Living Places

A new way of thinking about buildings

@ Adam Mork

Index

01

Introduction to Living Places

Living Places
a new way
forward

Its not just a design. Its a new way of thinking about buildings.

For the past 20 years, the VELUX Group has initiated and participated in more than 30 demonstration buildings exploring the future of healthy buildings through full scale experiments.

We're continuing to take action through Build for Life – a pioneering, multidisciplinary initiative that reconnects people and the planet through healthier, more sustainable buildings. In 2020, we launched an open innovation process to change the way we build today towards more sustainable practices and to decarbonize buildings.

The result is Living Places, a more sustainable approach to building homes that benefits both people and planet.

Since the building industry accounts for approximately 1/3 of global energy consumption and CO_2 emissions - the time for action is now. And with 90% of our lives spent indoors, buildings directly affect our physical and mental wellbeing. We believe that we should focus on creating a better living environment for our planet while building a path towards a society that enhances living conditions for people.

But we do not have to wait for future technology to build homes that benefit both people and planet. Living Places shows that it is possible to build more sustainable and healthy homes using standard materials, methods and technologies that are available today. By rethinking how we build today, we can help solve some of the global climate and health challenges we face through more sustainable solutions and practical action.

Building for tomorrow, today.

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02

Transformative Partnering

Living Places a new way of working together

Transformative Partnering: Description

The transformative partnership approach in Living Places is steeped in the ethos of 'Scaling by Replication / Scaling Out', an innovative strategy that propels proven, successful sustainability concepts across different communities and contexts. This method is reminiscent of the way a groundbreaking idea in the tech industry, like a successful software or app, is scaled to different markets, each version tailored to meet the specific demands and idiosyncrasies of its users. It's a method that takes the core of a proven success and replicates it, adapting to local customs, regulations, and market conditions—transforming localized victories into widespread, impactful solutions, and, very importantly, creates ambassadors and ownership way beyond the initiating partners.

With this approach, the spread of ideas, concepts, and methodologies is not a mere duplication but a thoughtful adaptation into new and different environments. It's how a disrupting approach to sustainability in one locality can spark a series of custom adaptations, each iteration learning from and building upon the last. This iterative process marks the journey from singular, local insights to a broad-based, global paradigm shift, via the ripple effect.

The Transformative Partnership Approach is more than a mere strategy; it is a commitment to democratic principles, advocating for the collective power of individuals and communities in enacting change. It promotes sharing the wealth of sustainable innovation, ensuring that cutting-edge practices in sustainability are not exclusive but are made available for the benefit of the wider community. It's a concerted effort towards a universally sustainable lifestyle that is open and actionable for everyone, regardless of their location.

This method reshapes the world by promoting sustainable practices that adapt to local needs, and enables cultural transformation within various sectors, while simultaneously inspiring collaborators to innovate, learn and change, thereby fuelling global change, based on the generosity of sharing innovations, ideas and knowledge. Living Places advocates for this approach because it symbolizes the democratization, diversification, and acceleration of sustainable development. By dedicating itself to this replicative strategy, Living Places plays an integral role in giving our planet a hopeful prospect for a sustainable and thriving future.

@ Andreas Bro

Transformative Partnering: Implementation

To implement the transformative partnership approach and transition away from the silo-based way of working, it's essential to foster an environment where collaboration is at the core from the very beginning. This strategy involves using each other's competencies to ask the right questions, find the right answers, and complete assignments in a manner that makes ideas and designs tangible and actionable.

The transformative partnership approach encourages everyone to exchange knowledge and take advantage of each other's competencies. This exchange is crucial for asking the right questions, as it allows for a diverse range of insights and expertise to be brought to the table. By combining and integrating each partner's ideas and knowledge into the design and prototype stages, the approach ensures that finding the right answers becomes a collective effort, leading to more innovative and effective solutions. Implementing ideas and designs from all partners into the actual project is the final step towards making these collaborative efforts tangible and actionable.

This process not only results in the completion of assignments but also in the transformation of industry culture and norms. Sharing knowledge is vital in this context because it drives innovation and improvement, breaking down silos and fostering a culture of collaboration and exchange of ideas. This, in turn, enhances individual professional growth, keeps the industry current with new developments, and makes industries more adaptable to change, ensuring sustainability and long-term success. By embracing the transformative partnership approach, the impact extends far beyond individual teams, creating a ripple effect that has the potential to transform an entire industry.

In summary, the transformative partnership approach is a comprehensive strategy that requires a shift towards openness, collaboration, and mutual learning from the outset, a cooperative companionship. It leverages the collective competencies of all partners to drive innovation, improve industry standards, and achieve sustainable success.

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Challenges & opportunities

Why is a new way of working needed
to unlock the potentials?

Digitalization & Lifetime

The construction industry is the second least digitized in the world[1], this is one of the primary reasons for the lifespan of our buildings being halved in the last century and is predicted to continue[2],. One of the main reasons is that we build increasingly complex structures and systems that are unable to connect with each other[3].Therefore they are not able to adapt to changes we cannot foresee. Digitizing the construction industry whilst building more flexible and adaptable buildings could make them able to adapt to the challenges we cannot foresee while increasing the lifespan of our built environment.

1 CiC - roadmap for change (2020)
2. Reinier de Graaf - 4 walls and a roof (2018)
3. Memori - smart city report (2019)

Productivity & Efficiency

The building industry has the lowest productivity gains of any industry. Just 31% of all projects came within 10% of the budget in the past 3 years, this is due to inefficiencies in design, planning and construction phases of the build. Lack of productivity and rising salaries mixed with a heightened complexity have resulted in a steep decrease in quality. By using prefabrication we can increase efficiency and enable more sustainable development by reducing waste, increase collaborations and enable circular material flows.[1]

1. Kpmg - climbing the curve report 2019

Environmental

Buildings alone are responsible for approx. 40% of global CO_2-emissions[1], and 40% of the world populations will need new homes[2]. Simultaneously we need to reach net zero emissions in this same time frame to avoid dramatic climate change[3]. By using low impact materials and focusing on the LCA of a building we could meet the demand for increased housing without depleting the earth's resources.

1. International Energy Outlook 2019 (EIA, 2019)
2. Sustainable Consumption and Production (UNEP, 2015)
3. Global Warming of 1.5°C (IPCC, 2020)

Health

We spend up to 90% of our time indoors[1], but fail to build for a healthy indoor climate by applying a one-size-fits-all logic to our buildings and compromising on the quality of construction materials[2]. By designing with healthy indoor principles and healthy materials we can create buildings that don't just make you less sick but actually makes you healthier.

1. The National Human Activity Pattern Survey (EPA, 2001)
2. Living conditions in Europe (eurostat, 2018)

Loneliness

Even though we live closer, and are more connected than ever we feel more lonely, anxious and stressed. And 1 in 5 people in Denmark long for community and a sense of belonging[1]. By designing a built environment that enables community through sharing, participation, identity and safety we could increase well-being and increase overall health and reduce anxiety, loneliness and stress.

1. Fælleskabsmålingen - trygfonden (2019)

Affordability

2.5 billion more people are expected to live in cities by 2050[1]. At the same time most places worldwide have seen a substantial and steady increase in housing prices, making our built environment unaffordable for the people who would benefit from them the most[2]. By designing a built environment that focuses on affordability by design, shared living and new business cases we could unlock housing for the people that would benefit from it the most.

1. World Urbanization Prospects 2018 (United Nations, 2018)
2. UBS Global Real Estate Bubble Index 2019 (UBS, 2019)

Post-pandemic Living

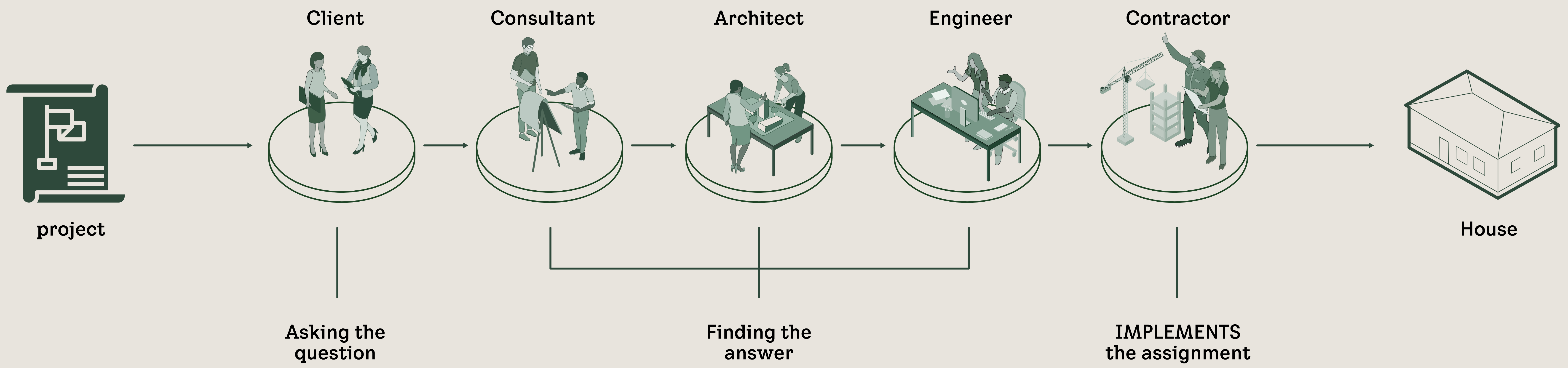
Whatever our experience of pandemic restrictions, their impact is prompting many of us to re-evaluate what makes a good home. The future home meeting our emotional needs will depend on health and wellbeing becoming the gold standard for a better life at home. These new and different priorities could have dramatic implications for what we mean by a 'good home', and for the way we live in the future[1]. By designing a build environment focused on meeting our emotional needs and enabling a strong sense of place we could pioneer a new way of thinking home, one that isn't about location but about the local context and what life it empowers people to live.

