

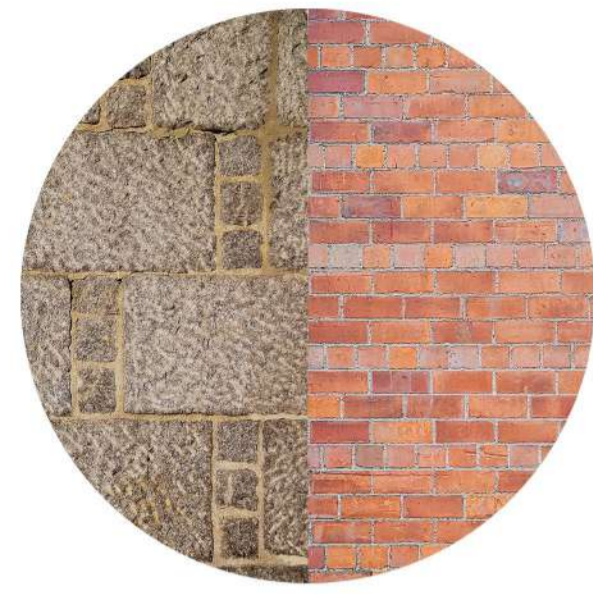


What would happen if we allowed Nature to take over Architecture?

What if she was the ultimate designer we needed to save our planet? Should we let her take back what once was all hers?



# G2G Social Housing (FROM) GRANITE TO GREEN



- Granite
- Red brick
- Traditional
- Dated
- Expensive
- Hard to replace
- Dull
- Hard to work
- Heavy



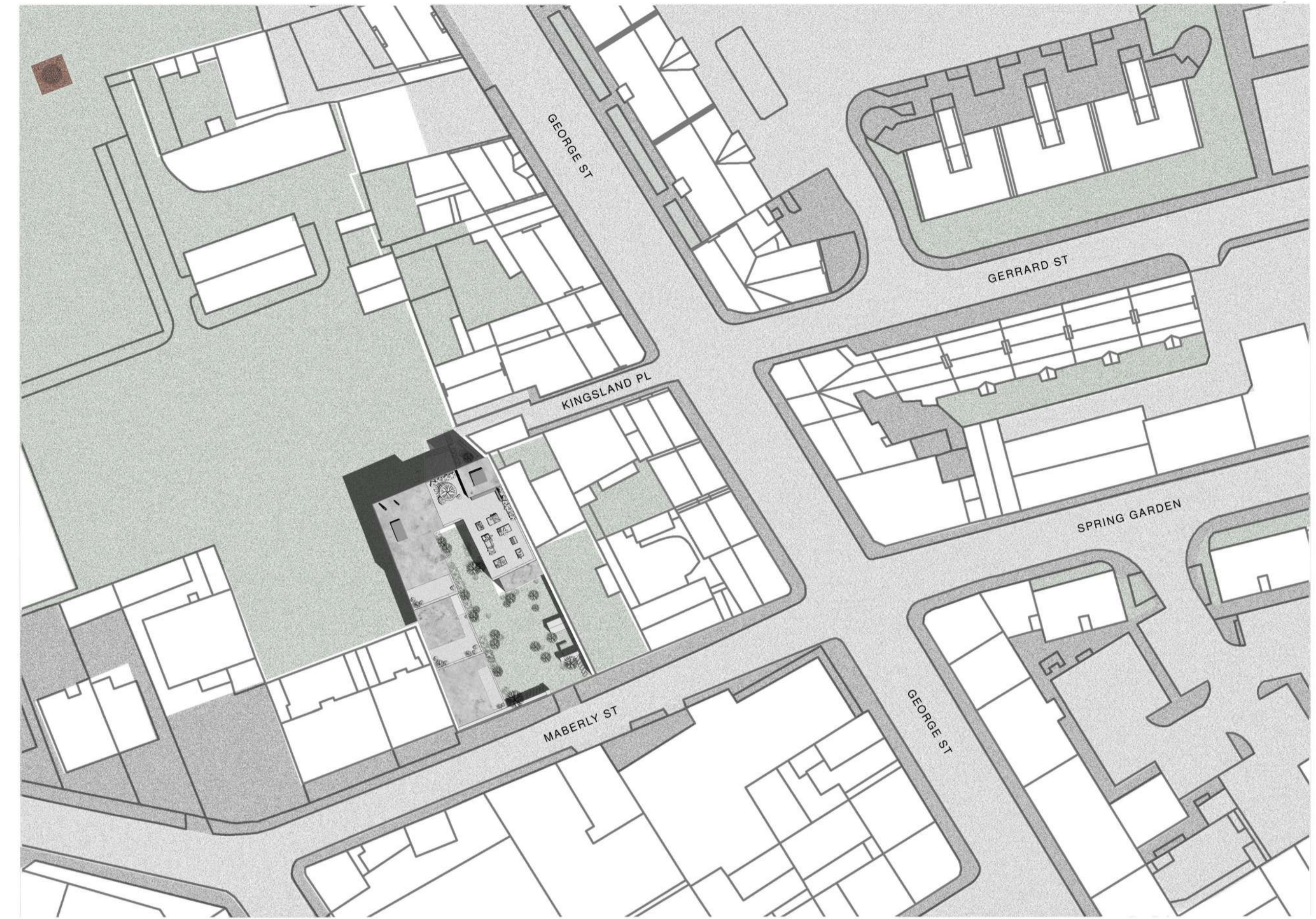
- Moss
- Mycelium
- CLT
- Sustainable
- Cheap
- Built for Dissassembly
- Biophilic
- Net Negative
- High scientific interest
- Lightweight

A Residential Housing project (14 flats), with an amphitheatre, a moss garden, and a communal kitchen on the rooftop.

The tectonics and the form allow for the inhabitants to fully experience the best quality Aberdeen's **sunlight** - which takes place in the **morning**. I focus on terms such as Social Rent, Affordable Rent, and Starter Homes to tackle a **site-specific problematic: Single-person Homelessness and Mental Health in the Aberdeenshire area**. The scheme also works to "reward" those who are willing to help others doing volunteering work - say big-cooking meals, doing storytelling in the moss amphitheatre, or taking care of the garden.

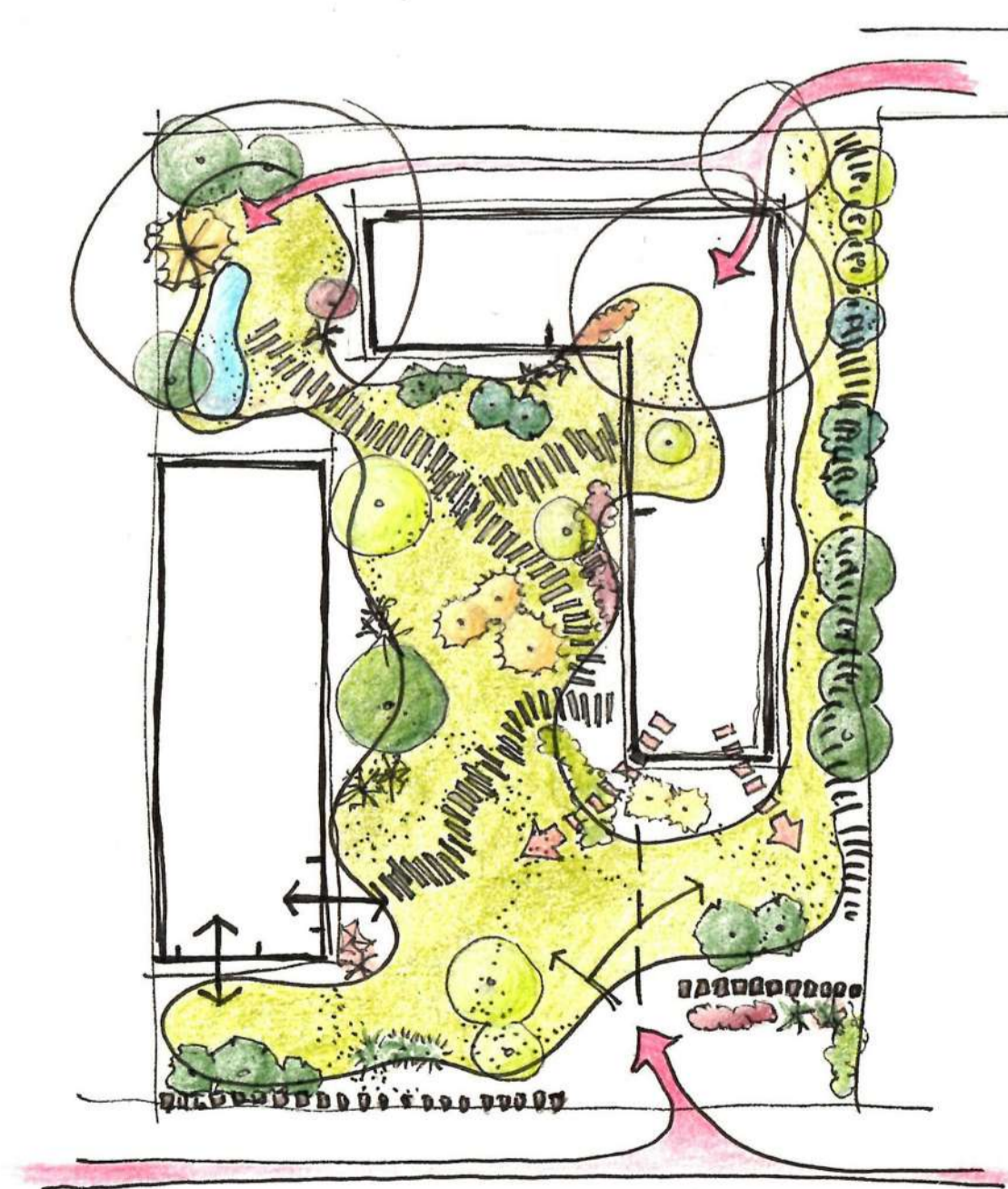
On the ground floor, a pocket moss garden that visually invites the public to "escape" from the greyness (granite) of the city to dive into a zen and relaxed environment. Next to it, the amphitheatre, that serves as a warm gathering area or a movie pavilion for people to shelter from the weather on a 24/7-public access basis (also targeting the homeless and creating a 'monitoring' practice upon the vulnerable ones).

On the rooftop, a food winter garden - enclosed during Winter, and open during Summer. Holding several scree beds with vegetables, fruit trees, and herbs that are grown by the public and the residents while positive interpersonal relations are created by the simple act of harvesting, cooking, and sharing a communal meal in a space that is safe for everyone.

