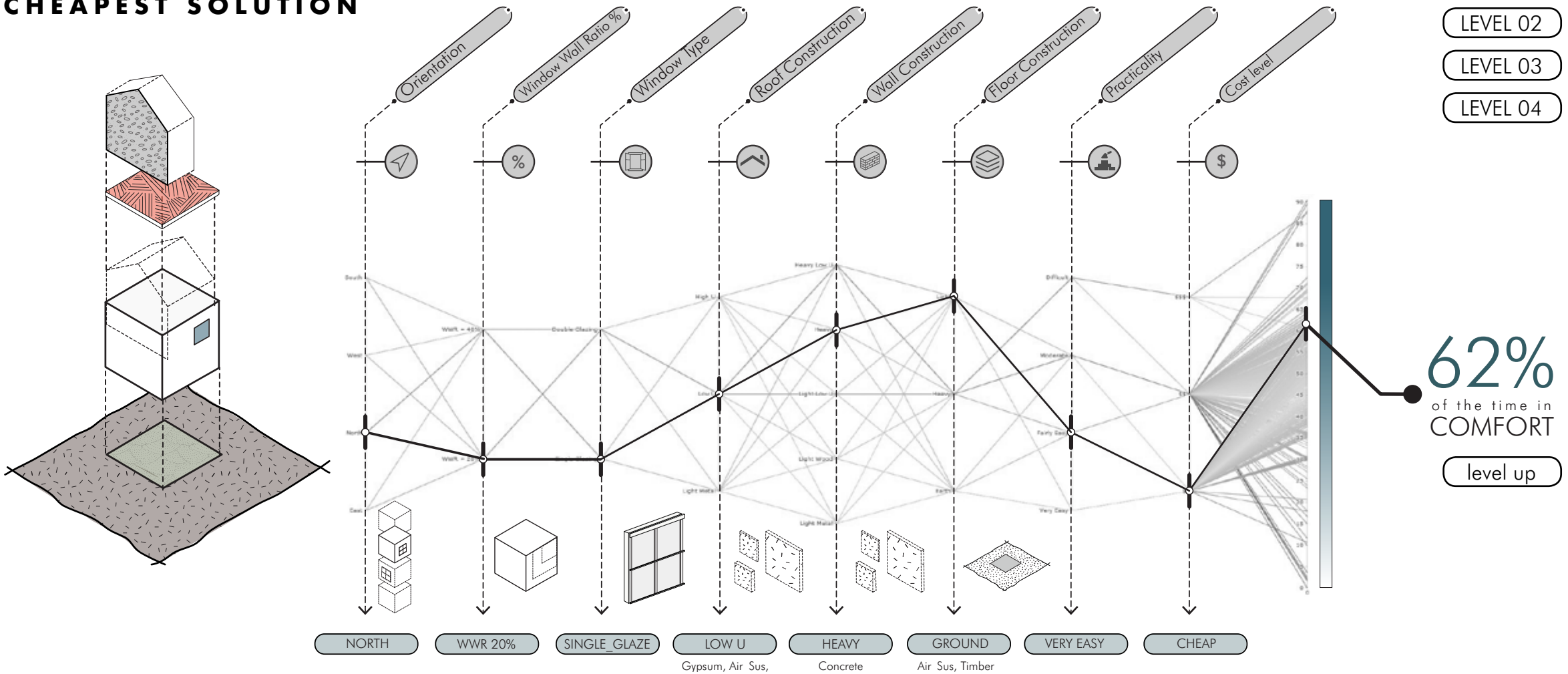
+setup solutions tab

LEVEL 02:

Inputs:

North Orientation
WWR 20%
Single glazing
Low U roof
Heavy concrete wall
Earth floor
Easy to build
Cheap

Output:

62% comfort of the time

Transsolar
**academy**

# START SMALL.

THE PERFORMANCE OF THE
# MID RANGE SOLUTION



LEVEL 01
LEVEL 02
LEVEL 03
LEVEL 04

Orientation
Window Wall Ratio %
Window Type
Roof Construction
Wall Construction
Floor Construction
Practicality
Cost level

**88%**
of the time in
COMFORT

level up

DBL_GLAZE

LEVEL 03:

Inputs:

North Orientation
WWR 40%
Double glazing
Low U roof
Heavy, Low U wall
Heavy concrete floor
Moderate to build
Medium cost

Output:

88% comfort of the time

Transsolar
academy

# START SMALL.

THE PERFORMANCE OF THE
## MOST EXPENSIVE SOLUTION



LEVEL 01
LEVEL 02
LEVEL 03
LEVEL 04

Orientation    Window Wall Ratio %    Window Type    Roof Construction    Wall Construction    Floor Construction    Practicality    Cost level