1. IKEA - "Life at home" report 2020

How do we create
the transformation needed
to reverse these **challenges**
and turn them into **opportunities?**

Linear collaborative process - today

Today, inquiries come from the clients, while the architect engages in design, the engineer focuses on calculations, and the entrepreneur oversees construction. The building takes the form of a simple square box, with each party operating independently in their respective silos.



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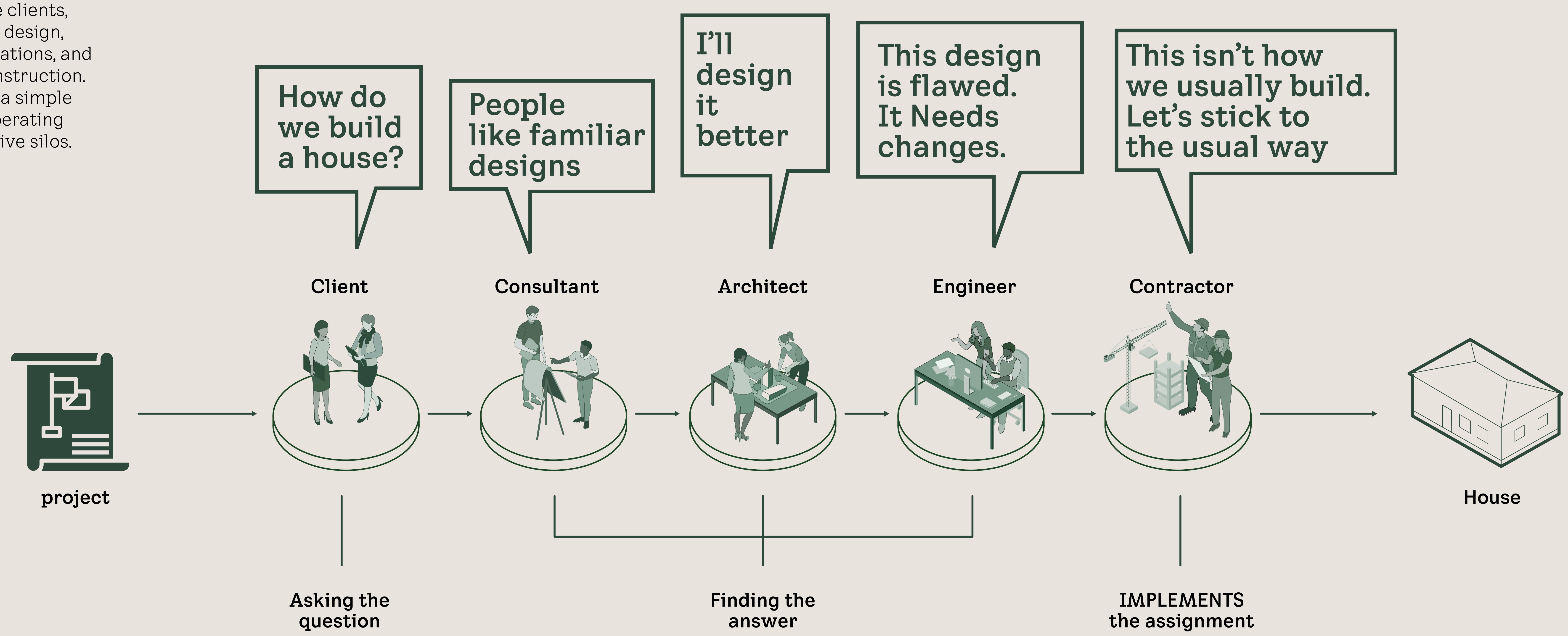


Status today












When everyone asks a similar question, **the answer is often the same.**







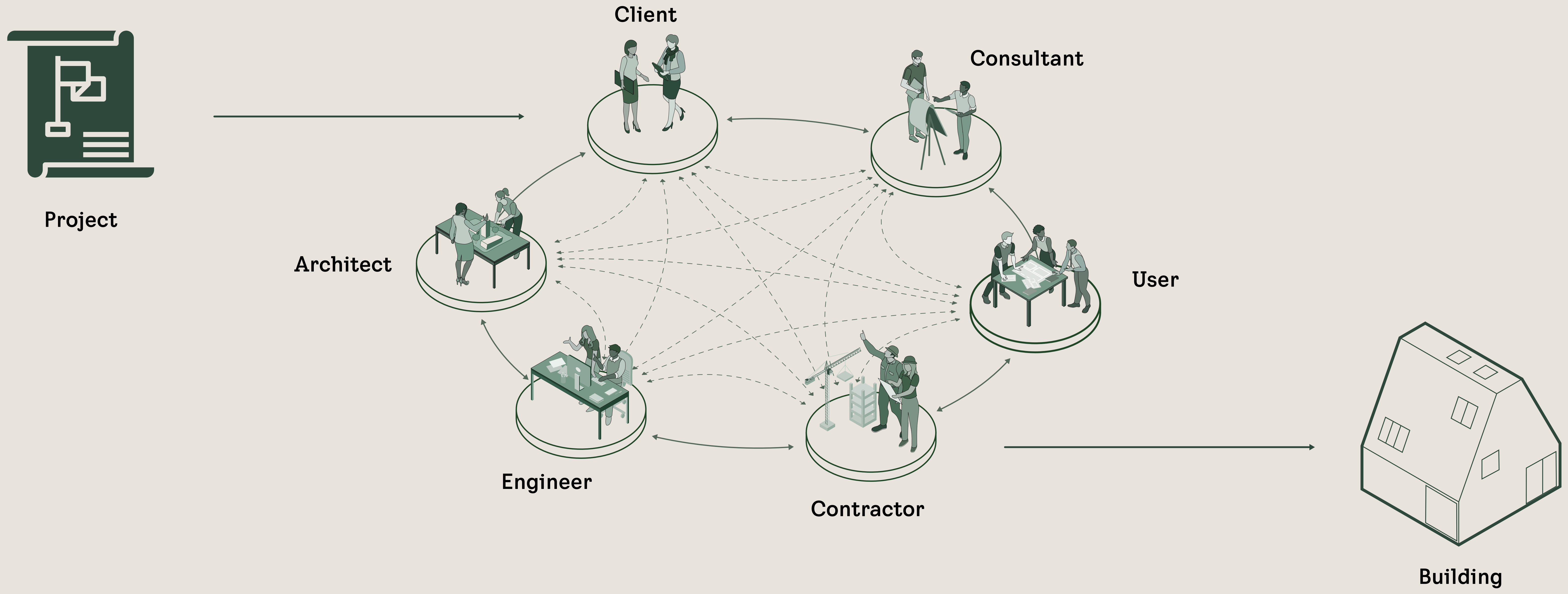




Transformative Partnering approach

Transformative Partnership is
a new way of working together

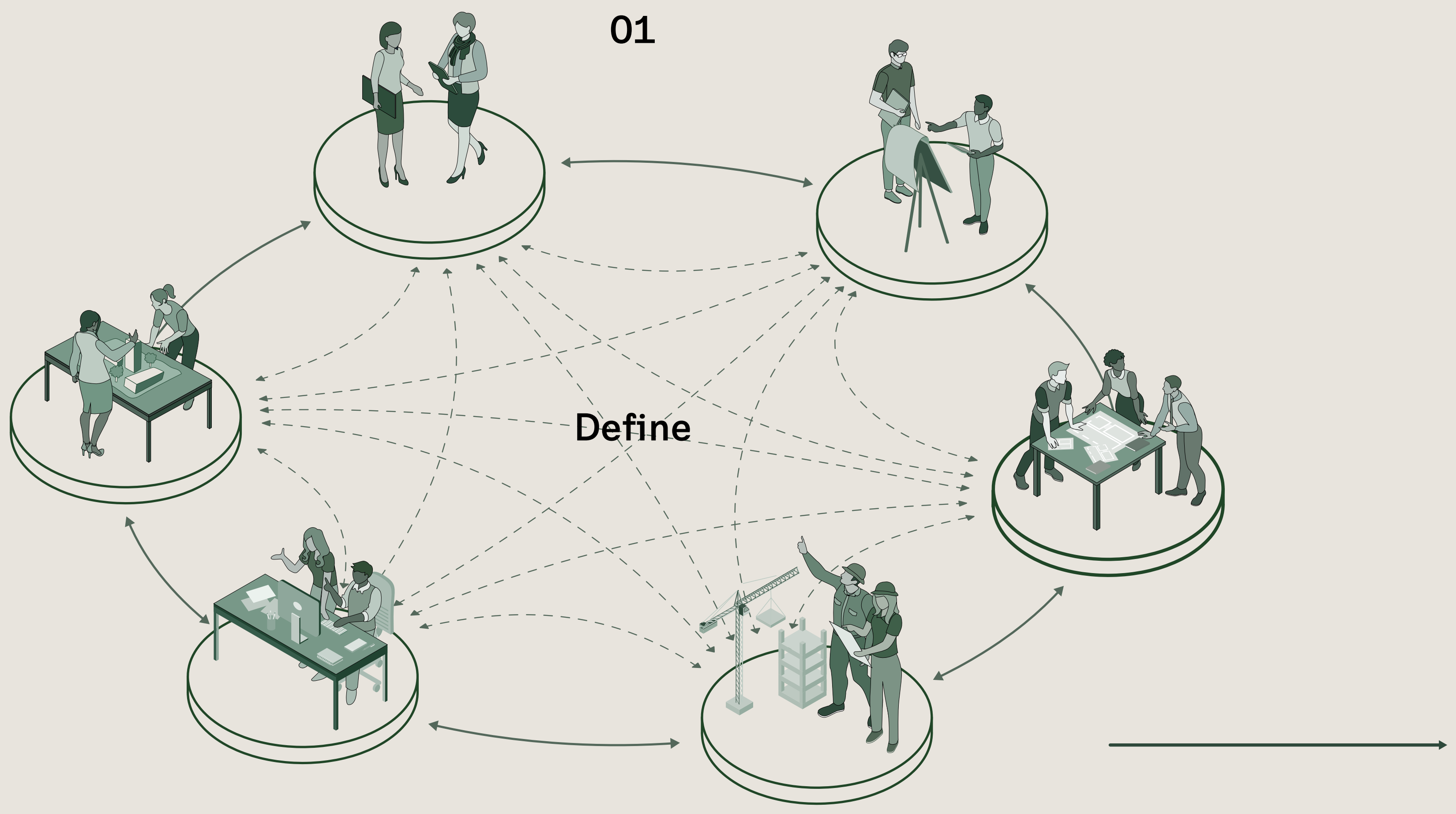
Working together we follow this process:
1. Asking the right questions
2. Finding the right answers
3. Completes assignment