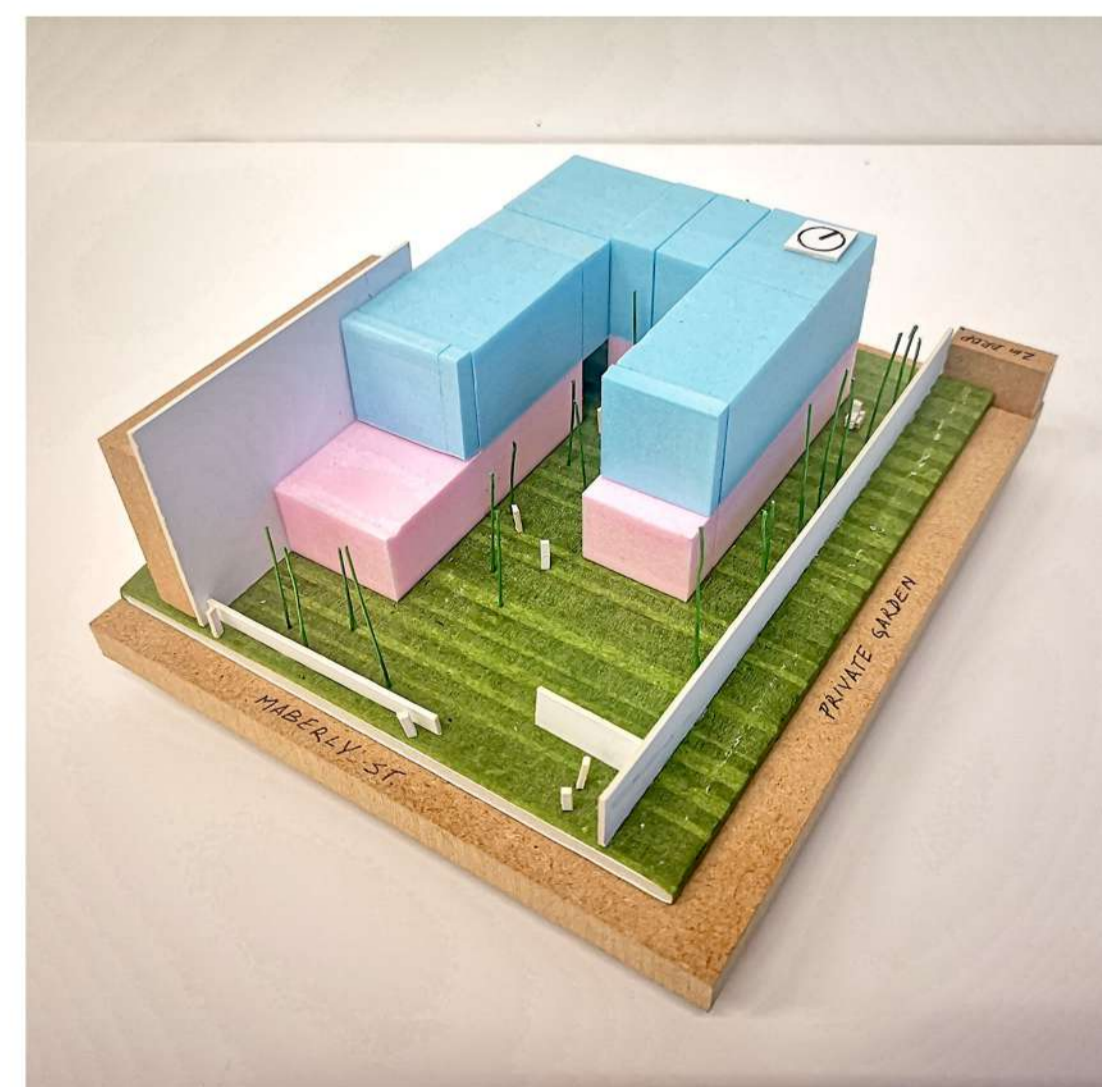


Roof Plan

## CONCEPT DESIGN - First ideas



1st Courtyard explorations



1st Mass model  
MDF, styrofoam, chipboard, and florist wire



## LAND USE - 10min City

- Mixed use (Shops on Ground floor/Residential above)
- Residential only
- Dentist, Orthodontist
- Community center
- Student accomodation
- Listed buildings
- 2-5 min walk
- 5-10 min walk

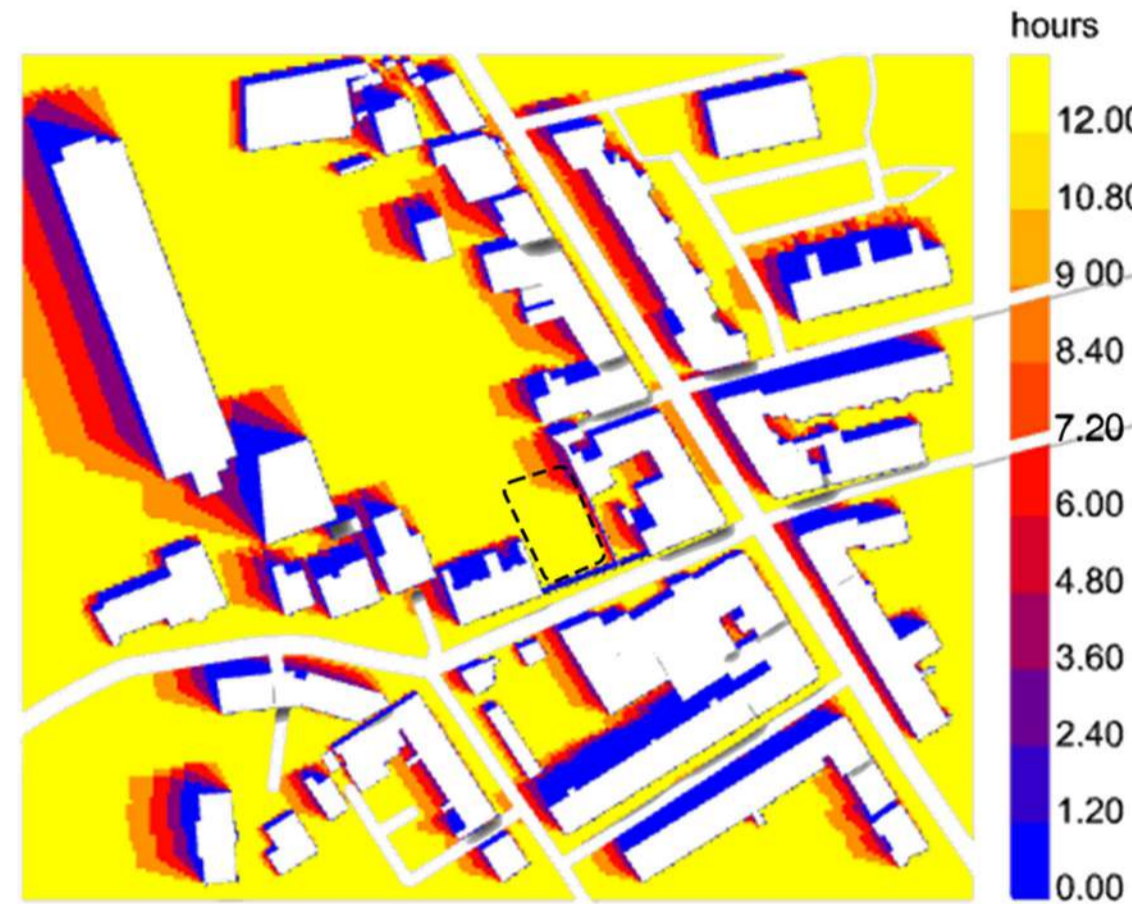




**DATA-DRIVEN DESIGN:** Taking advantage of quality morning light

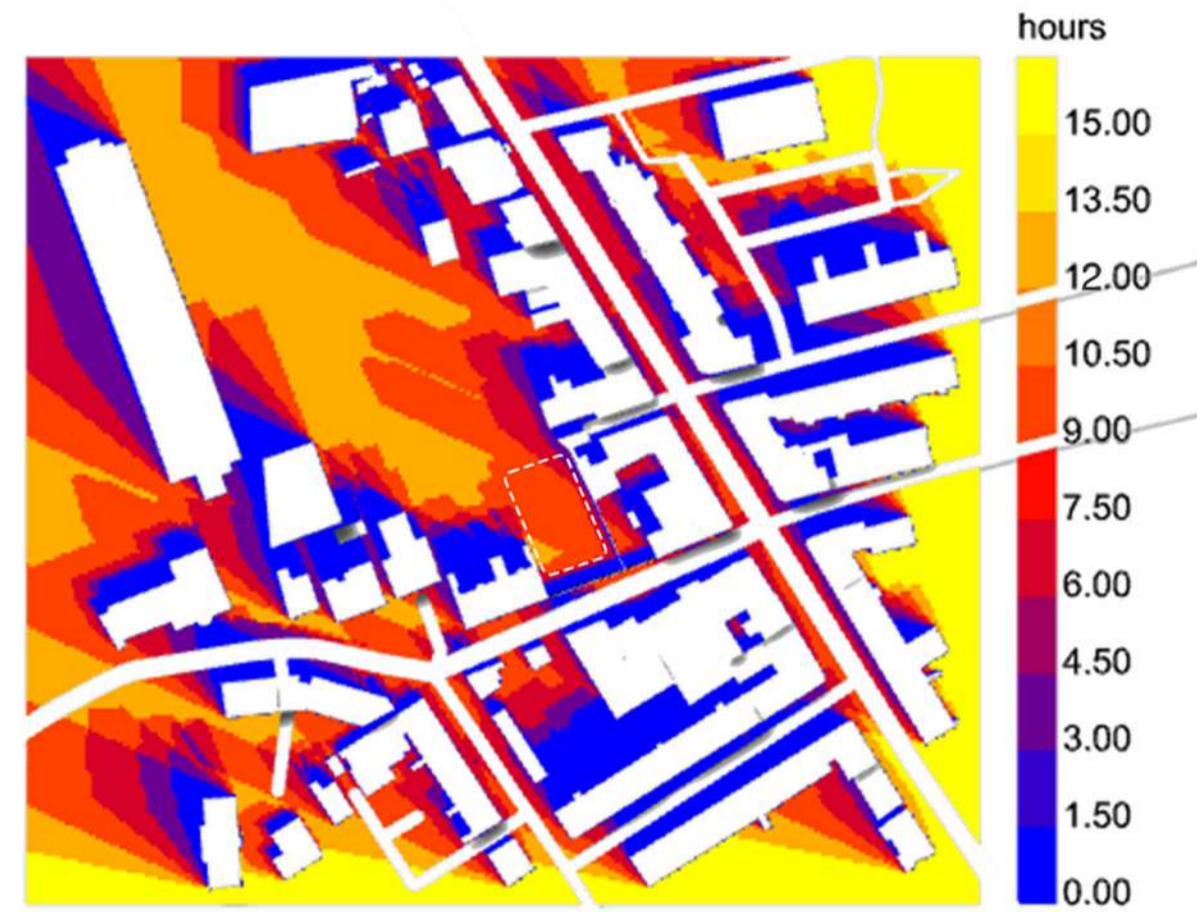
Aberdeen City - Maberly st with George st