## 86%
of the time in
COMFORT
level up

DBL_GLAZE
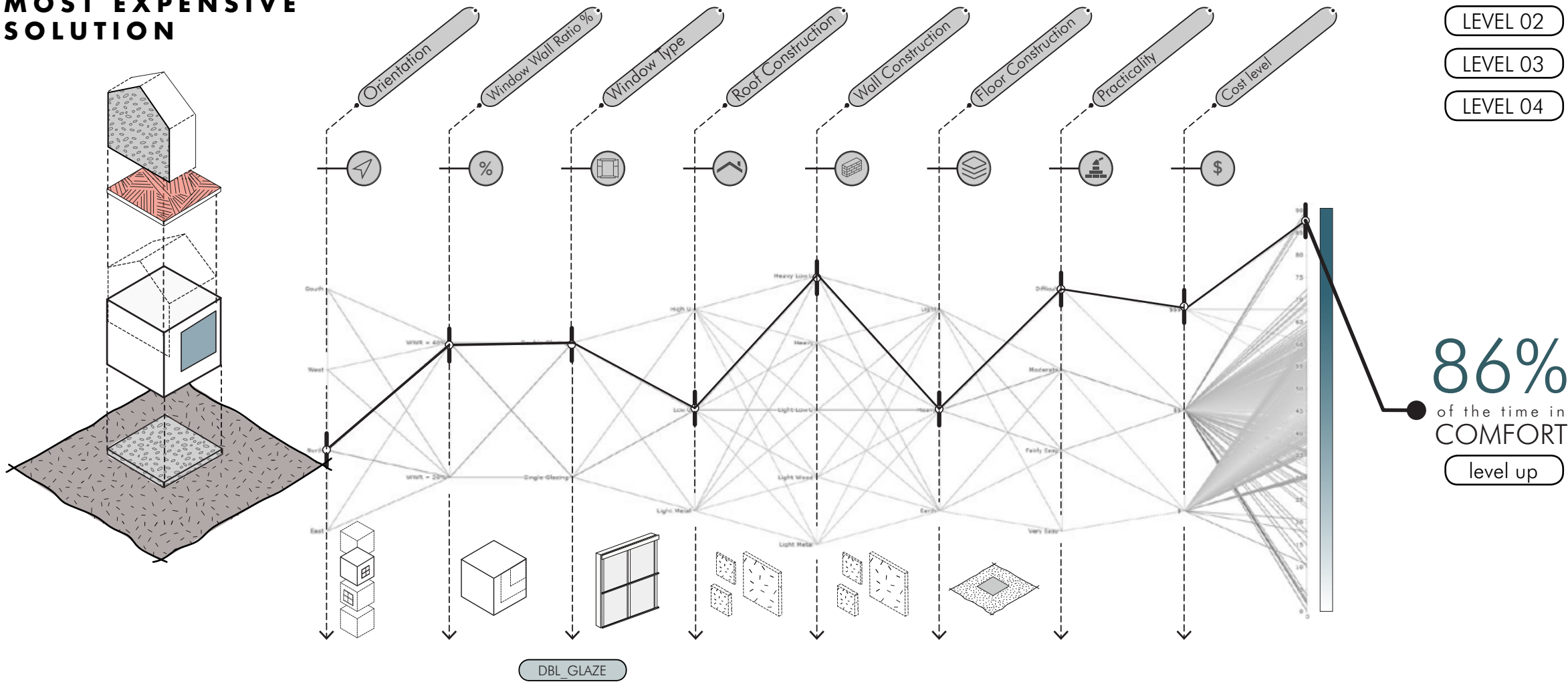
+setup solutions tab

LEVEL 03:

Inputs:

North Orientation
WWR 40%
Double glazing
Low U roof
Heavy, Low U wall
Heavy concrete floor
Difficult to build
Expensive cost

Output:

86% comfort of the time

Transsolar
academy

# START SMALL.

**START SMALL.** has developed a database for you to create your own unique level of comfort according to your budget and building context.

+build your own tab

As a more complex solution, Start Small. wants to give more power and freedom to the self builder to act as an "architect" or "engineer".

I received free timber, where should I use it?