Transformative partnerships
1. Asking the right questions
2. Finding the right answers
3. Completes assignment

Process
01 Define

Process 01: Define - Asking the right questions by exchanging knowledge and taking advantage of each other's competencies.

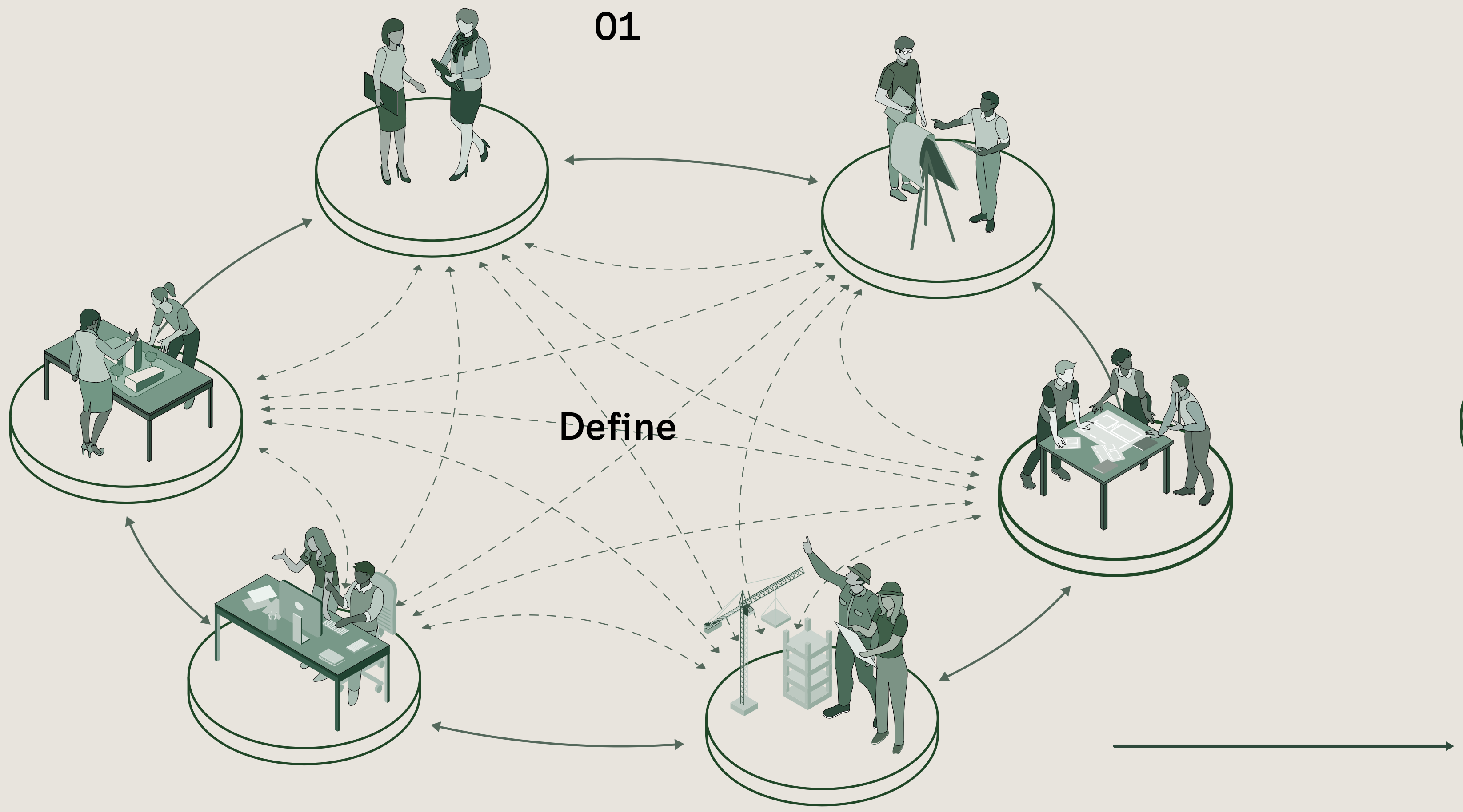


**Exchange knowledge
and take advantage of each other's
competencies**

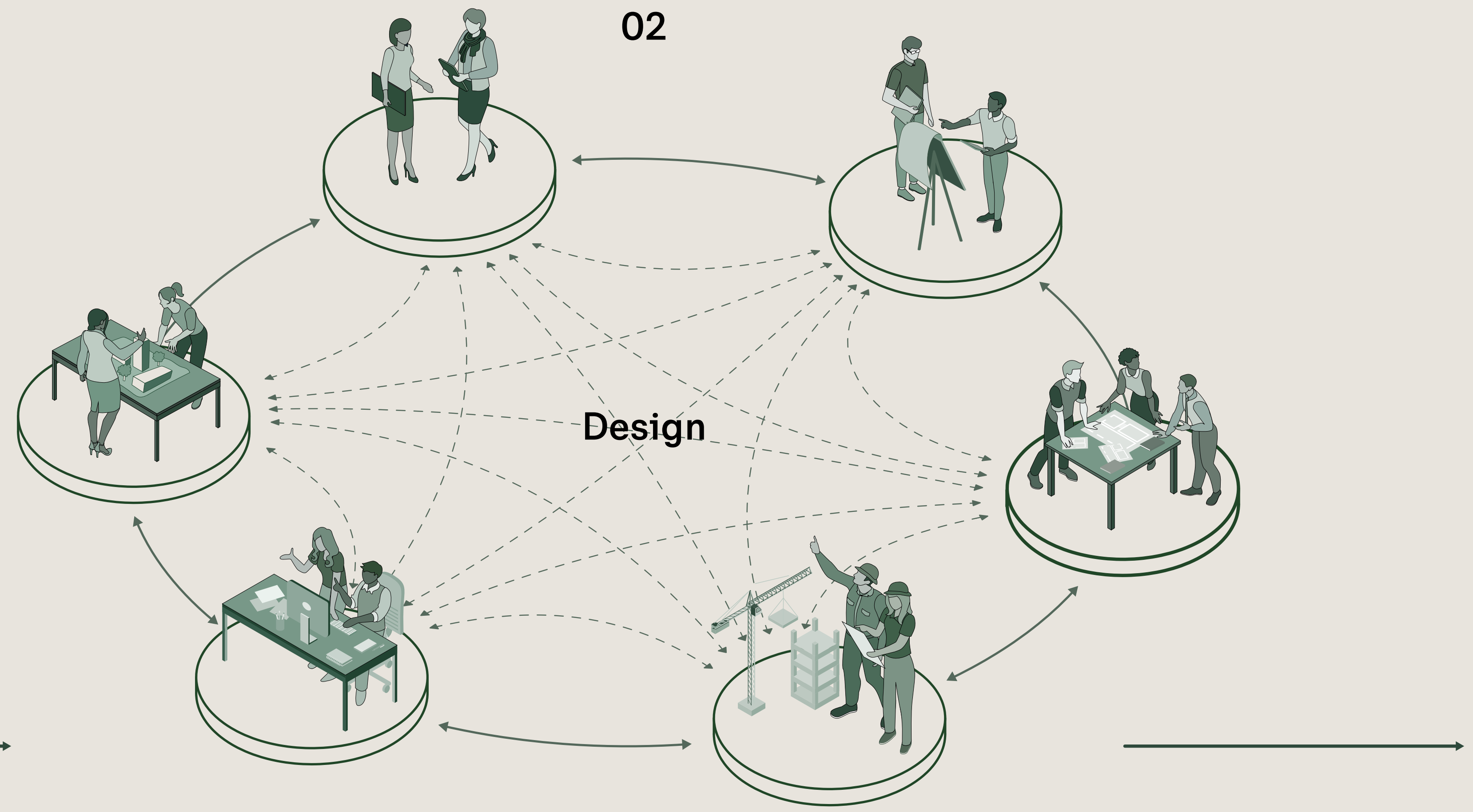
Process
02 Design

Process 02: Design -Finding the right answers

Combining and integrating each partner's ideas and knowledge into the design and prototype.