Summer morning



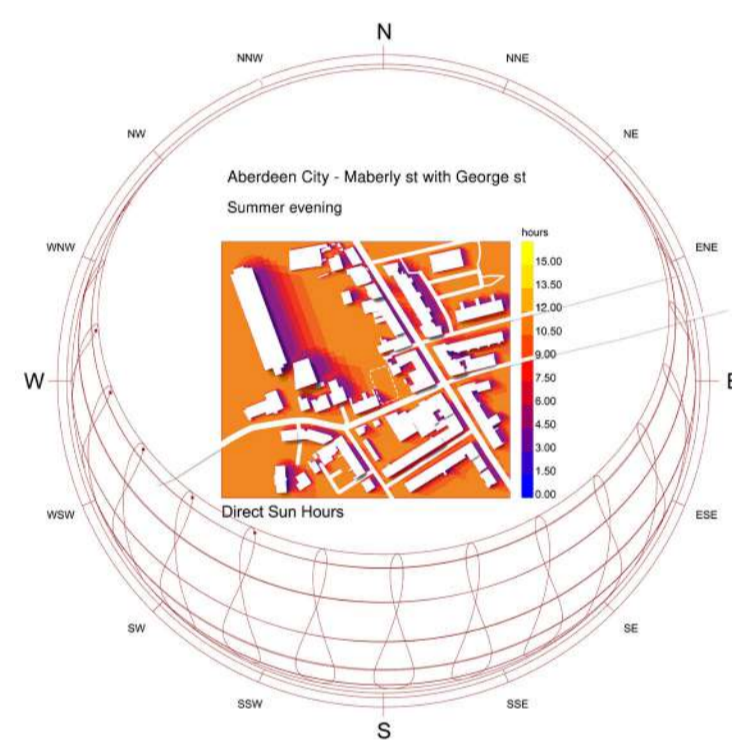
Direct Sun Hours

Winter morning

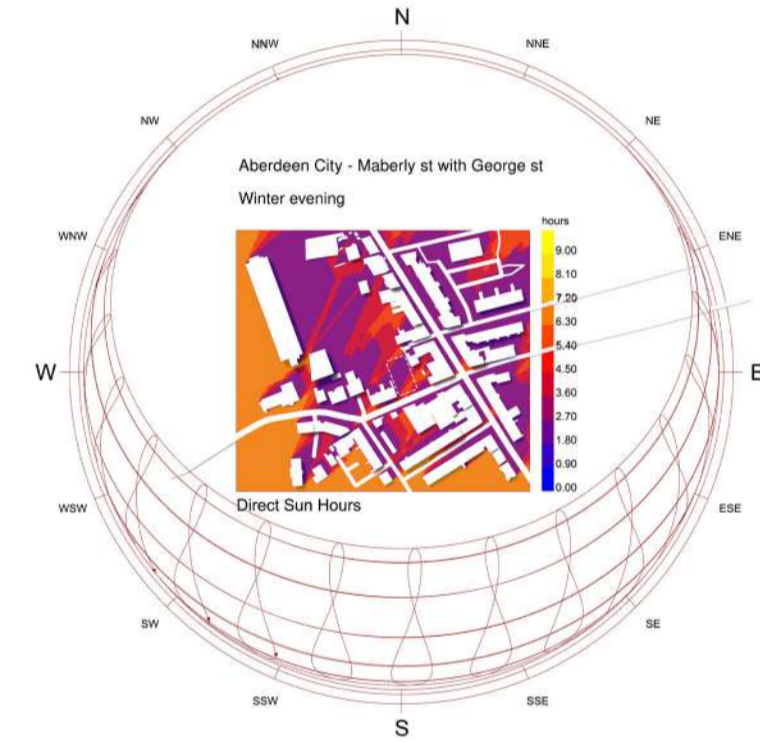


Direct Sun Hours

Summer evening

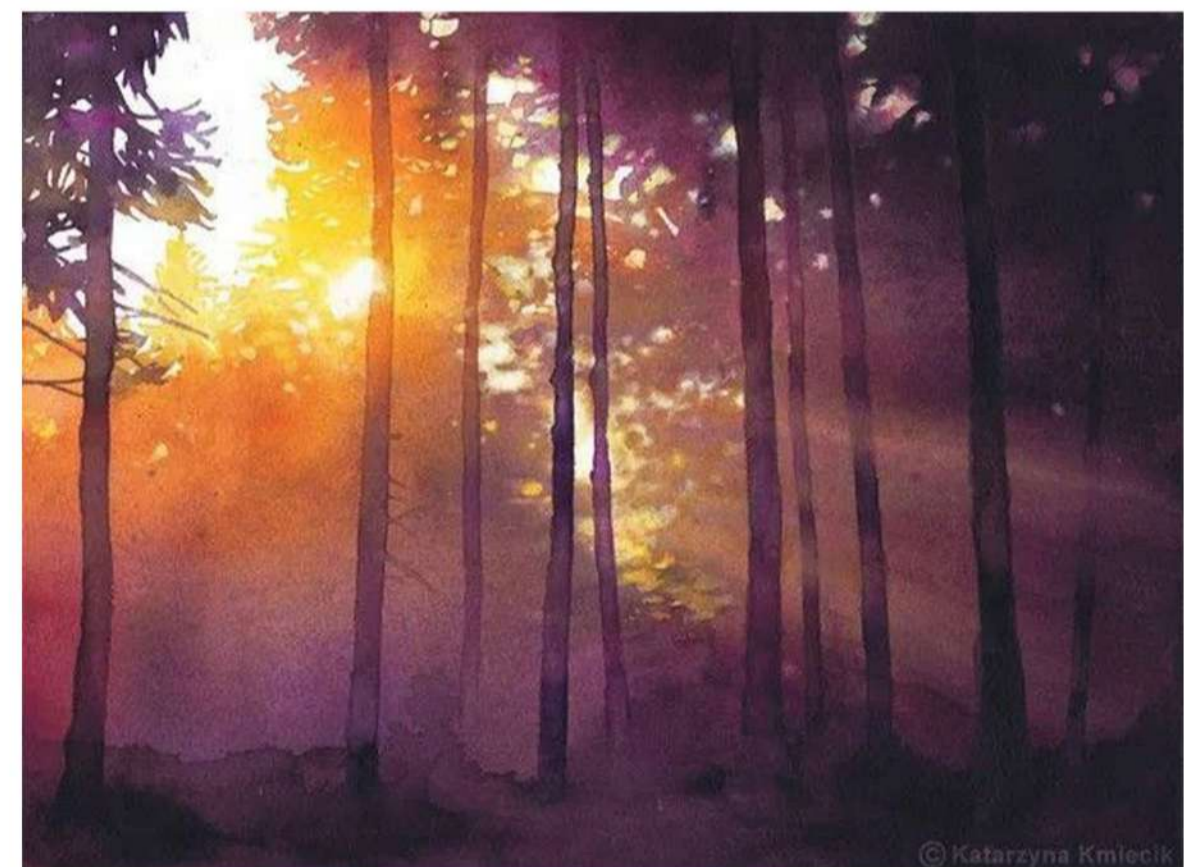


Winter evening



With Ladybug, a plug-in for Grasshopper for Rhino, I could explore the **form factor** and **sun gain** possibilities of my design, focusing especially on **morning light**. As weather and daylight are both strong constraints for building in Scotland. (These analyses do not take into account the percentile volume of clouds throughout the year).

Although, I have considered the 'potential' of the site during Summer - when we have a lower volume of clouds. This direct morning sunlight bring a more artistic inspiration for me, that one of the '*Komorebi*', which refers to the effect of sunlight filtering through the leaves of trees. This would create a **mystic environment that brings calmness and peace to the minds of the inhabitants**.



Inspiration: The watercolor works of Ilya Ibryaev (left), and Katarzyna Kmiecik (right) have drawn me to experiment with horticulture (different types of moss, deciduous trees and vegetation) for achieving the *Komorebi*.

**SITE-SPECIFIC PROBLEMATICS:**

Homelessness, Mental Health, Loneliness and Depression

**Homelessness:**

Housing First tackles homelessness and those with complex support needs, such as managing drug and alcohol addiction or mental health issues.

Some of its principles are that housing is a human right; choice and control for service users as to the location and type of housing they live in; treatment spaces and housing are separated, so housing is never conditional on engaging with treatment; it is recovery-oriented; **person-specific planning**; and offers flexible support for as long as required.

For me, in this case, Architectural Intention goes far beyond simply 'how my building responds to certain peculiarities of the site' but how it tackles a humanitarian emergency. Two of my goals are:

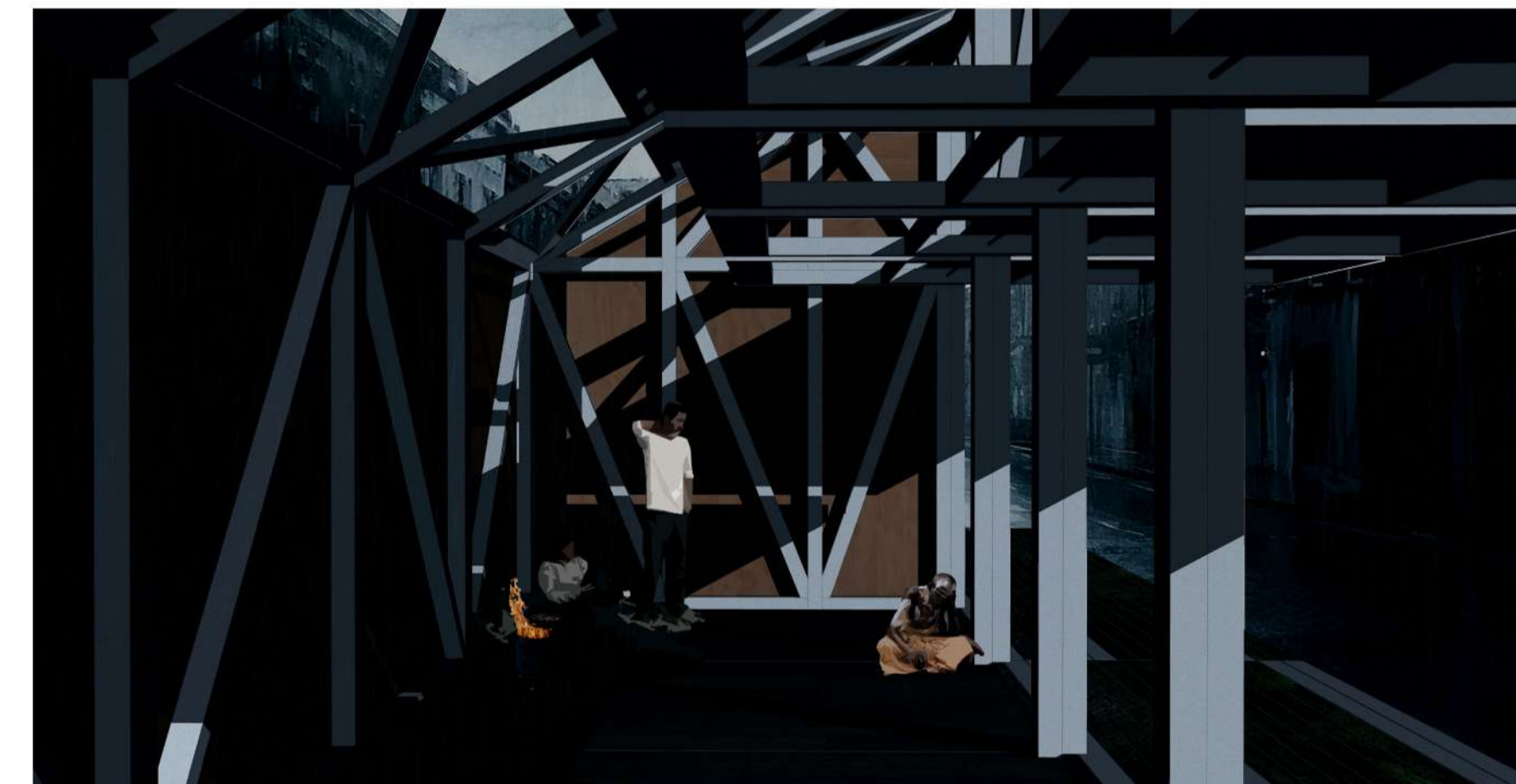
- **Single homeless individuals** - that have nowhere to settle down - live in shelters and temporary accomodation. This can cause distress and depression, driving them into harming themselves to the extent of suicide, in some cases.
- **'Hidden homeless' households**. For some people, their situation is not visible either in official census statistics or physically on the streets. In this case, all we can do is build safe spaces and hope for them to express and show up with their difficulties. In order for this, we need to be the '*facilitators through Architecture*'.

One of the most effective solutions for reducing homelessness could be increasing the Social Rented sector - this involves us as architects being responsible for designing with these issues in mind.

This solution is included in governmental statistical modelling, which indicates that it could be part of several other solutions that could reduce the total core homelessness by 34% in England, 30% in Wales, and **42% in Scotland**. (Gov.uk 2023).

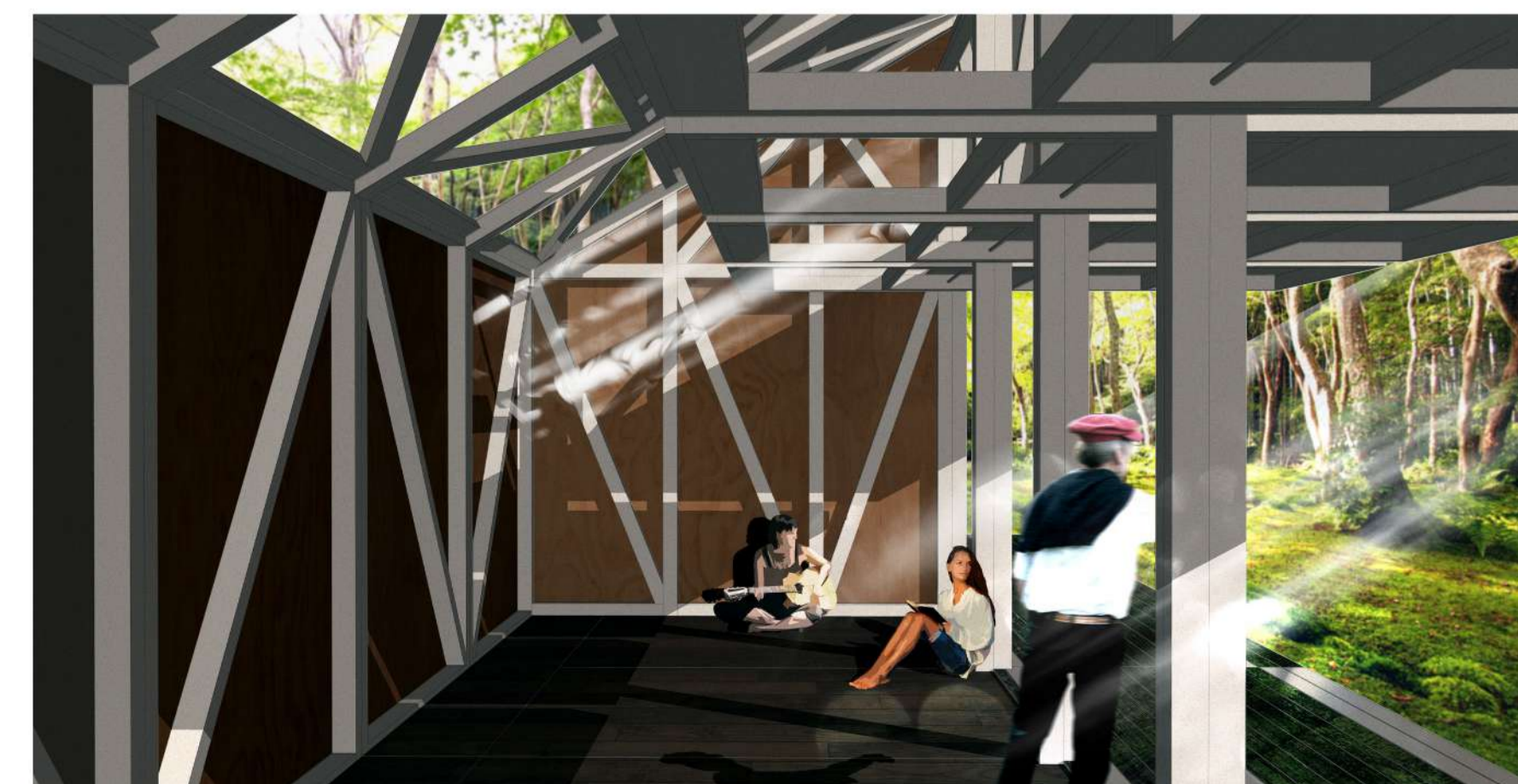
**Suicide rates:**

Data showed that suicide deaths are **consistently above average during Summer (Jul - Sep) 2020**. This supposes a **30% increase** (for those three months). Men only are accounted for 71% of all suicides of 2020, and since 2016, Dundee City has had the highest suicide rate.