I have 10 bags of concrete but I have no money at the moment for insulation…
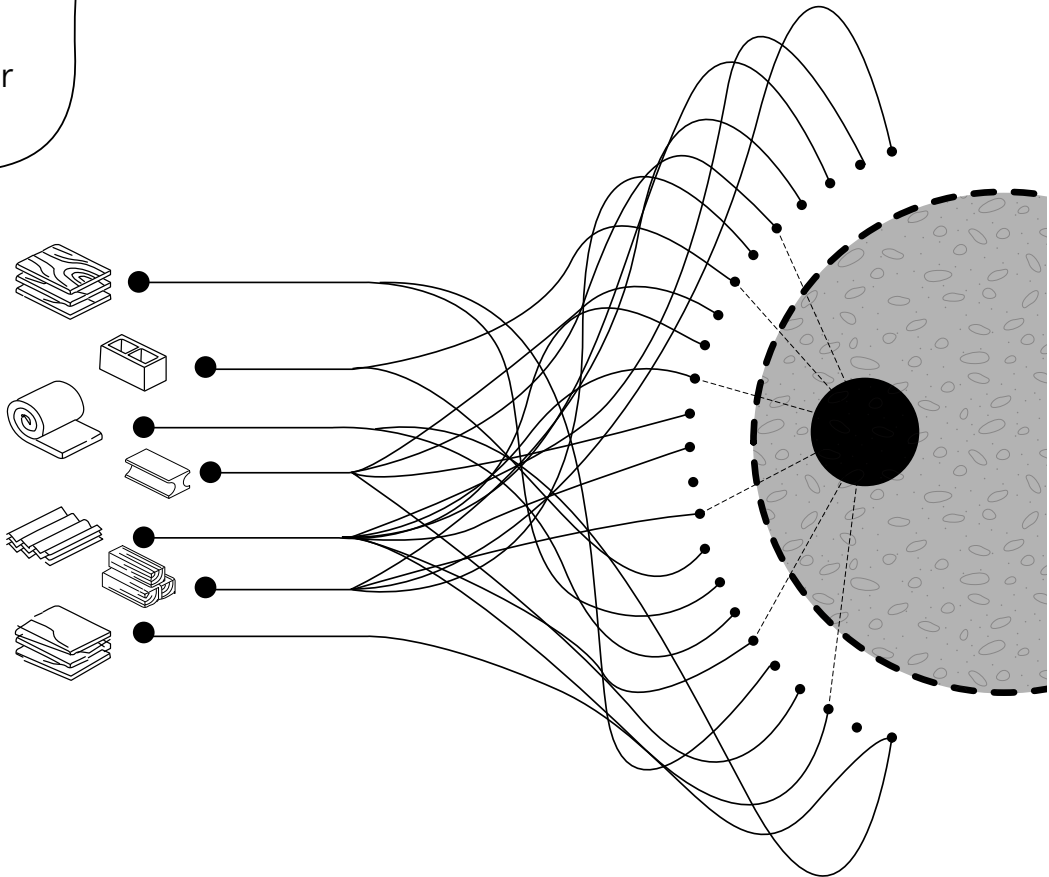
## PUTTING YOU IN CHARGE TO DICTATE THE COMFORT IN YOUR HOME

want to check it out?

Transsolar
**academy**

# START SMALL.

**START SMALL.** has developed a database for you to create your own unique level of comfort according to your budget and building context.



ORIENT WINDOW    WWR    WINDOW    ROOF    WALL    FLOOR    PRAC.    FIN.

+build your own tab

This page gives the user an dynamic-interactive graph to play with. By this Start Small. Gives the user the opportunity to enter his or her own inputs as needed by the site or by what materials are accessible at the given time and context. In this way the tool becomes educating and intuitive.

Check it out online to see how it works... it is pretty fun!