Exchange knowledge and take advantage of each other's competencies

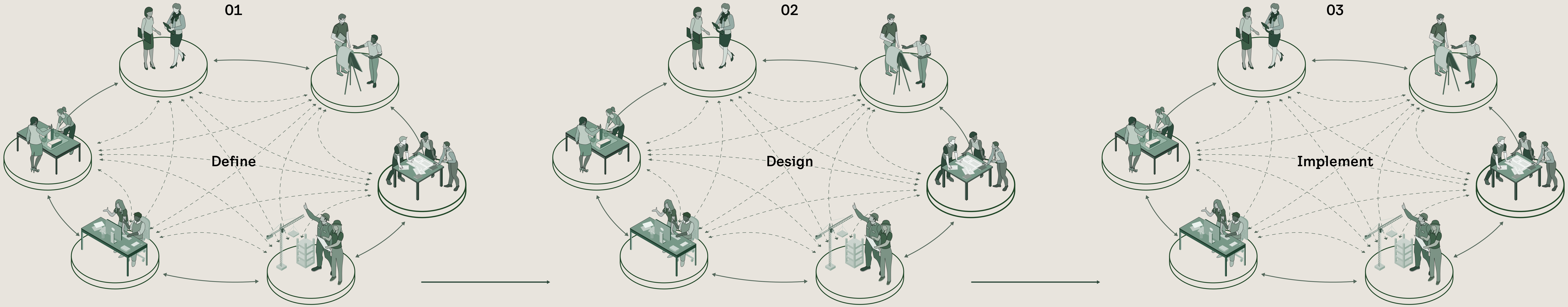


Combines and integrates each partners ideas and knowledge into the design and prototype

Process
03 Implement

Process 03 - Completes assignment

Implement - Implementing ideas and designs into real-world projects.



Exchange knowledge and take advantage of each other's competencies

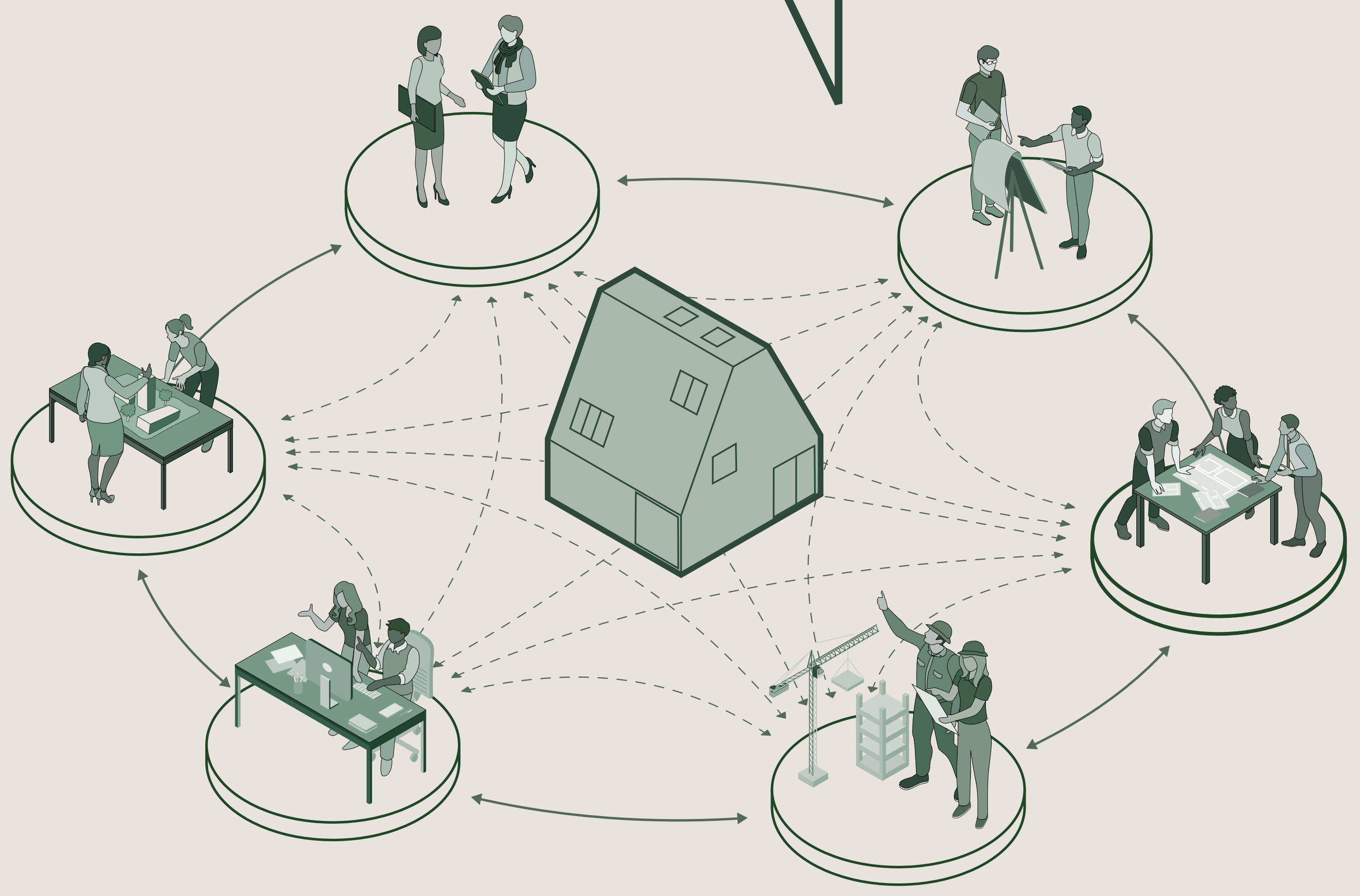
Combines and integrates each partners ideas and knowledge into the design and prototype

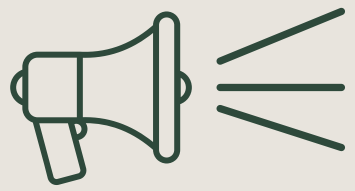
Implement ideas and designs into real world projects

Process
04 Sharing the knowledge

Sharing knowledge is vital for transforming industry culture and norms because it drives innovation and improvement. It breaks down silos, fostering collaboration and the exchange of ideas, leading to more effective solutions. This sharing enhances individual professional growth and keeps the industry current with new developments. A culture of openness and learning makes industries more adaptable to change, ensuring sustainability and long-term success. Overall, knowledge sharing elevates the entire industry, contributing to broader societal and economic benefits.