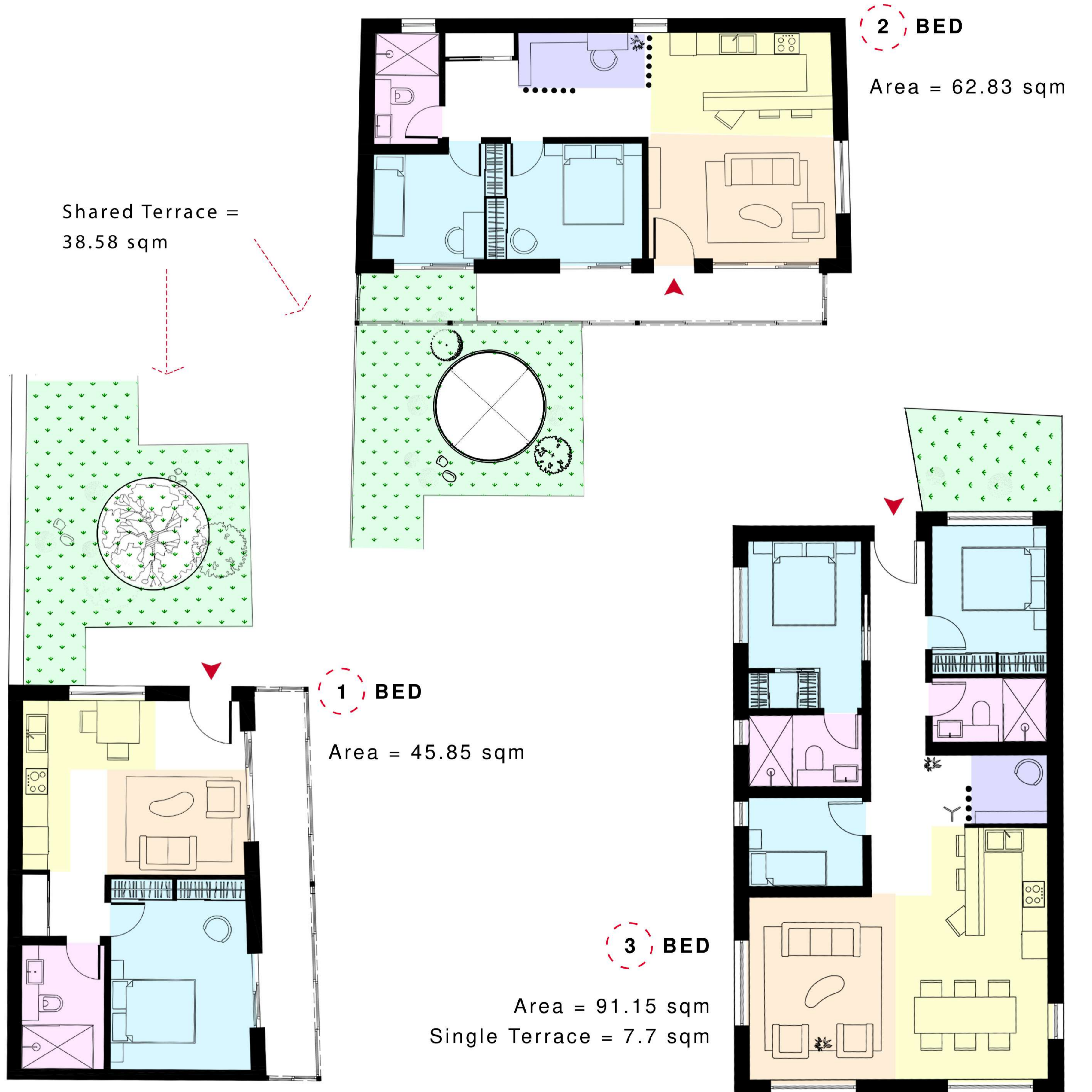
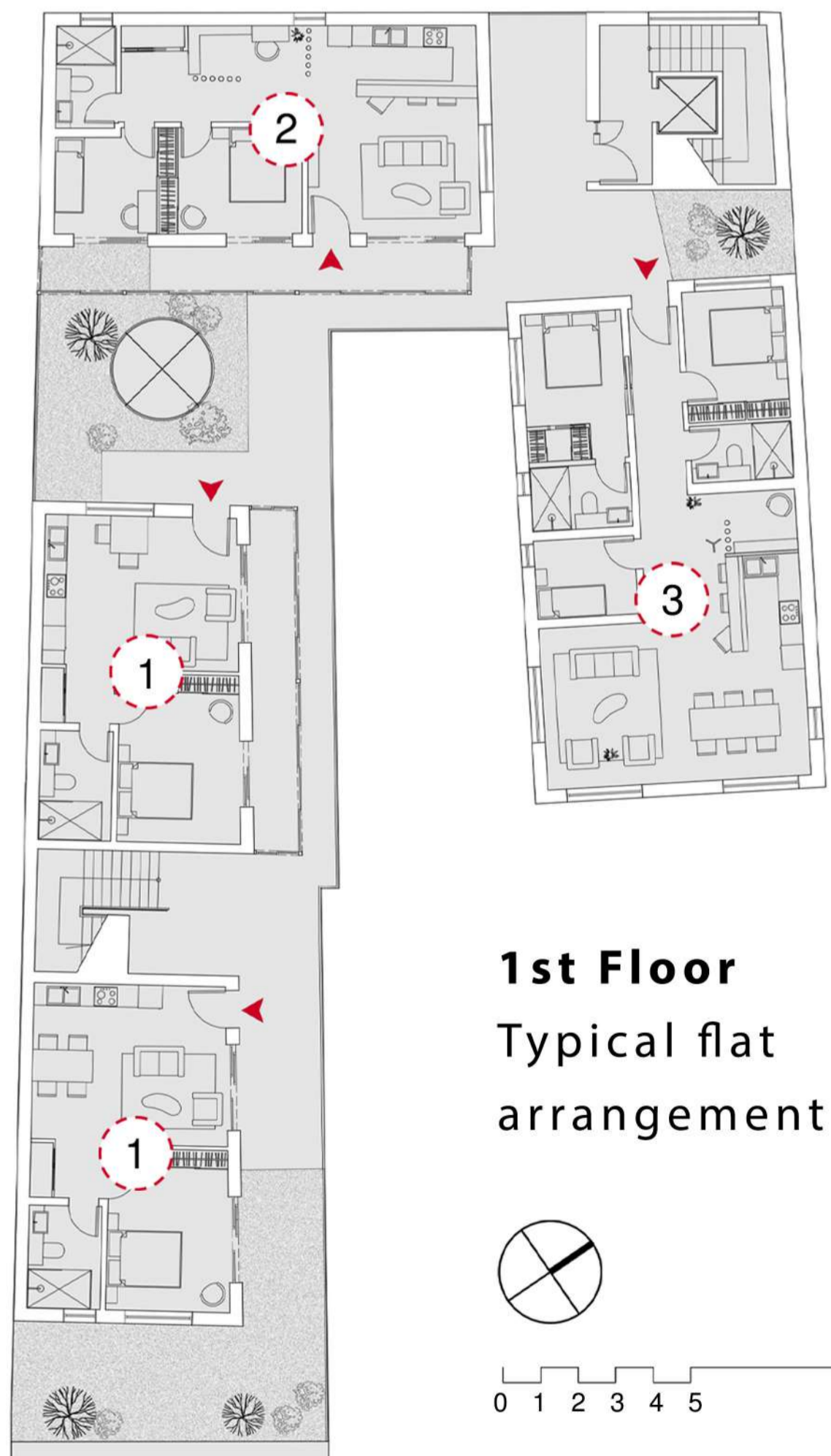
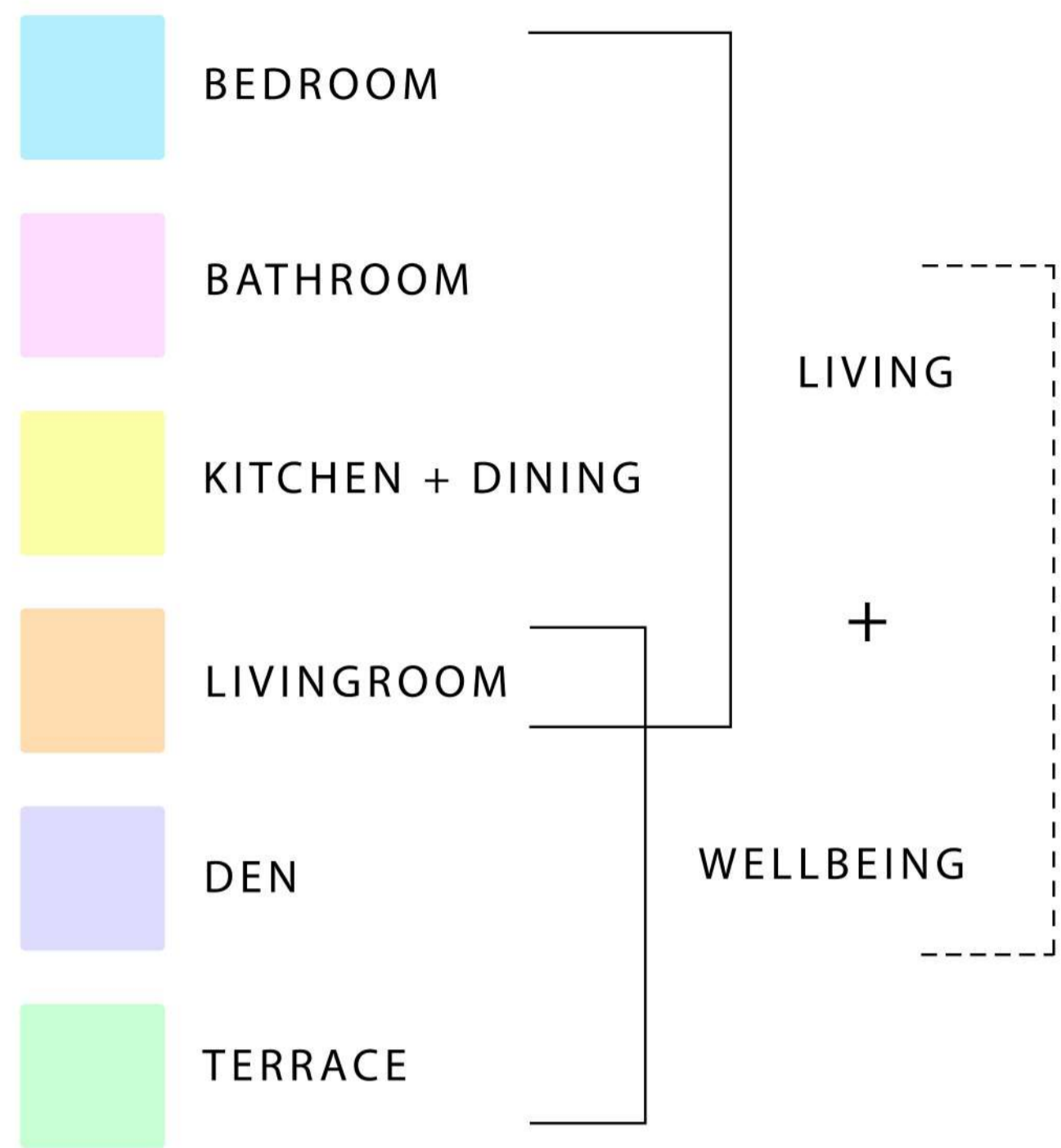
Biophilic Design + Sustainability