Transsolar academy

# START SMALL.

01 team up with a
LOCAL BUILDING TEAM

join a 03
WORKSHOP

buy and sell
2nd HAND MATERIAL + OBJECTS

02 get in touch with
ARCHITECTS

4 collaborate with an
NGO

WWW
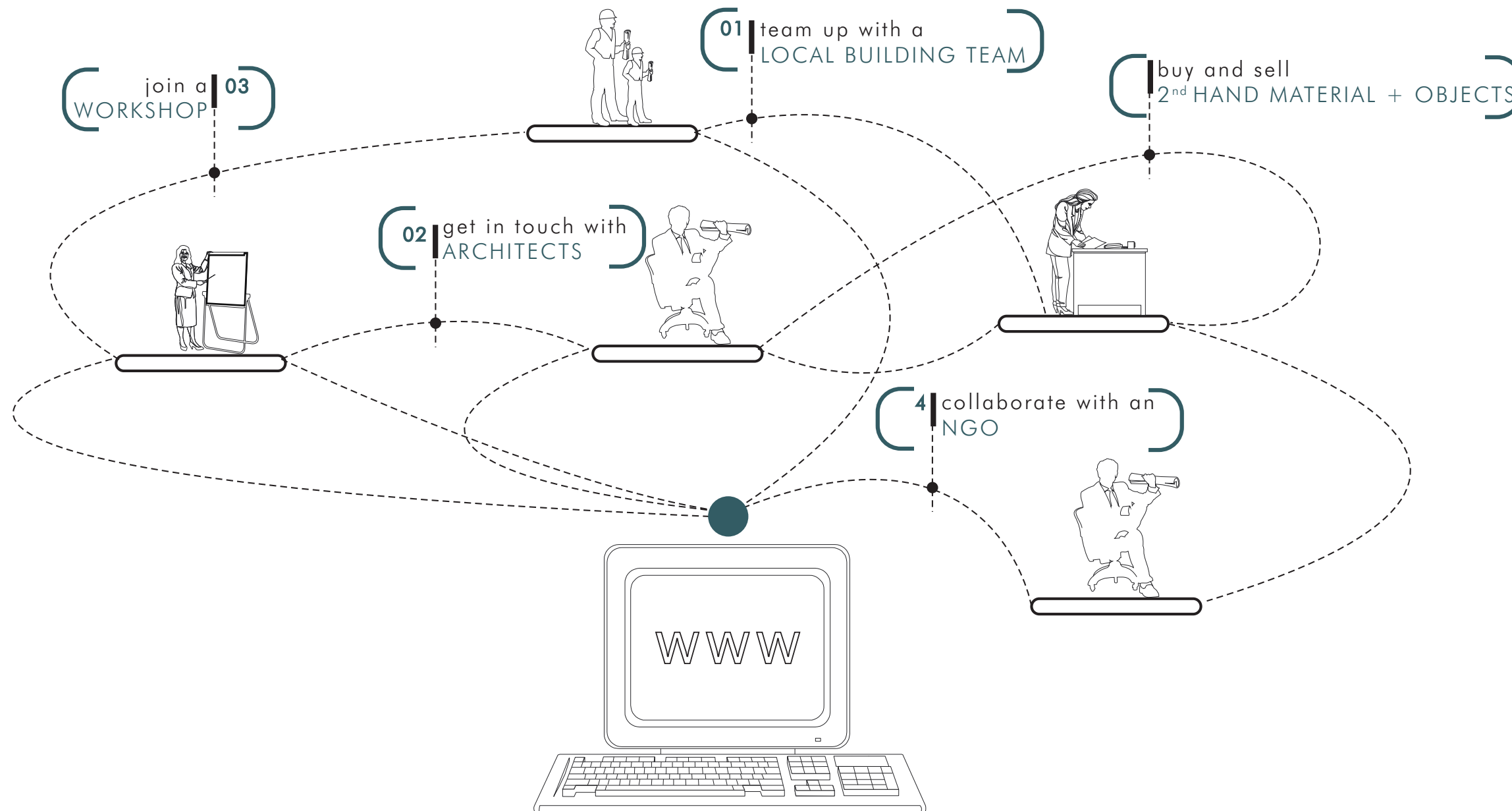
+network tab

Apart from the comfort levels within the homes of the user, Start Small. aims to deliver a network seen in the image on the right.

The goal is to stimulate and strengthen the local economy. Through putting people in touch and encouraging connection the urban form can be developed by the local user and not big capitalist.

Transsolar academy

# START SMALL.

**START SMALL.** has local architects that are backing you!

+network tab

As an example these could be possible architects in and around Cape Town that could possibly be willing to be apart of the Start Small. Initiative.

Their role could be to host workshops, do pro bono work or assist in dialogue between the various shareholders.

# START SMALL.

**START SMALL.** connects you to local builders and craftsmen.

| | | | | | |
|---|---|---|---|---|---|
| **GrounUP Builders** | **JUMP Builders** | **Concrete KINGS** | **ACM** | I focus on doing my work with intergrity and a good work ethic. | **DomesticImpro** |
| Why We're Great > | Why We're Great > | Why We're Great > | Why We're Great > | | Why We're Great > |
| **346 Builders** | **Bricks KINGS** | **Bob the Builder** | **PainterPRO** | **Jim the Tiler** | **GreenCycle Systems** |
| Why We're Great > | Why We're Great > | Why We're Great > | Why We're Great > | Why We're Great > | Why We're Great > |

+network tab

This page makes it possible for local builder, craftsmen or associated field to upload their respective profiles.

On their profiles they could express their particular skills and contact details.

This gives people the opportunity to take part in a local market at a competitive level.