> **“Together we can do so much more”**
>
> Helen Keller

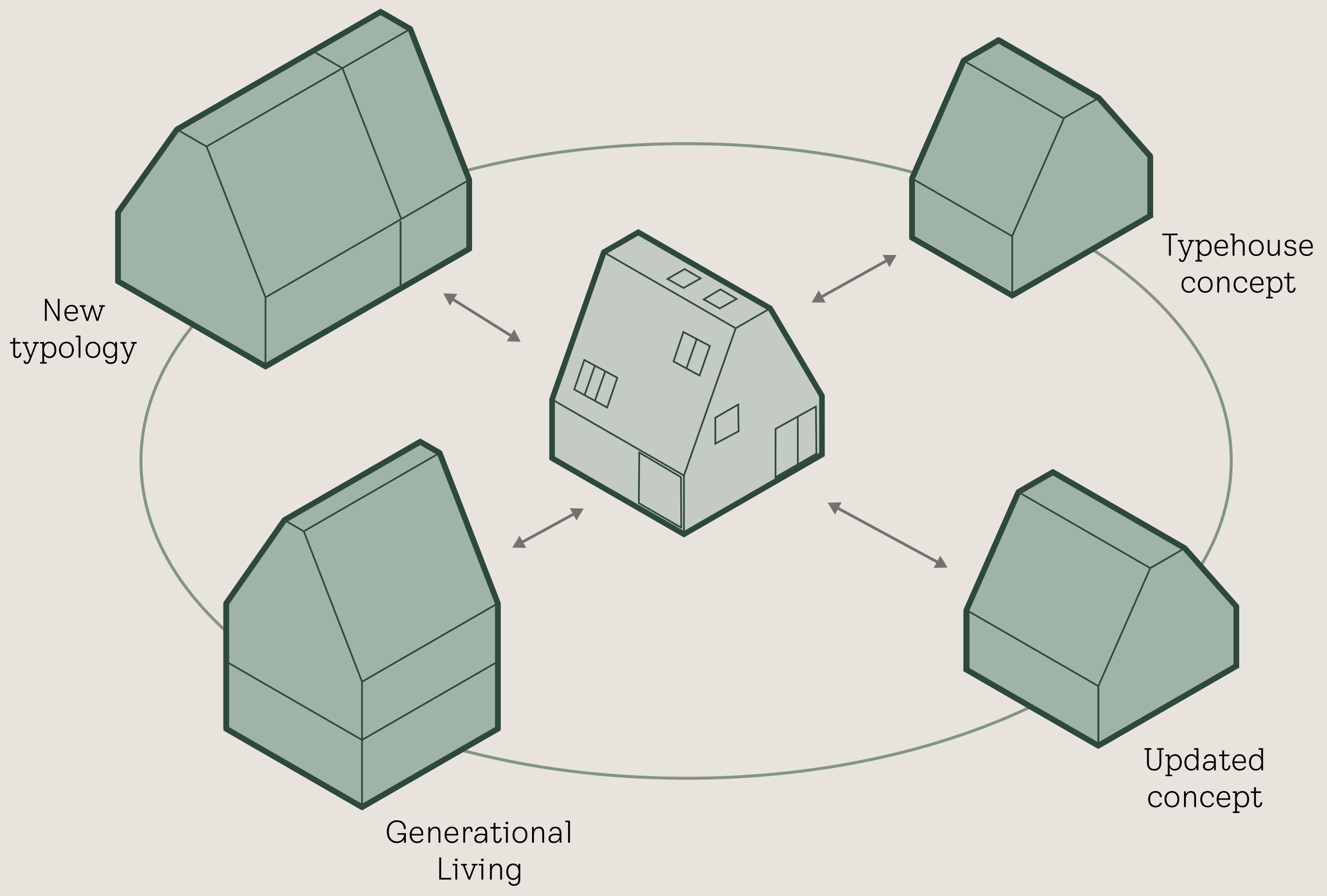




Share learning and key insights with the world

Scaling out

The transformative partnership approach in Living Places is steeped in the ethos of ‘Scaling by Replication / Scaling Out’, an innovative strategy that propels proven, successful sustainability concepts across different communities and contexts.

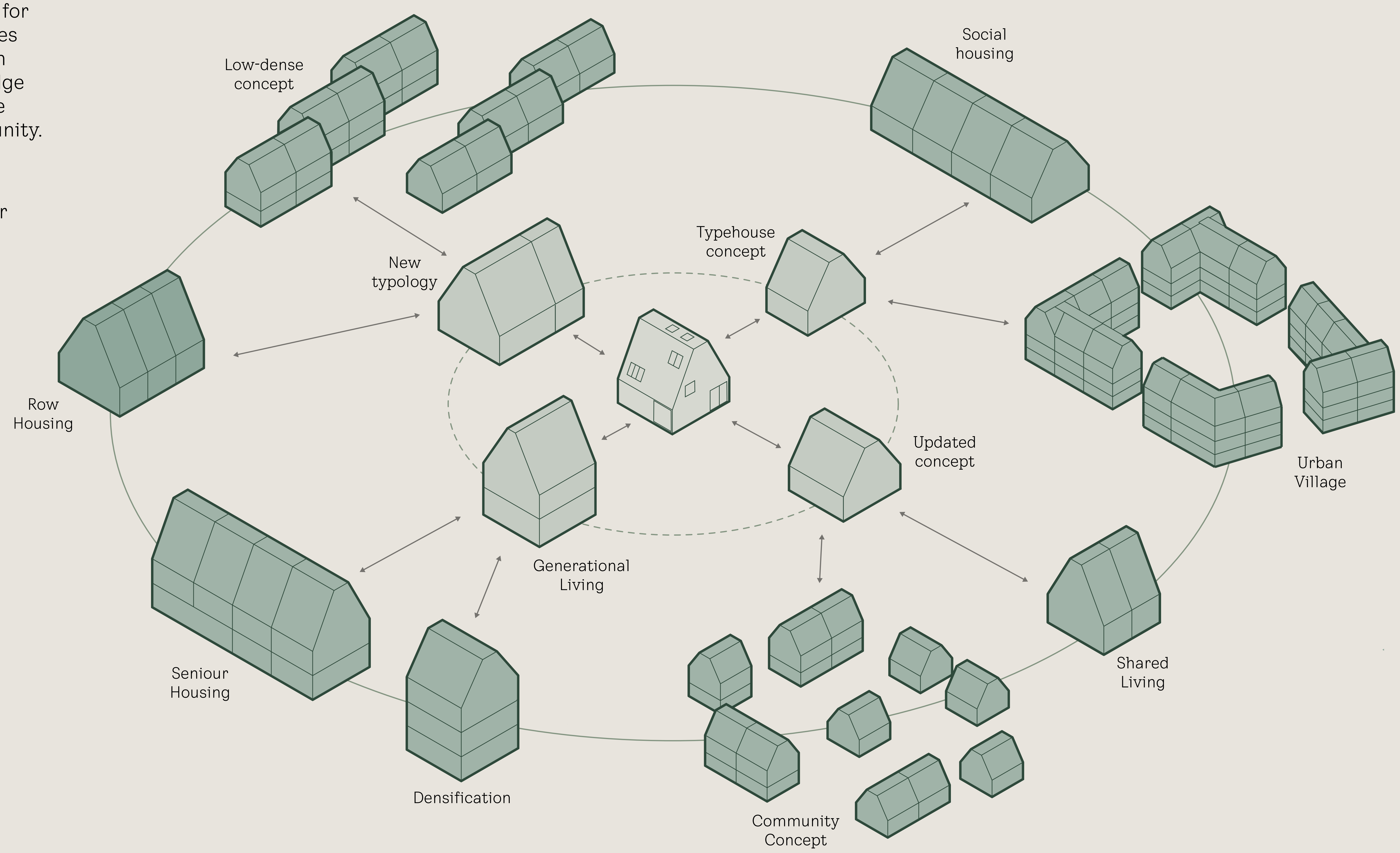


Scaling out and thereby democratizing knowledge

Ripple effect

Approach is more than a mere strategy; it is a commitment to democratic principles, advocating for the collective power of individuals and communities in enacting change. It promotes sharing the wealth of sustainable innovation, ensuring that cutting-edge practices in sustainability are not exclusive but are made available for the benefit of the wider community.

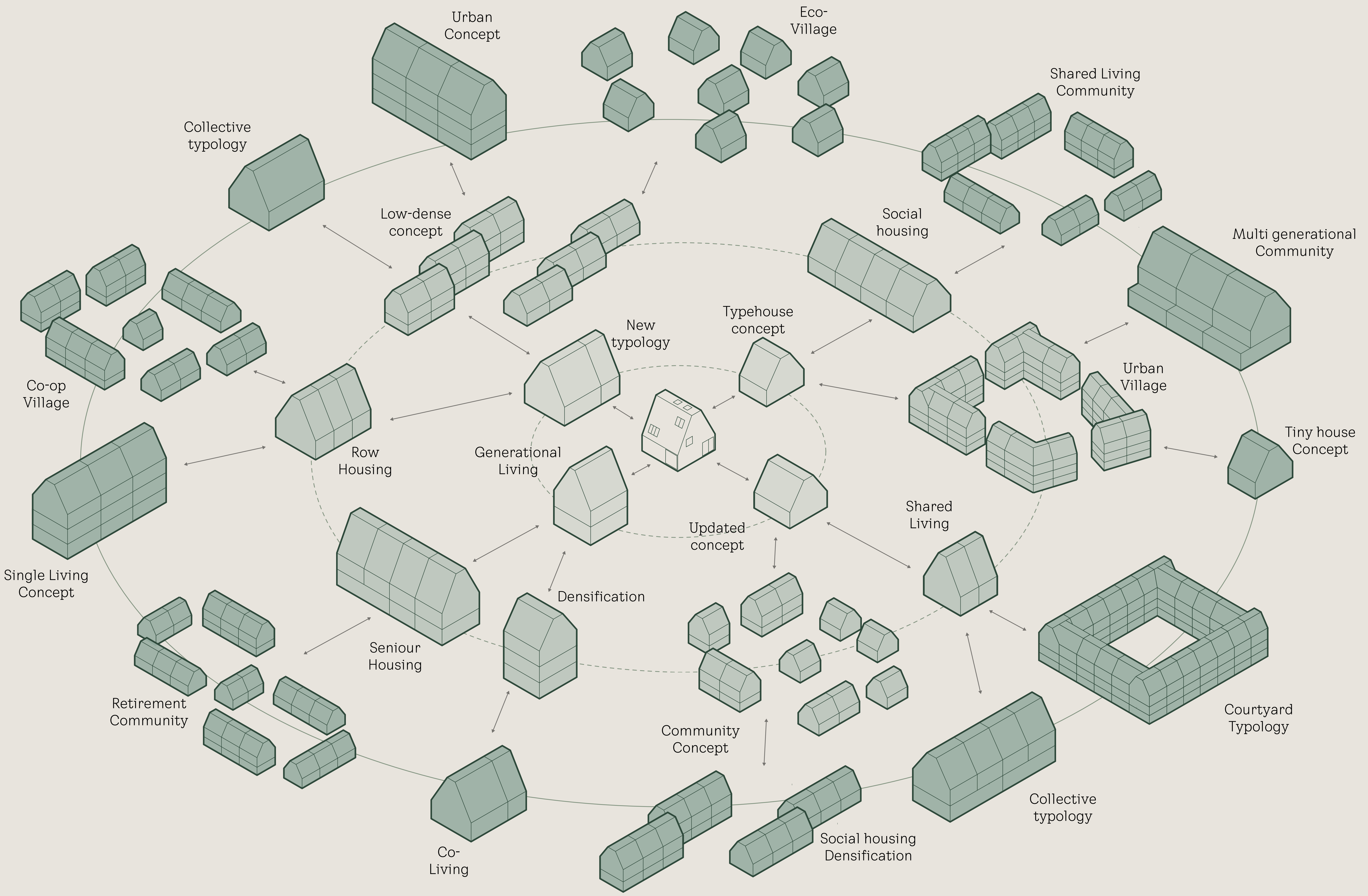
It's a concerted effort towards a universally sustainable lifestyle that is open and actionable for everyone, regardless of their location.