Architectural Empathy





**FLAT TYPOLOGIES:** Zoning and Biophilic character

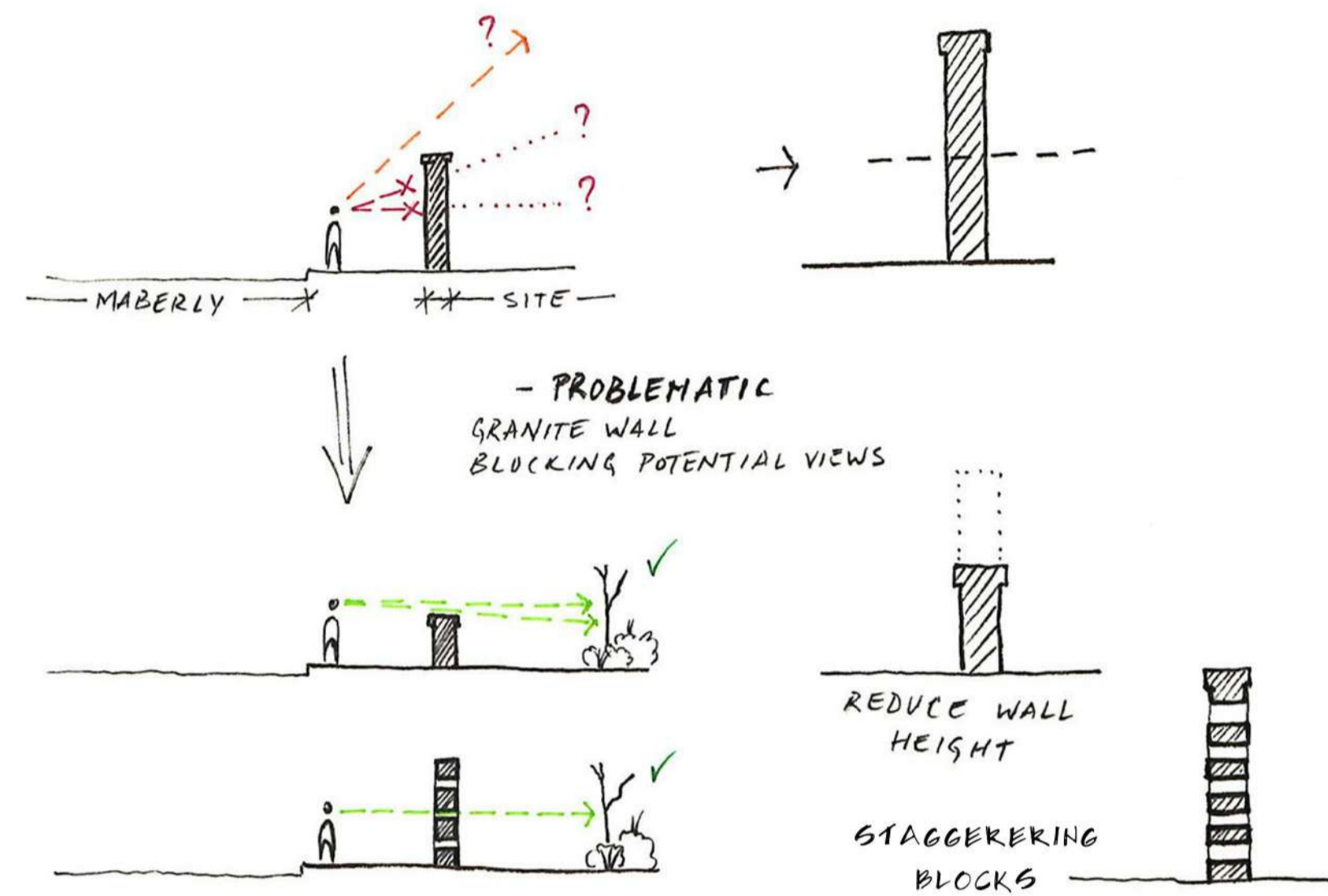




**VISUAL STRATEGY** - Connecting the public with the inner courtyard  
Solving the granite wall issue: Shall we preserve it, demolish it, or perhaps something else?

**Constraint:** Granite wall

This well-preserved wall blocks the direct views from the public towards the inside of our moss garden, disconnecting both 'worlds' from one another.



**DIRECTING MOVEMENT THROUGH FOLIAGE AND MICROSCAPE STRATEGIES:**

In certain areas the density of the greenery would become a circulation constrain, thus, indirectly guiding pedestrians' movements around the site.

- Mid-high hedges: allow for a visual and social connection, but makes it awkward when trying to go through them. [See 1:50 section physical model]
- Tall trees (deciduous): focus in both the horizon line and the sunlight that goes through the trees. [Komorebi]
- Ground-height bumpy moss: drags people towards it: picnic, sunbathing, gathering, movie theatre extension, naps.



**VEGETATION AND NOISE BUFFERING:**

Taking advantage of the granite wall and our biophilic design strategy



As a general rule, vegetation helps to screen noise but it is not enough as a barrier on its own. We also need to consider this during Winter when our deciduous trees/plants will have no leaves.

The leaves of the trees act as a natural sound barrier as depending on the shape, size and density of the leaves, sound will bounce in certain way - each different to every type of leaf. Evergreens and dense vegetation will be a starting solution to mitigate the noise problem. Especially when, psychologically, not having a full visual connection with the source of the noise will detach us from paying attention to it (being bothered).

**Significant noise reductions of up to 5-10 dB will most likely be achieved with a good well-thought landscape strategy.**

The London Plane tree contributes with a gamut of sizes, leaves' colors, and are deciduous.



Birch trees vary in height, density, and house a variety of lichen, mushrooms and bird life.

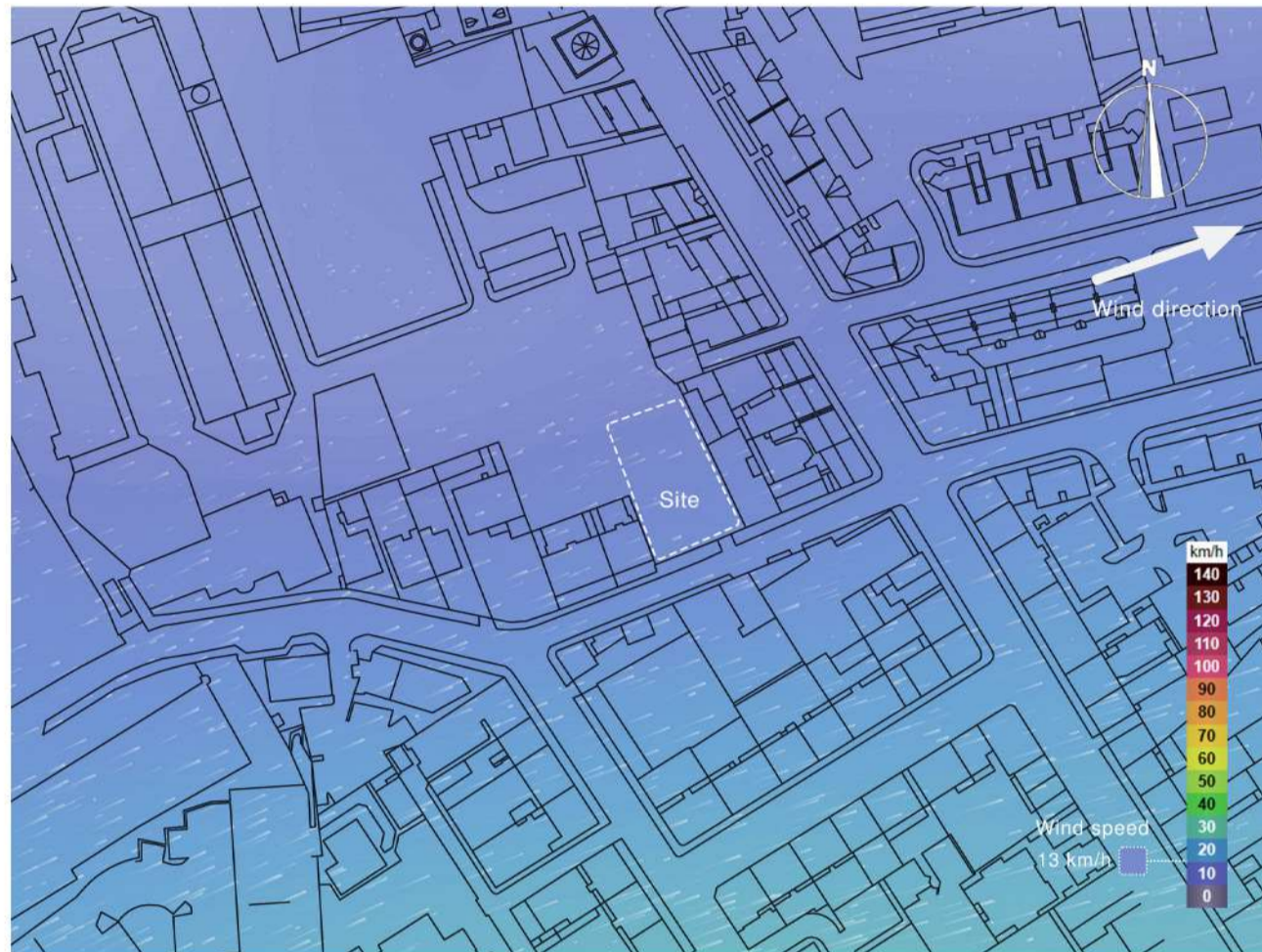




## EFFECT OF VEGETATION ON ENERGY CONSUMPTION - Urban Heat Islands (UHI)

In general, urban areas are around 5oC warmer than the outskirts. Although in Winter may be beneficial, in Summer it supposes a potential overheating problem.

**Mechanical (active) cooling systems are proven to increase the CO2 emissions**, which is detrimental to the environment as well as the local and global human health. On the other hand, Passive cooling measures can help reduce the overall carbon emissions.