Transsolar academy

# START SMALL.

**START SMALL.** supports teaming up with local NGO's

| | | | | |
|---|---|---|---|---|
| MAMA'S CHILDREN | FRAMING HOPE | FUTURE CAPE TOWN | | BO OP |
| KHULISA SOCIAL SOLUTIONS Reinventing lives | SYMPHONIA for South Africa | Bhongolethu foundation | | YOUNG URBANISTS |
| BRIDGING GAPS | KAF Kolkata Architecture Foundation | C-re-a.i.d. | | R |
| LULLABY STUDIO | LOVE JUSTICE SOUTH AFRICA | BE\ PRA GUE \ST | | IKATERE |

# START SMALL.

**START SMALL.** has one last suggestion to even better the level of comfort in your home.
Check out these passive strategies.

Solution

Set up
solutions

Research

Database

passive strategy 01

passive strategy 02

passive strategy 03

Daylight
CHECK IT OUT

Air quality
CHECK IT OUT

Cooling
CHECK IT OUT
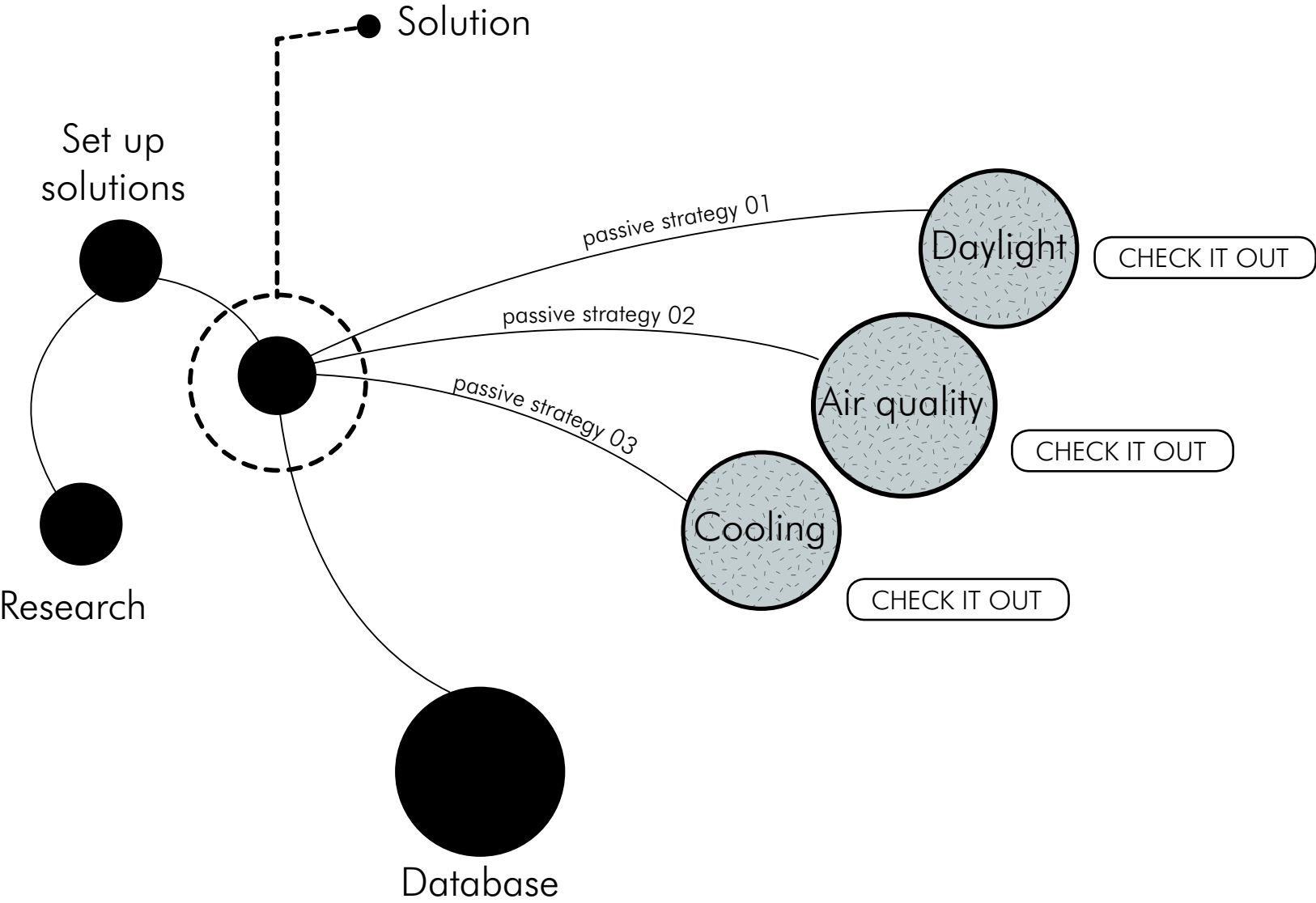
+passive strategies tab

Passive strategies are introduced
to the user by explains what the
strategies are and how they
could be applied.