A small splash creates a ripple

Democratizing knowledge

This method reshapes the world by promoting sustainable practices that adapt to local needs, and enables cultural transformation within various sectors, while simultaneously inspiring collaborators to innovate, learn and change, thereby fueling global change, based on the generosity of sharing innovations, ideas and knowledge. Living Places advocates for this approach because it symbolizes the democratization, diversification, and acceleration of sustainable development.



The more the approach scales the more impactful the transformation

03

People & planet methodology

Living Places a
new way of thinking
about buildings

People and planet methodology description

In this chapter, we explore the ‘People and Planet Methodology,’ a dual-faceted approach that breaks down complex systems into manageable segments. By benchmarking and evaluating different scenarios, this method transitions us from a state of unawareness to a position of informed clarity.

The ‘People’ aspect is rooted in the principles of healthy building and utilizes the Active House Radar to measure well-being within spaces.

Meanwhile, the ‘Planet’ facet employs Life Cycle Assessment (LCA) benchmarking to quantify environmental impacts. Together, they form a comprehensive framework for sustainable living and building practices

Today our built environment fails to integrate Health and Environmental Concerns

Often, building designs overlook the connection between human health and the environment, favouring economic over ecological considerations. This leads to structures lacking in green features, contributing to poor air quality and environmental degradation. The result is a negative impact on both the environment and human health.

We spend 90% of our time indoor and indoor air pollutants are often 2 to 5 times higher than outdoor levels.[1]

[1] The National Human Activity Pattern Survey (EPA, 2001)

120 million Europeans and 1 out of 3 European children live in unhealthy buildings.[1]

[1] Buildings and the forgotten 90% (ERACTIV, 2019)

“The person who design and operates your building is more important to your health than your doctor”[1]

[1] Joseph G. Allan - Harvard

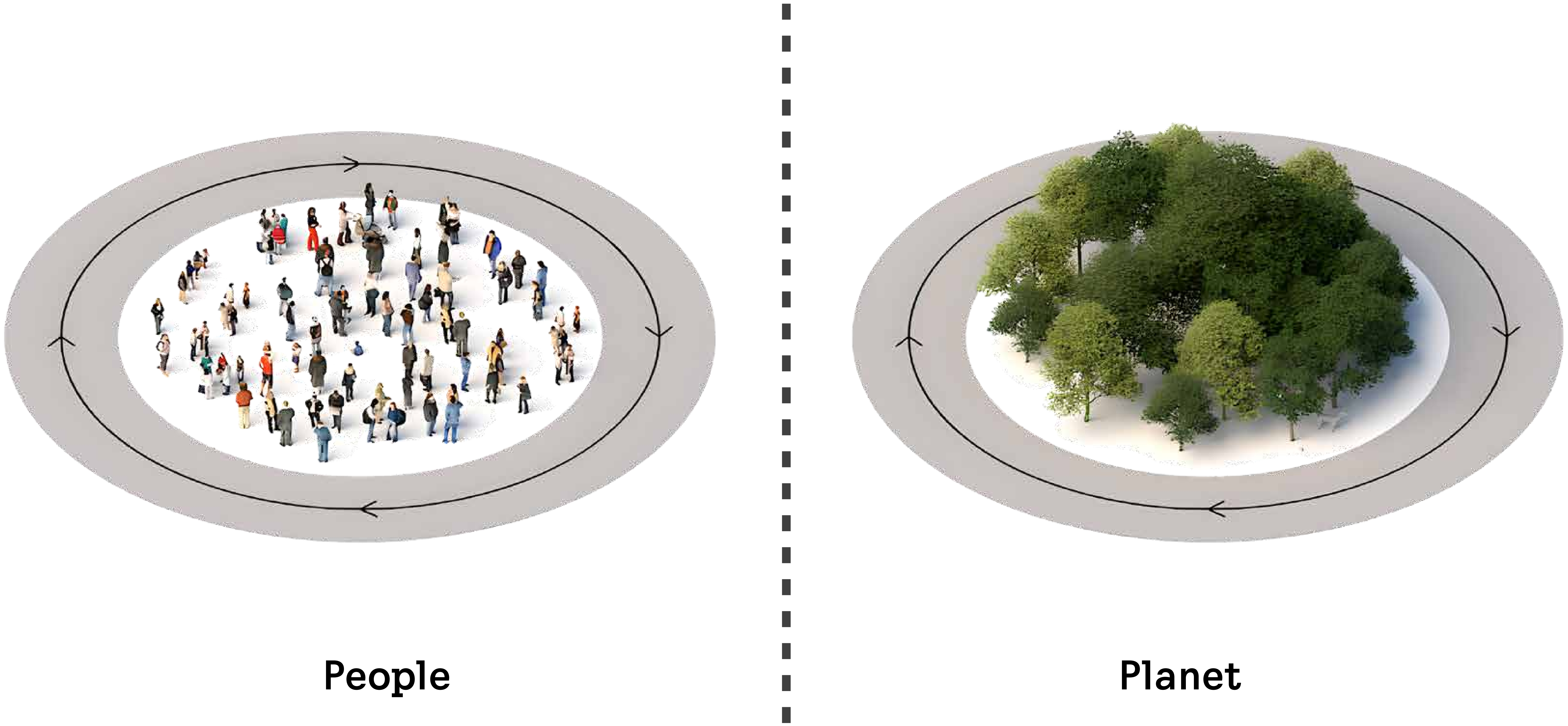
36% of Europe´s total CO_2 emissions are emitted by homes and buildings.[1]

[1] Energy Efficiency in Buildings (European Commision, 2020)

2.5 billion more people are expected to live in cities by 2050.[1]

[1] World Urbanization Prospects 2018 (United Nations, 2018)

At the same time we have to reduce emissions to stay within planetary boundaries



**From a fragmented
RELATIONSHIP WITH NATURE ...**

Reconnecting People & planet

The Living Places methodology embraces the philosophy that the way we construct our environments must be designed for the well-being of people and the planet. This approach acknowledges the profound impact that our building practices have on human and planetary health. It calls for a reflective consideration of how buildings are used, as well as their impact on the systems that sustain us. Homes and community spaces should be developed with a core emphasis on healthy building and design principles, ensuring that they are conducive to a better future for all.

Prioritize creating a healthy indoor environment.

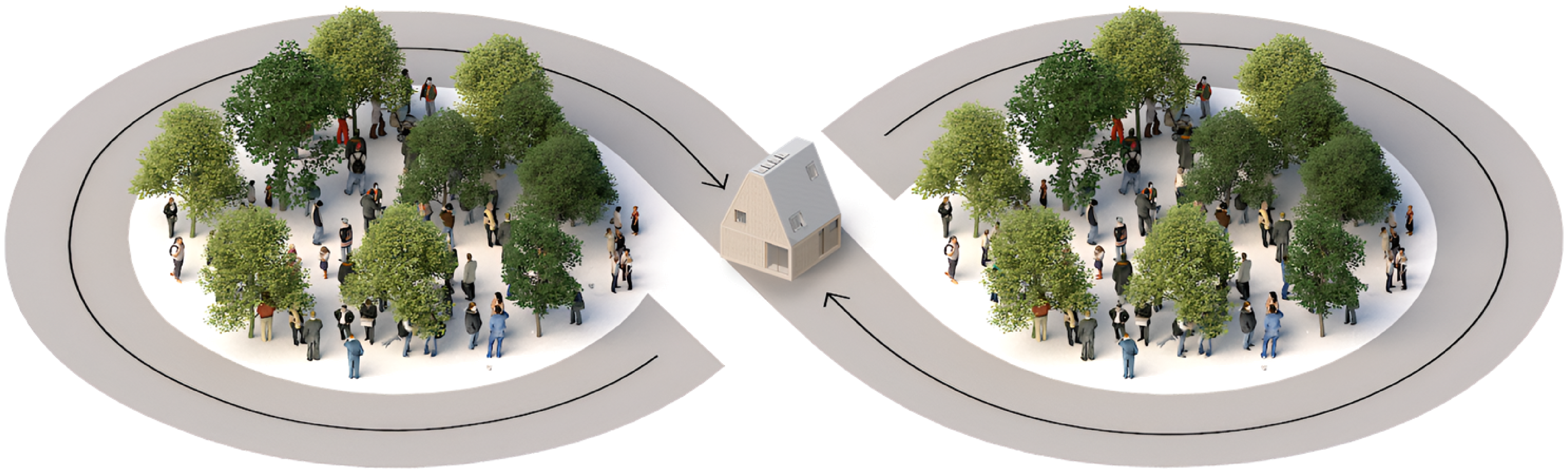
Ensure fresh air and daylight becomes the norm for building design.