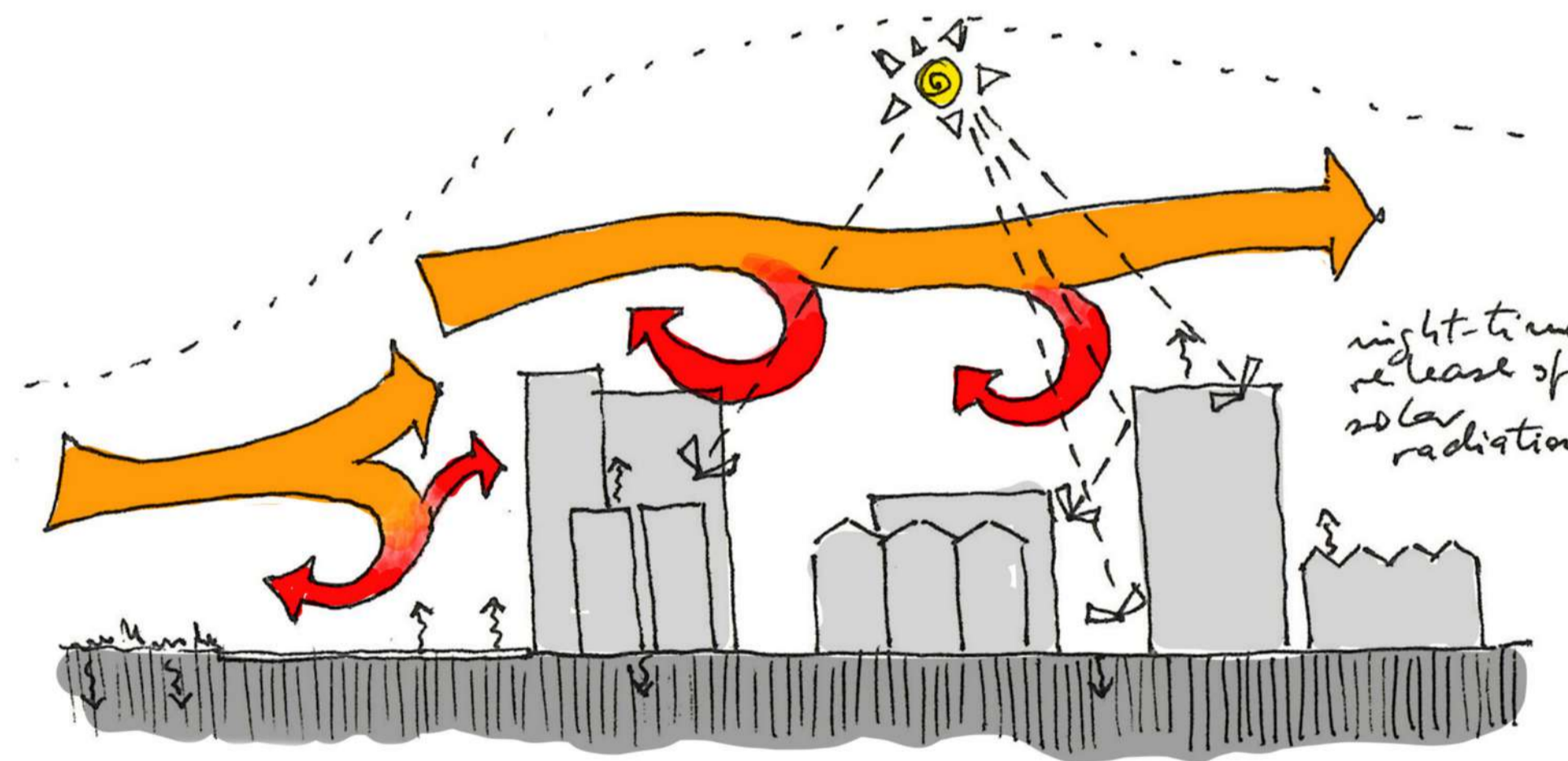
During the day, the soil and humidity from the moss garden evaporates, and the shade from the vegetation and trees create a temporary cool island effect. Temperatures are held from 2-3oC lower than the urban surroundings. Thus, **the larger the green scape, the greater the tempering effect it will have upon inhabitants and neighboring buildings.**

Placing vegetation upwind guarantees catching prevailing winds, which tempers both Summer and Winter temperatures.

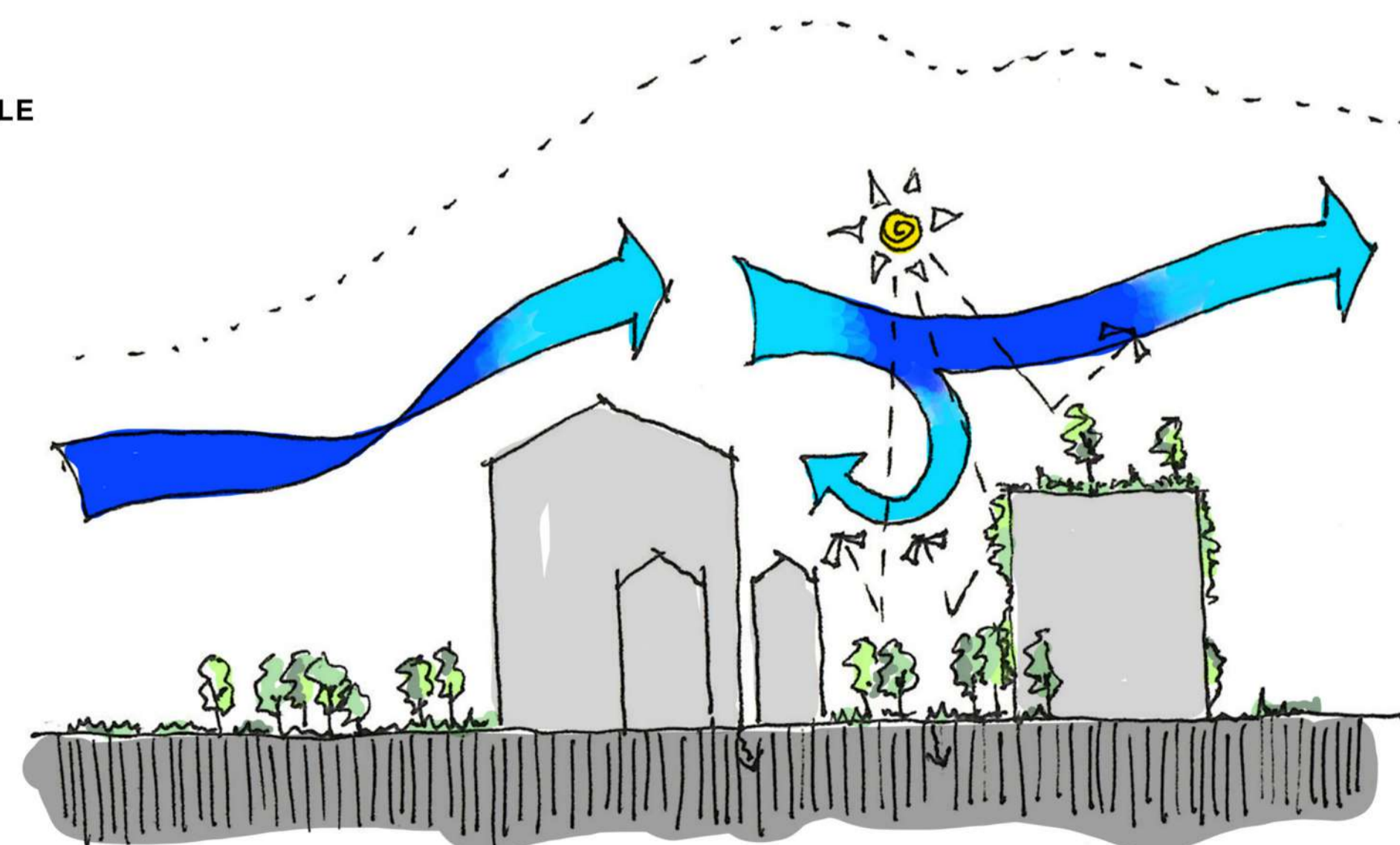
Reduced solar absorption from planted areas - including facades and green roofs.

Overall local temperatures of the moss garden: - 2-3oC in Summer.

TYPICAL UHI PROFILE



'GREEN CITY' UHI PROFILE



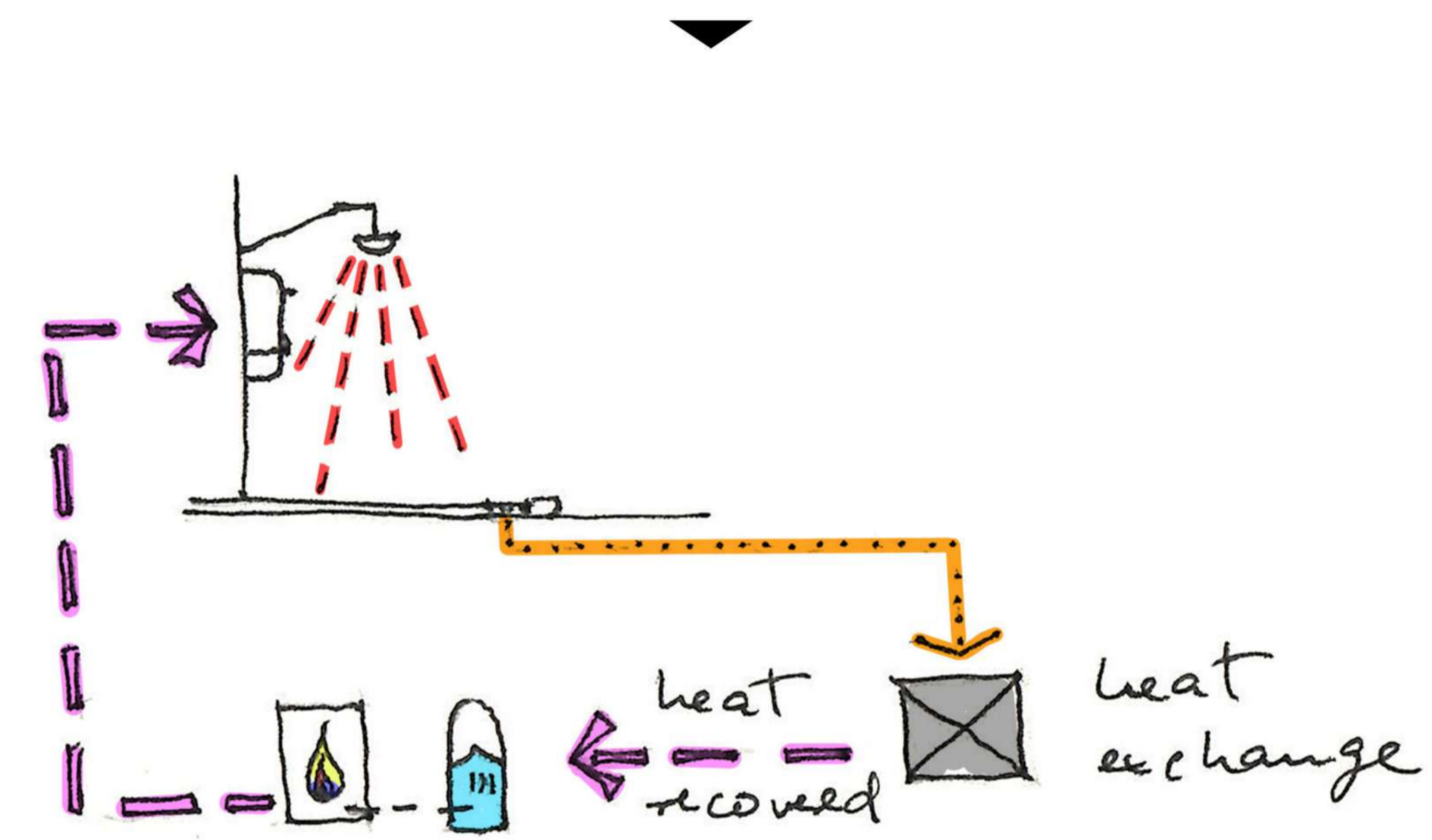
## WASTEWATER HEAT RECOVERY SYSTEMS (WWHR) - Shower wastewater

### Sustainability and Net Zero Carbon philosophy:

I studied the possibility of having a biomechanical grey water harvesting with heat recovery system to be used as irrigation for our moss garden, communal kitchen, and for WC flushing and washing machines. Although, grey water systems are not always energy efficient.

What I propose for my building is to have a heat recovery system without grey water recycling. This process, connected to a thermostatic shower (no bathtubs in my design), **reuses the heat of the water at the time of showering to provide a base heat (pre-heating) the cold mains in a quicker and more efficient way, so less energy is used.**

For example, shower wastewater at around 35-40oC flows down the drain; 15-20oC approx. of its heat is recovered, which will heat the new running 10oC water to about 30oC.



We will see a CO2 reduction of around 3-4 kgCO2 per 1000 litres of shower water. If compared to a non-heat recovery system, this process supposes around 150 kgCO2 reduction per year per household.

In most situations, grey water recycling is likely to increase the total CO2 emissions. This without considering that it requires regular maintenance, additional money and space for separate grey water tank systems and storage tanks. Although, for larger scale planning it would work better.