Transsolar
academy

# START SMALL.

ENHANCING THE
## DAYLIGHT IN YOUR HOME

Daylighting is a passive strategy using natural daylight to illumnate interior spaces. The benefits from daylighting ranges from improved experience of the space, better colour balance, connection to the outdoor. It also reduces the need for artificial lighting which in turn decreases the energy demand.

**01**  Direct sunlight

**02**  Plastic translucent panel
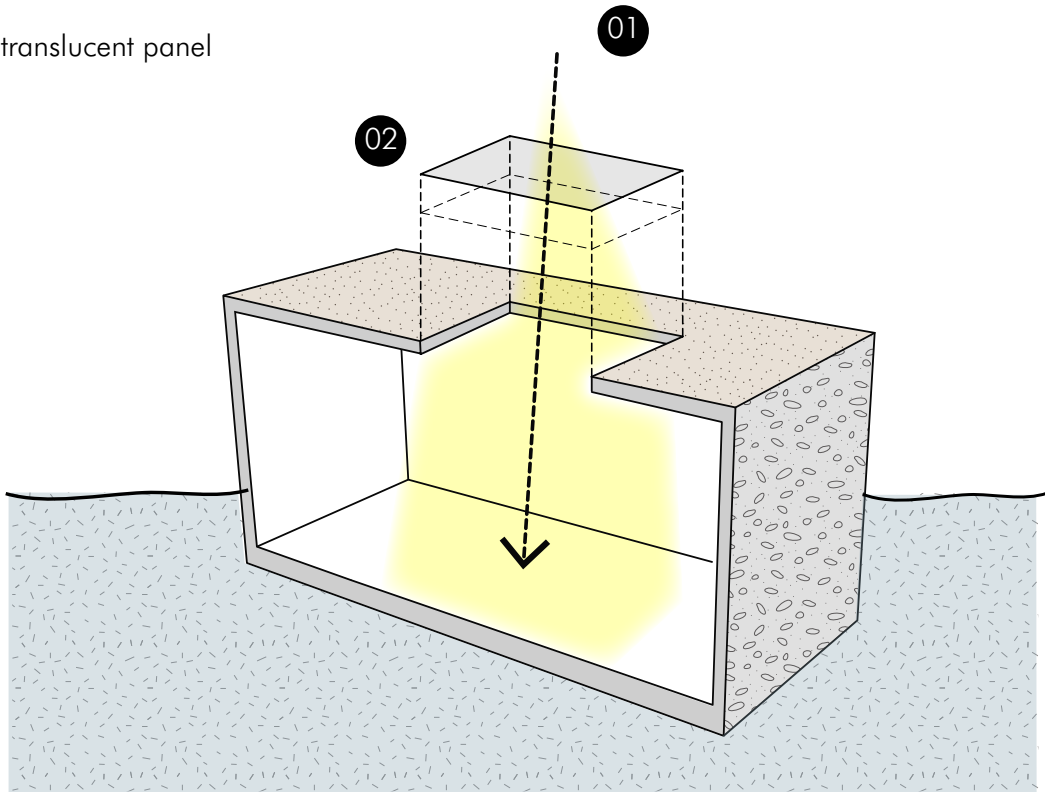
**01**  Standard horizontal overhang

**02**  Vertical louvres for east and west facades

**03**  Drop edge for less projection

**04**  Slope down for less projection

# START SMALL.
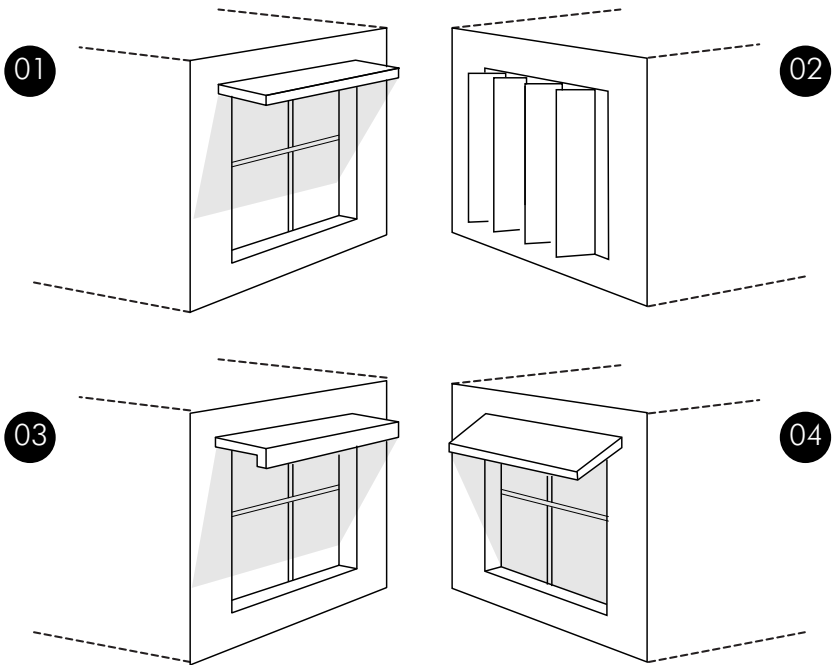
## ENHANCING THE
## AIR QUALITY

Natural ventilation is a passive strategy using both wind and temperatures differences to