Utilize healthy building materials with minimal chemical materials.

Incorporate natural elements and green spaces in architectural design.

Focus on reducing emissions throughout the entire lifecycle of buildings.

Focus on reducing negative pressures on all planetary boundaries.



People + Planet

... TO RECONNECTING WITH
THE ECO-SYSTEMS THAT SUSTAIN US

How we measure

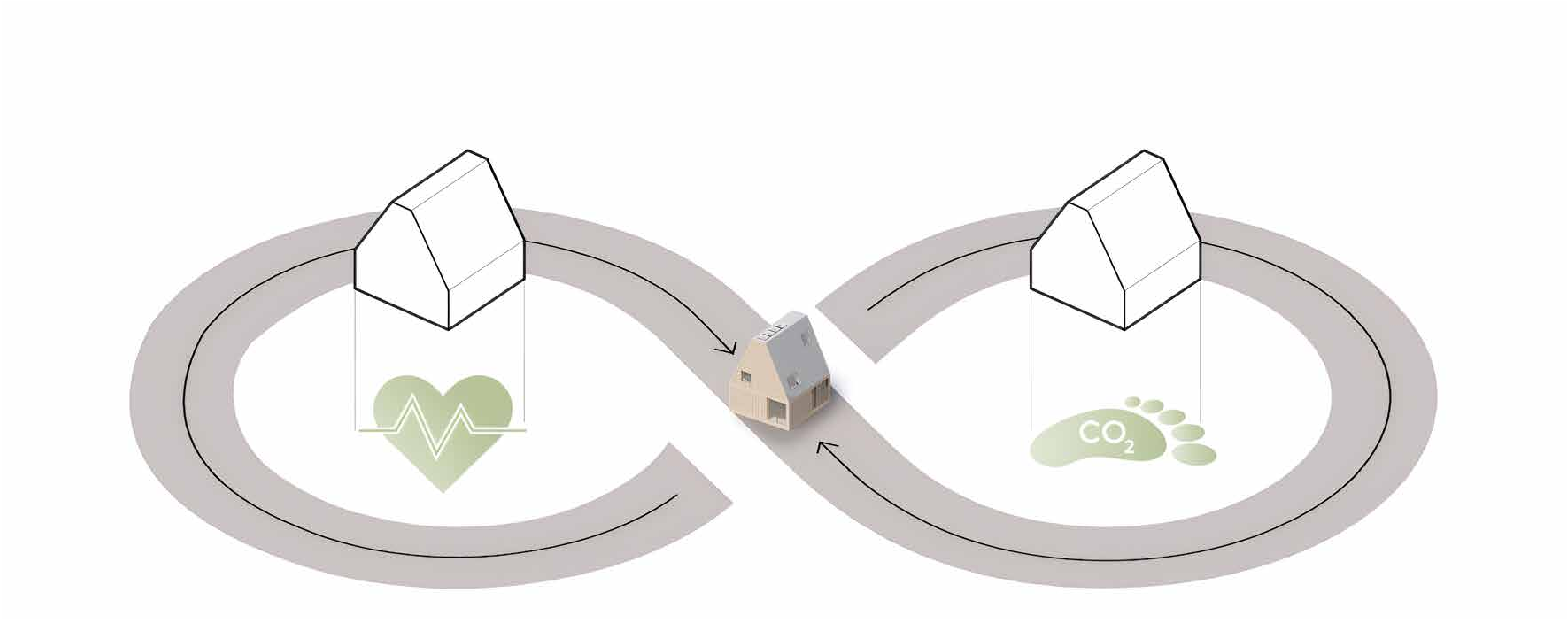
We utilize a full life cycle assessment (LCA) to ensure our buildings are in harmony with the environment, scrutinizing their ecological footprint throughout every phase of their existence. Meanwhile, the Active House radar helps us fine-tune our spaces for the people within, focusing on optimizing comfort, energy use, and minimizing environmental impact, thereby aligning our built environment with the needs of both people and the planet.

LCA:

Life Cycle Assessment (LCA) for buildings is a methodology used to evaluate the environmental impacts associated with all the stages of a building's life cycle.

Indoor climate class:

It is a standard that allows to benchmark the indoor climate in the categories of Indoor air quality, Thermal environment, Acoustics and Visuals (daylight)



Indoor climate class

LCA: Life Cycle Assessment

How we Benchmark

Benchmarking against a reference house, typically a standard parcel house, involves comparing a building's performance in key areas to a baseline established by the reference. This process includes assessing environmental impact through Life Cycle Assessment (LCA), and indoor environmental quality (Active house radar). The reference house represents average construction practices in the region.

By benchmarking against a standard, the comparison highlights how the building under assessment either surpasses or falls short of typical performance levels. This approach aids in identifying areas for improvement and in promoting higher standards for sustainable and efficient building design.

The benchmark house is based on the average of the typical Danish single house.

How we build today

TYPICAL DANISH SINGLE FAMILY HOUSE

Size:	184
Floors:	1
Building principle:	Brick
Foundation:	Concrete
Floor height:	2.7 m
Room height:	2.4 m
Heating application:	District heating
Heating source:	Floor heating
Ventilation:	Mechanical
Solar panels:	7 m^2

How we might build in the future

LIVING PLACES HOUSE

Size:	147
Floors:	3
Building principle:	Timberframe construction
Foundation:	Screw pile foundation
Floor height:	3 m
Room height:	2.6 m
Heating application:	Air to water heat pump
Heating source:	Radiators
Ventilation:	Natural or hybrid
Solar panels:	11 m^2

Source: Artelia, 2022

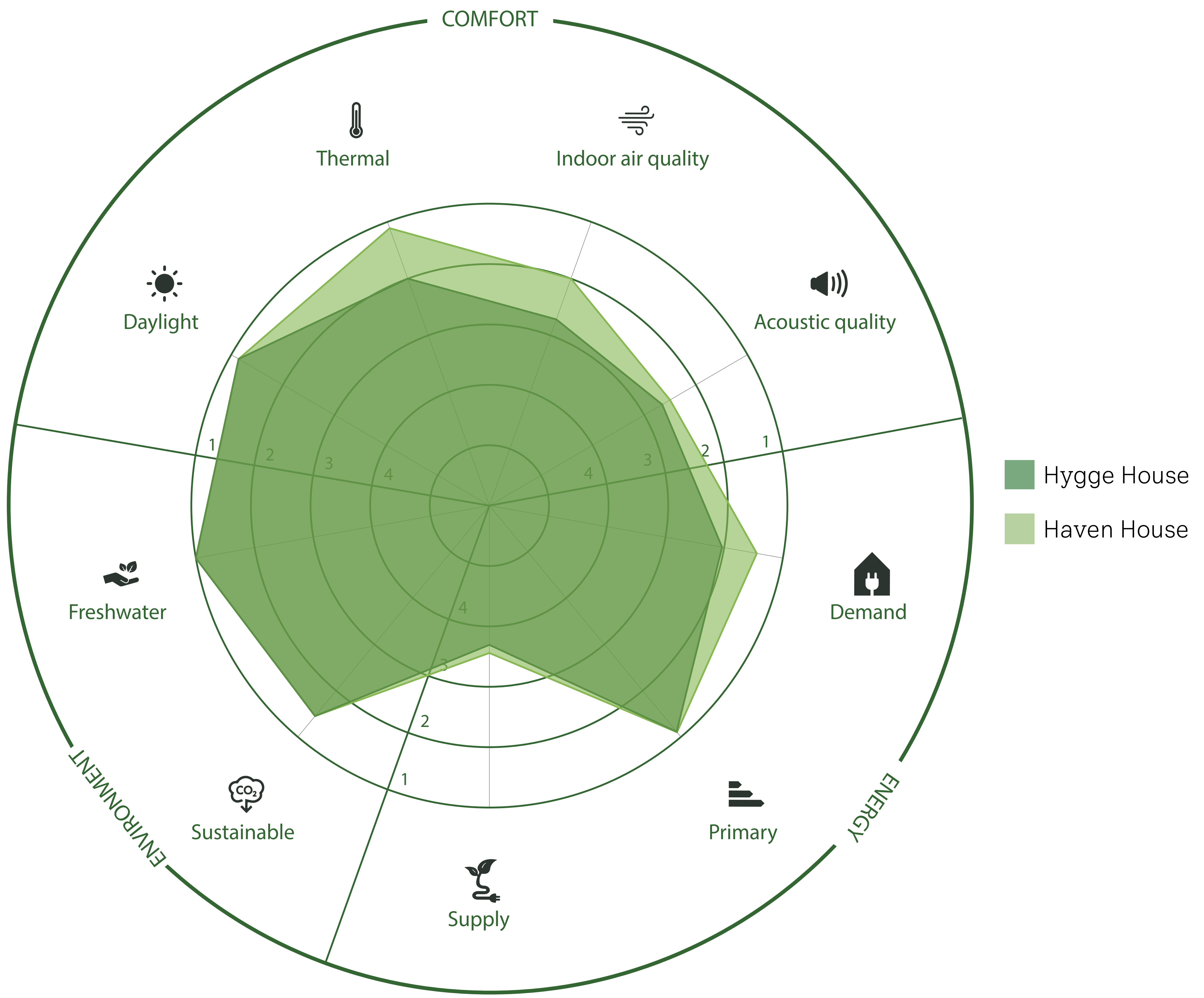
The tool for measurement

Active House Radar:

The Active House Radar is a tool used in the evaluation of buildings, specifically focusing on the concept of Active Houses. An Active House is designed with a focus on energy efficiency, indoor climate conditions, and environmental impact.