150 kgCO2 x 14 flats = **2,100 kgCO2/year** that the whole building will not produce

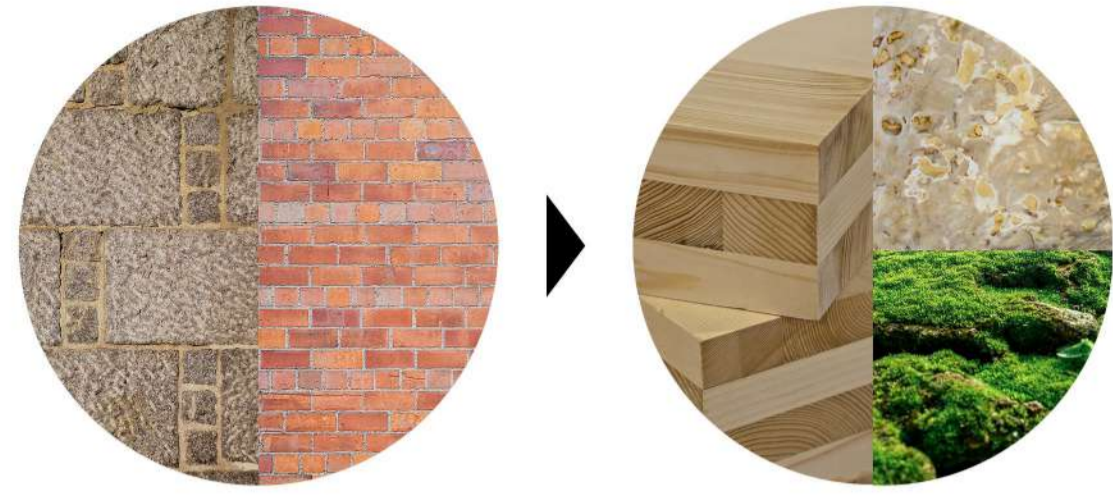




# G2G Social Housing - (FROM) GRANITE TO GREEN

Mycelium as both Thermal (Insulating) and Protective Layers + New proposed design for a *micro-ecosystem, self-sustainable, Net-Negative* interior *bio-facade* system.

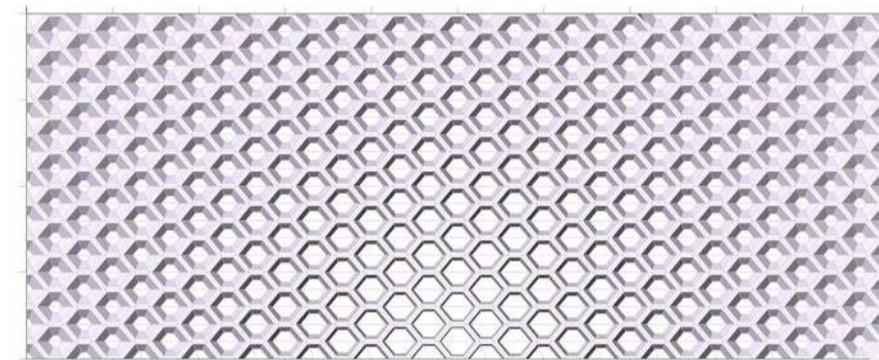
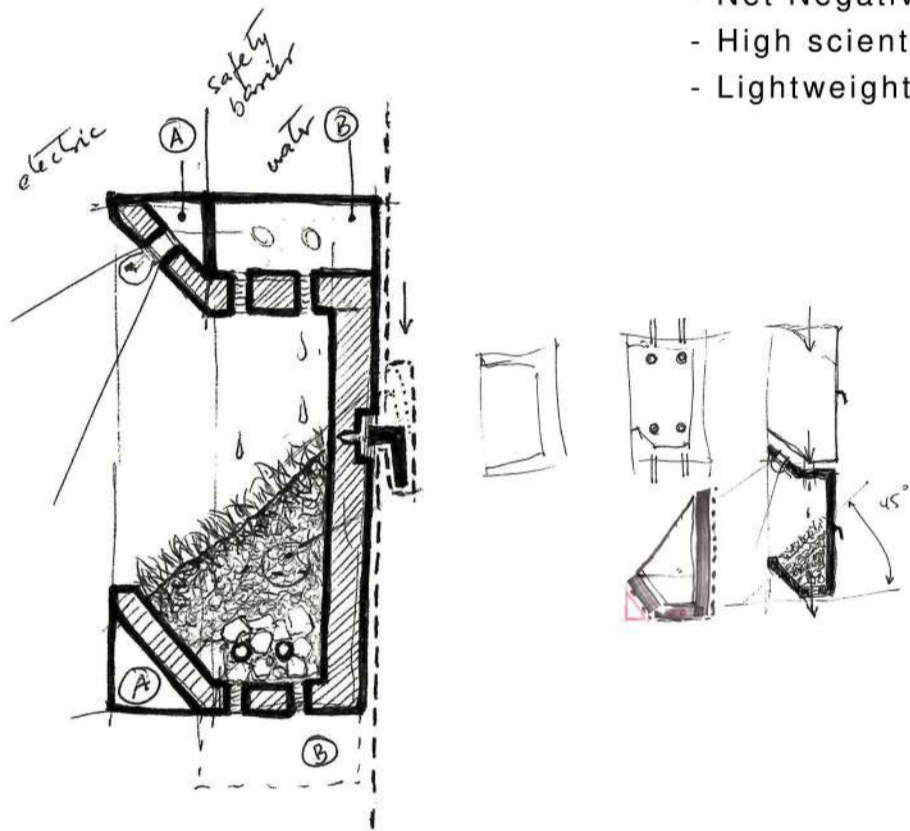
MARCO ANTONIO PAZ GARCIA



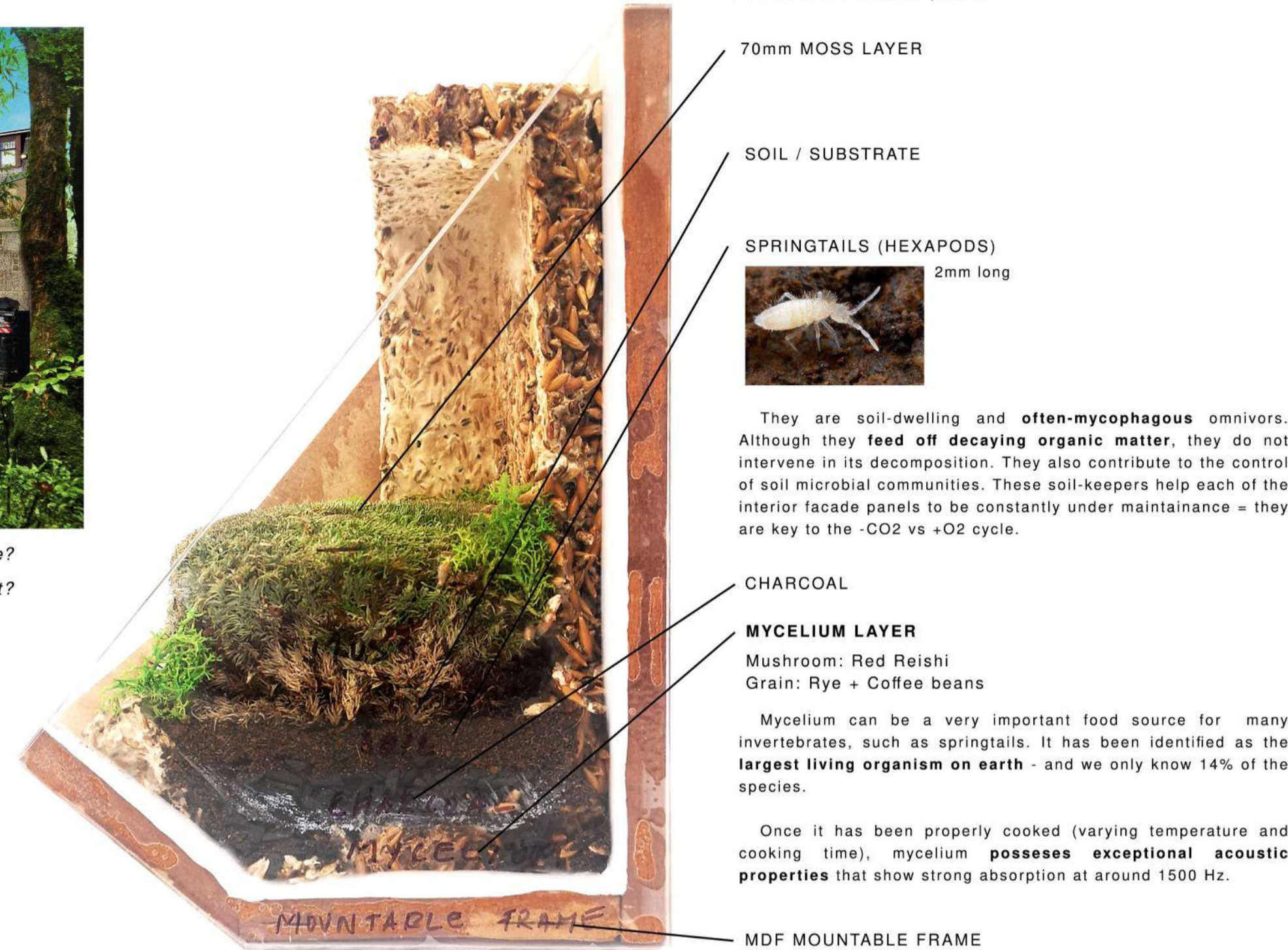
- |               |                   |                            |
|---------------|-------------------|----------------------------|
| - Granite     | - Expensive       | - Moss                     |
| - Red brick   | - Hard to replace | - Mycelium                 |
| - Traditional | - Dull            | - CLT                      |
| - Dated       | - Hard to work    | - Sustainable              |
|               | - Heavy           | - Cheap                    |
|               |                   | - Built for Dissassembly   |
|               |                   | - Biophilic                |
|               |                   | - Net Negative             |
|               |                   | - High scientific interest |
|               |                   | - Lightweight              |



What would happen if we embraced Nature to take over Architecture?  
 What if she was the ultimate designer we needed to save our planet?  
 Should we let her take back what once was all hers?



Designing a Parametric interior facade (Grasshopper + Lunchbox) where we could fit our modular panels. [see 1:100 model images] Hexagonal, pentagonal, squared mold shapes can be possible.



## TECHNICAL DETAILS OF MYCELIUM MODULAR INTERIOR FACADE

Vertical Section. 1:2 model sample  
 200mm x 200mm panel

70mm MOSS LAYER

SOIL / SUBSTRATE

SPRINGTAILS (HEXAPODS)  
 2mm long

They are soil-dwelling and often-mycophagous omnivores. Although they feed off decaying organic matter, they do not intervene in its decomposition. They also contribute to the control of soil microbial communities. These soil-keepers help each of the interior facade panels to be constantly under maintenance - they are key to the -CO2 vs +O2 cycle.

CHARCOAL

MYCELIUM LAYER  
 Mushroom: Red Reishi  
 Grain: Rye + Coffee beans

Mycelium can be a very important food source for many invertebrates, such as springtails. It has been identified as the largest living organism on earth - and we only know 14% of the species.

Once it has been properly cooked (varying temperature and cooking time), mycelium possesses exceptional acoustic properties that show strong absorption at around 1500 Hz.

MDF MOUNTABLE FRAME

For every 1kg of Mycelium, 2kg of CO2 will be eliminated from the environment. Making this facade system not only Net Zero but Net Negative (does not produce CO2 but generates O2 indefinitely - until it decays after life span).

If thrown into nature it will take 2-3 weeks approx. to completely biodegrade.



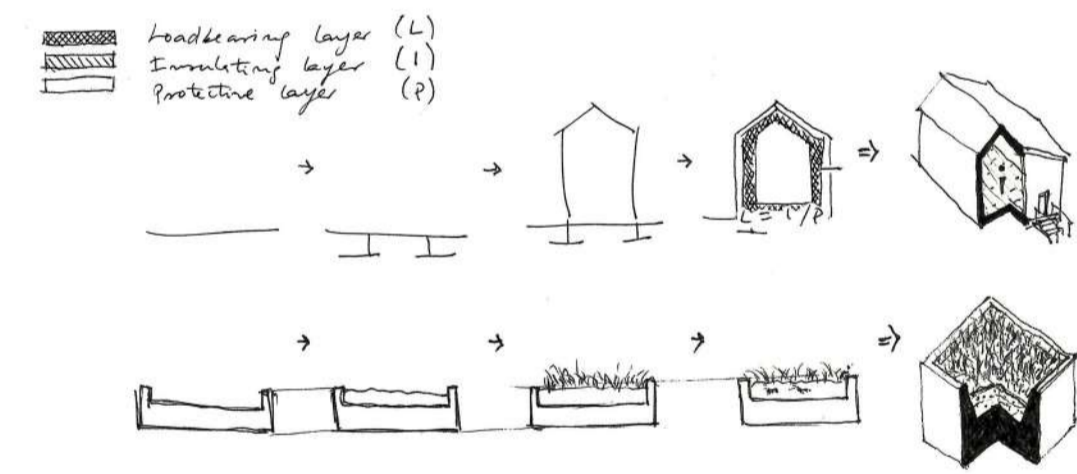
1:100 model

Moss can be used as decoration when put as the external surface. It has acoustic and cleansing properties. In comparison with green walls that need water, artificial light, or fertiliser, moss is maintenance free, long-lasting, fire-proof, and absorbs moisture. Furthermore, if we were to use moss as exterior facades, it would act as an air filter, cleansing the air from dust particles improving the air quality and reducing the stale air temperature 1-2°C approx. This effect can help reduce the overall temperature of warm cities such as Rome or Madrid, making them more inhabitable (Urban Heat Islands).