cool or ventilate spaces. The benefits from natural ventilation include improved air quality and increased energy effieciency. Passive ventilation strategies use naturally occurring air flow patterns around and in a building to introduce outdoor air into the space. Wind and buoyancy caused by air temperature differences create air pressure differences throughout occupied spaces. Buildings can be designed to enhance these natural air flows and take advantage of them rather than work against them.

**01**  Cross ventilation concept

**02**  Stack ventilation concept

**01**  Wind walls as protection
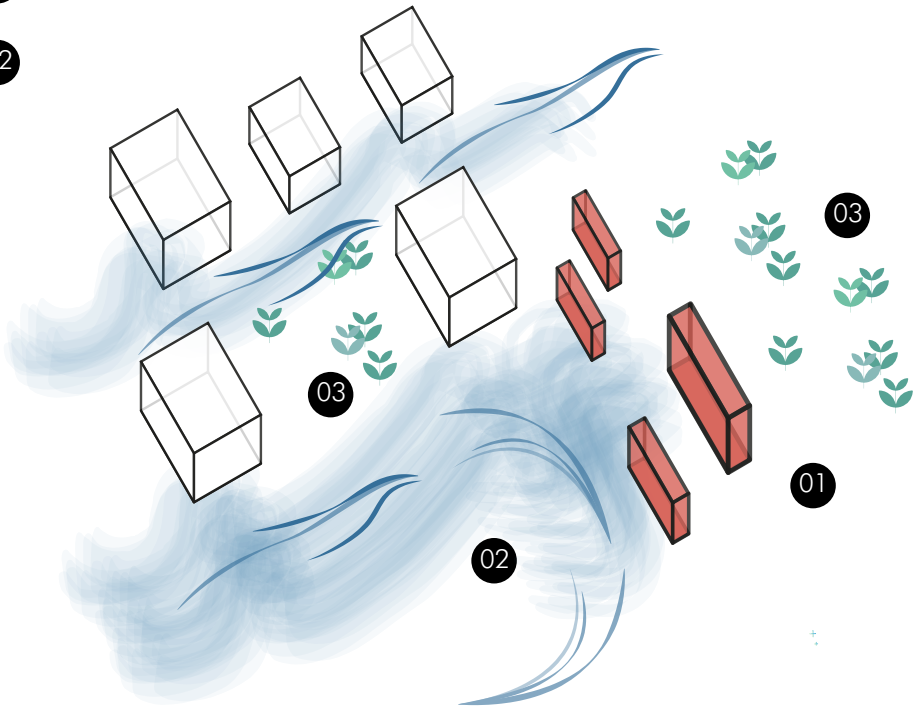
**02**  Windy area

**02**



**01**
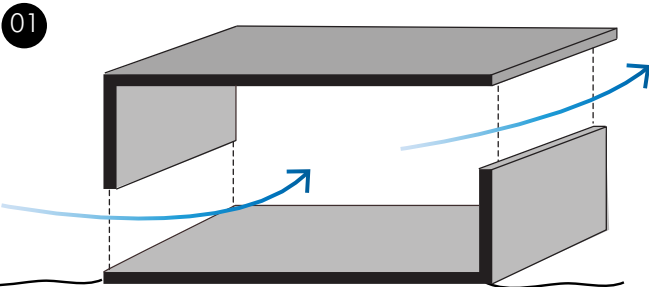
Cross ventilation maximum performance when inlet and outlet are placed at diagonal in both plan and section.