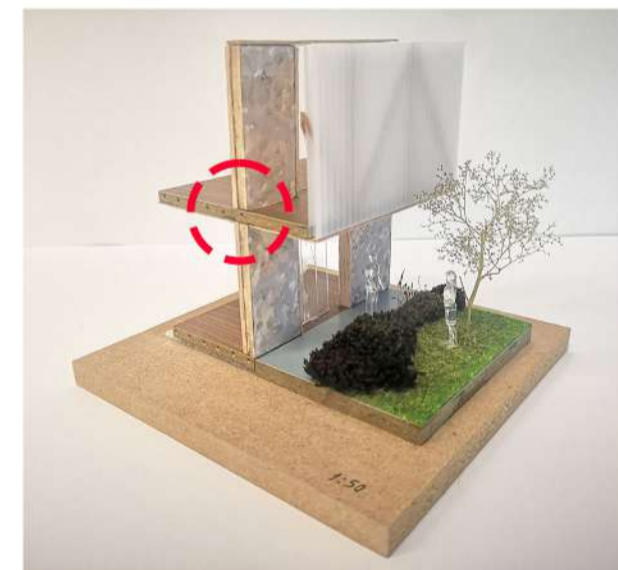
Opposite to say clays, moss has a high porosity (accounting for its roots and soil where it will rest) and high absorptivity. In our moss + mycelium interior facade panels, a 50mm thick moss layer would be able to absorb frequencies above 500 Hz. As it is a lightweight material, it would be pre-mounted to a MDF holding structure of a thickness between 10-20mm, which makes it a modular piece that is easy to install.

Modules can be replaced; have the mold shape changed; or even experiment with hundreds of other mushrooms to get a different hue/texture. Moss can also be changed during Summer or Winter for a more resilient one - depending of the geographic location.

## MYCELIUM AS BOTH THERMAL AND PROTECTIVE LAYERS

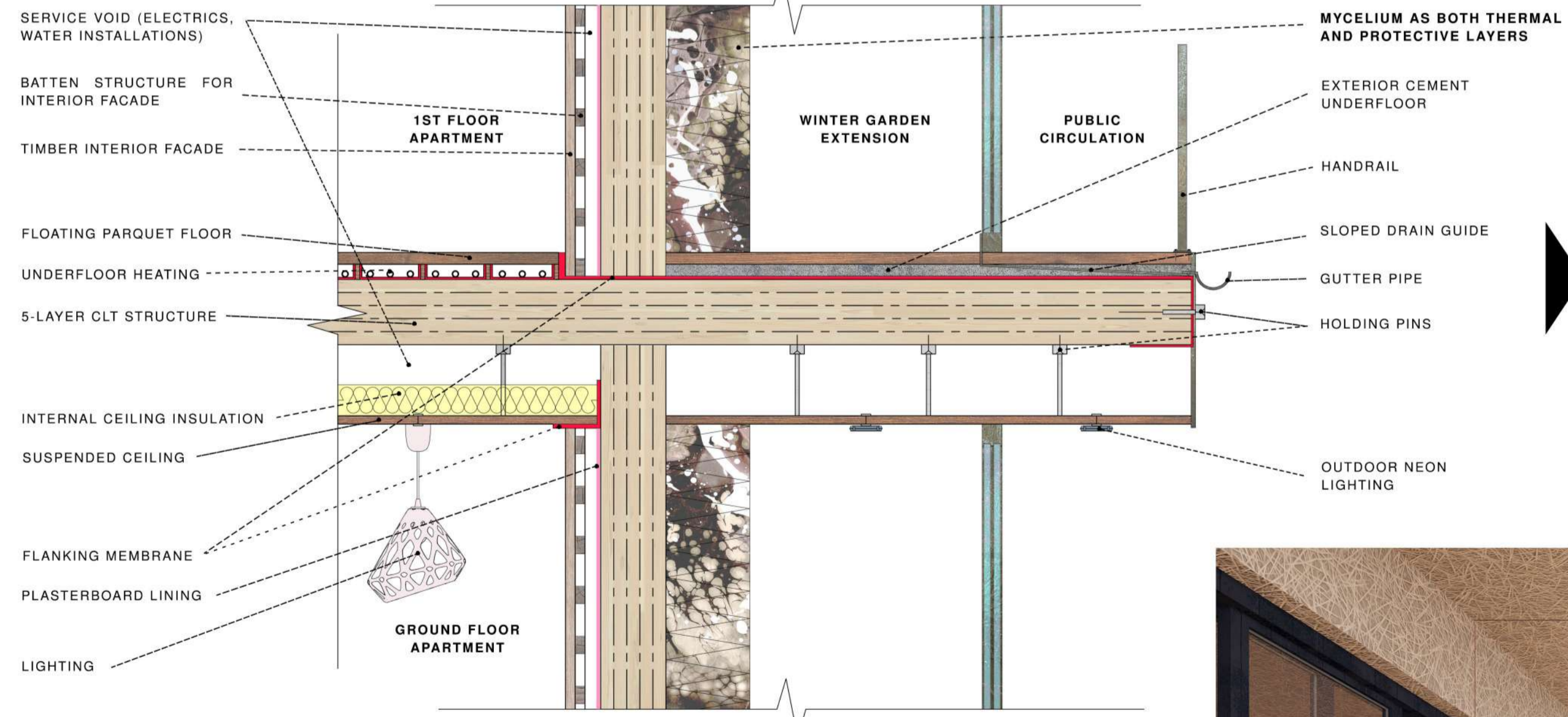


Ground floor level and 1st floor level



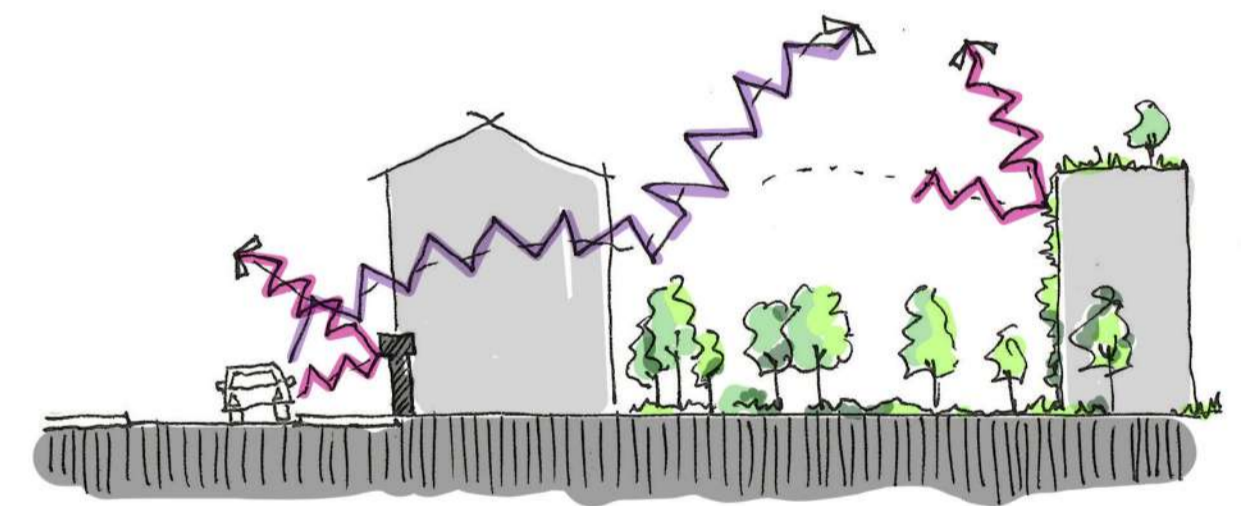
1:50 model

## STRUCTURAL CLT DETAIL SECTION



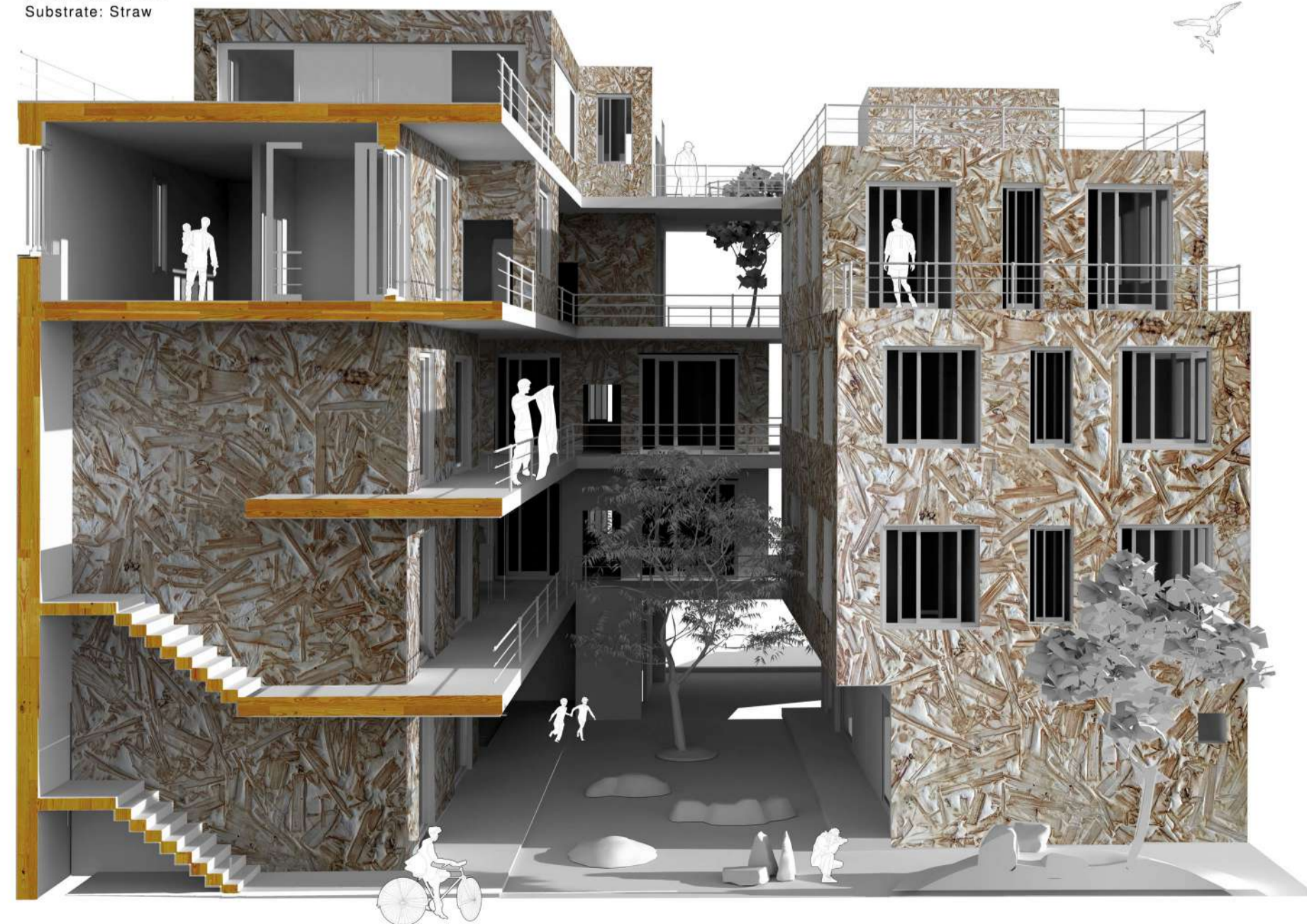
## MYCELIUM EXTERIOR FACADE AS A NOISE BUFFER

'Green City' Urban Heat Island



## PERSPECTIVE SECTIONAL ELEVATION

Aesthetic look  
 Mushroom: Oyster  
 Substrate: Straw



## FIRE-RETARDANT

Laser thermometer: 495°C for over 4min without a flame being generated