**02**
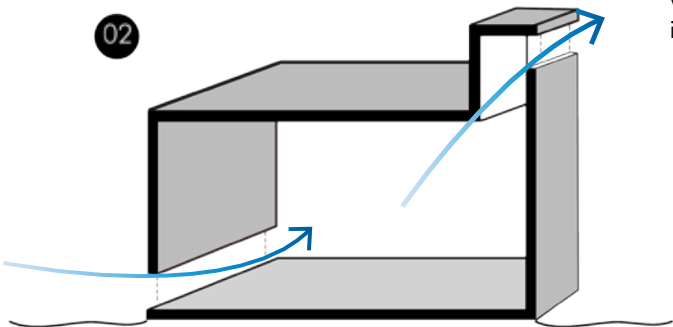
Stack ventilation: maximum performance when inlet and outlet areas are equal and minimum stack height is 3.3 meters

Transsolar academy

# START SMALL.

So what we did to actually get to our **START SMALL.** solutions.
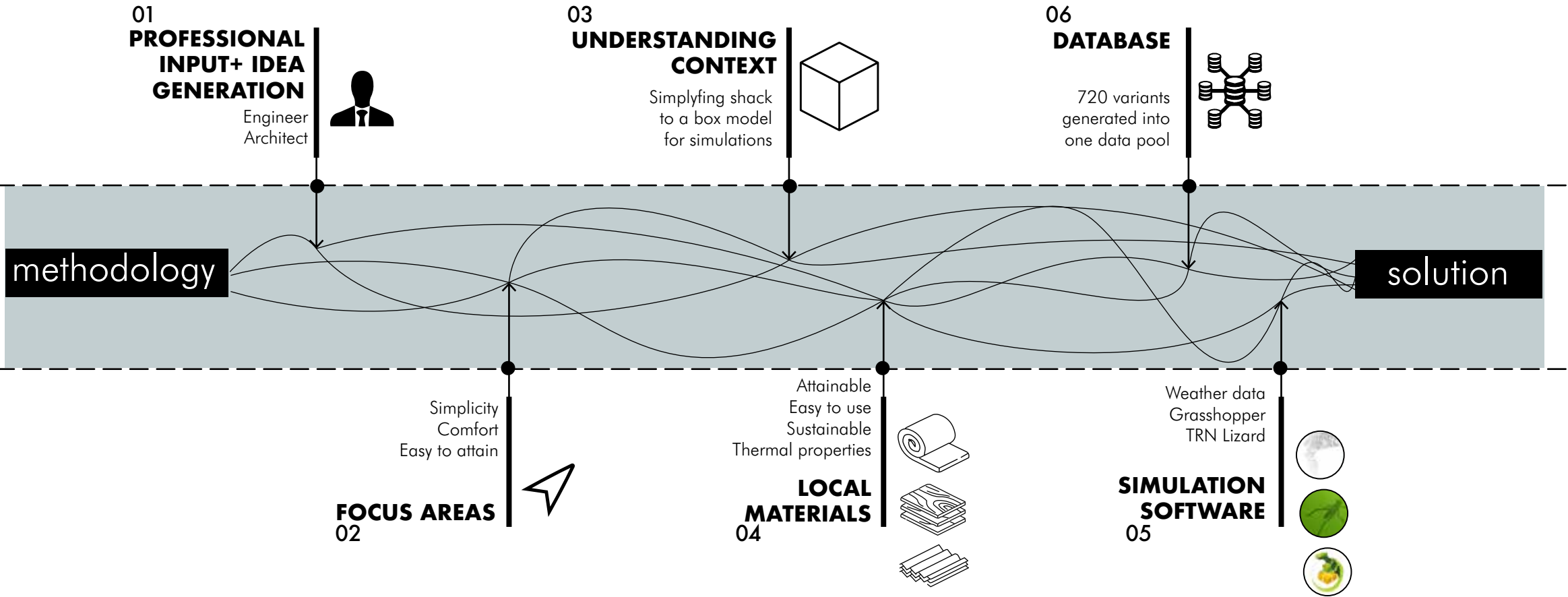
+our methodology tab

This page allows the user to see what channels and tools were used and investigated throughout the study.

Moreover, it allows the user an overview and flow of methodology used to get to the results.

**01**
**PROFESSIONAL INPUT+ IDEA GENERATION**

Engineer
Architect

**03**
**UNDERSTANDING CONTEXT**

Simplyfing shack to a box model for simulations

**06**
**DATABASE**

720 variants generated into one data pool

**methodology**

**solution**

Simplicity
Comfort
Easy to attain

**FOCUS AREAS**
02

Attainable
Easy to use
Sustainable
Thermal properties

**LOCAL MATERIALS**
04

Weather data
Grasshopper
TRN Lizard

**SIMULATION SOFTWARE**
05

Transsolar
academy

# START SMALL.

**START SMALL.** wants to hear from YOU!



START SMALL. ✕

Full Name *

Email Address *

Phone Number

Write Your Request

Submit Now

Transsolar academy

Fig.6: inner city slum area in Johannesburg, South Africa

A BIG shout out to Vu and Jakob for being super cool mentors.

Thank you!

Transsolar **academy**