The radar provides a visual representation of how well a building performs in these three key areas. Here's a breakdown of its components.

Learn more about Active House



Active House Design Radar of Hygge and Haven House

Source: EFFEKT Architects, 2023

Planet

How we assess and
benchmark a building’s
environmental performance

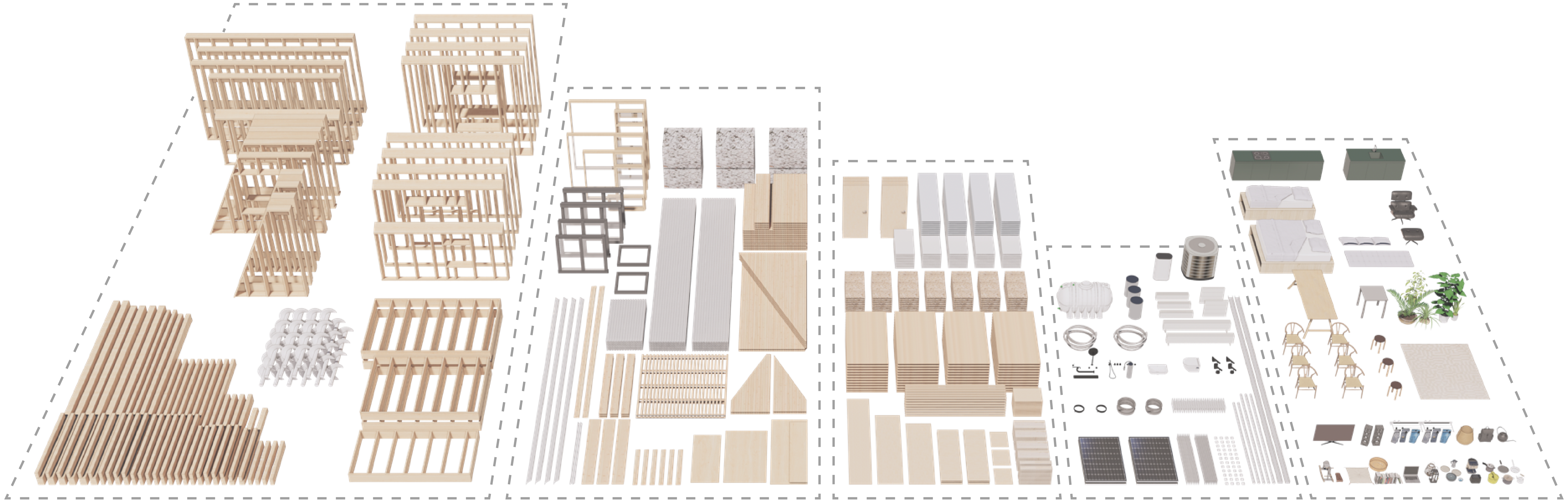
From a complex system to individual components.

Our approach to sustainability by breaking down the building process into individual components. We meticulously optimize each part to ensure it aligns with our environmental goals, understanding that even small reductions in CO_2 emissions are steps in the right direction. This careful and considered method recognizes the complexities of sustainable building, and while we may not have all the answers, we believe this is a step towards smarter and more responsible construction.

Building

Detached house
147 m²

Components



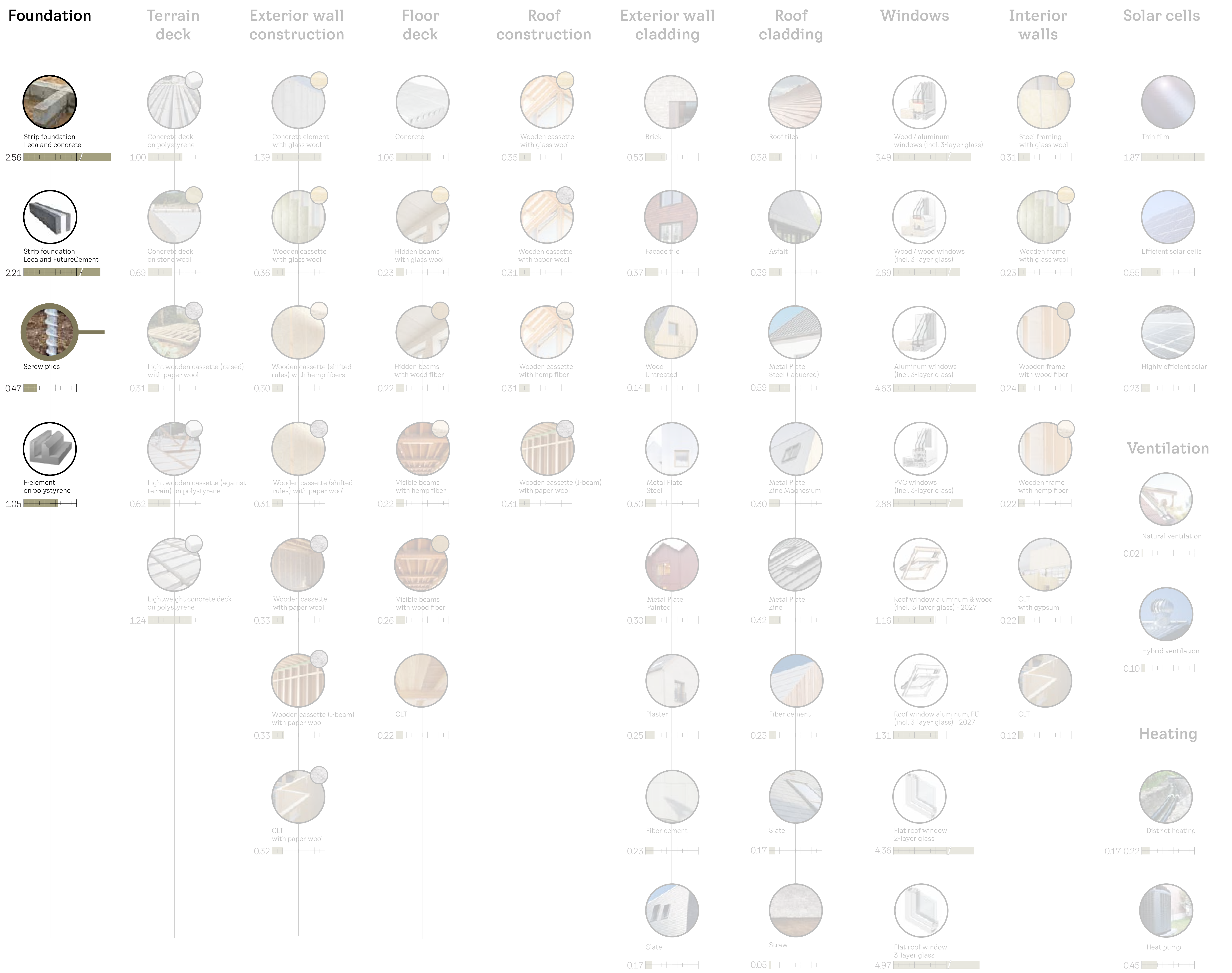
STRUCTURE: Foundation, Terrain deck, Exterior wall, Floor decks, Roof

SKIN: Exterior wall cladding, Roof cladding, Windows

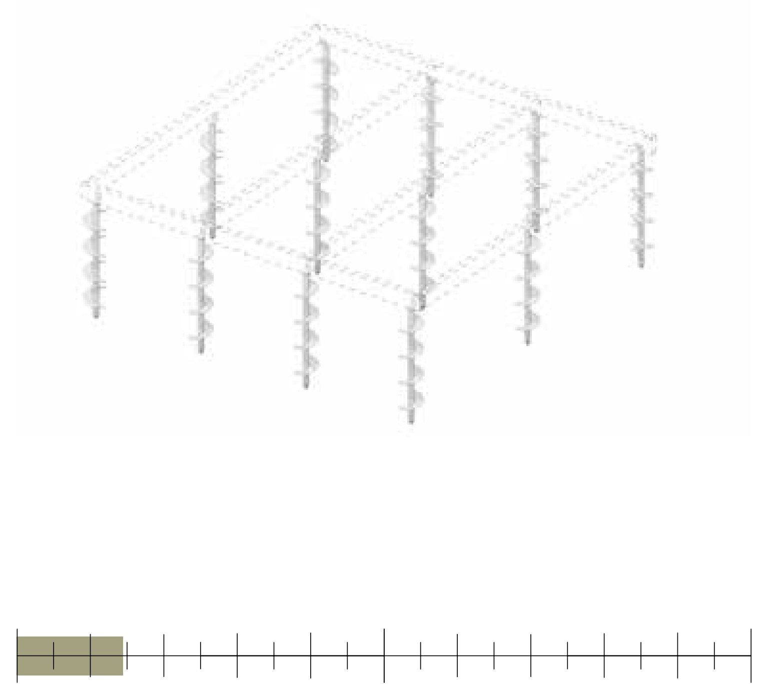
SPACE PLAN: Interior walls

SERVICES: Solar cells, Ventilation Heating

STUFF: Furniture, Objects



LCA [$kgCO_2eq/m^2/year$] m^2 of material



Material usage

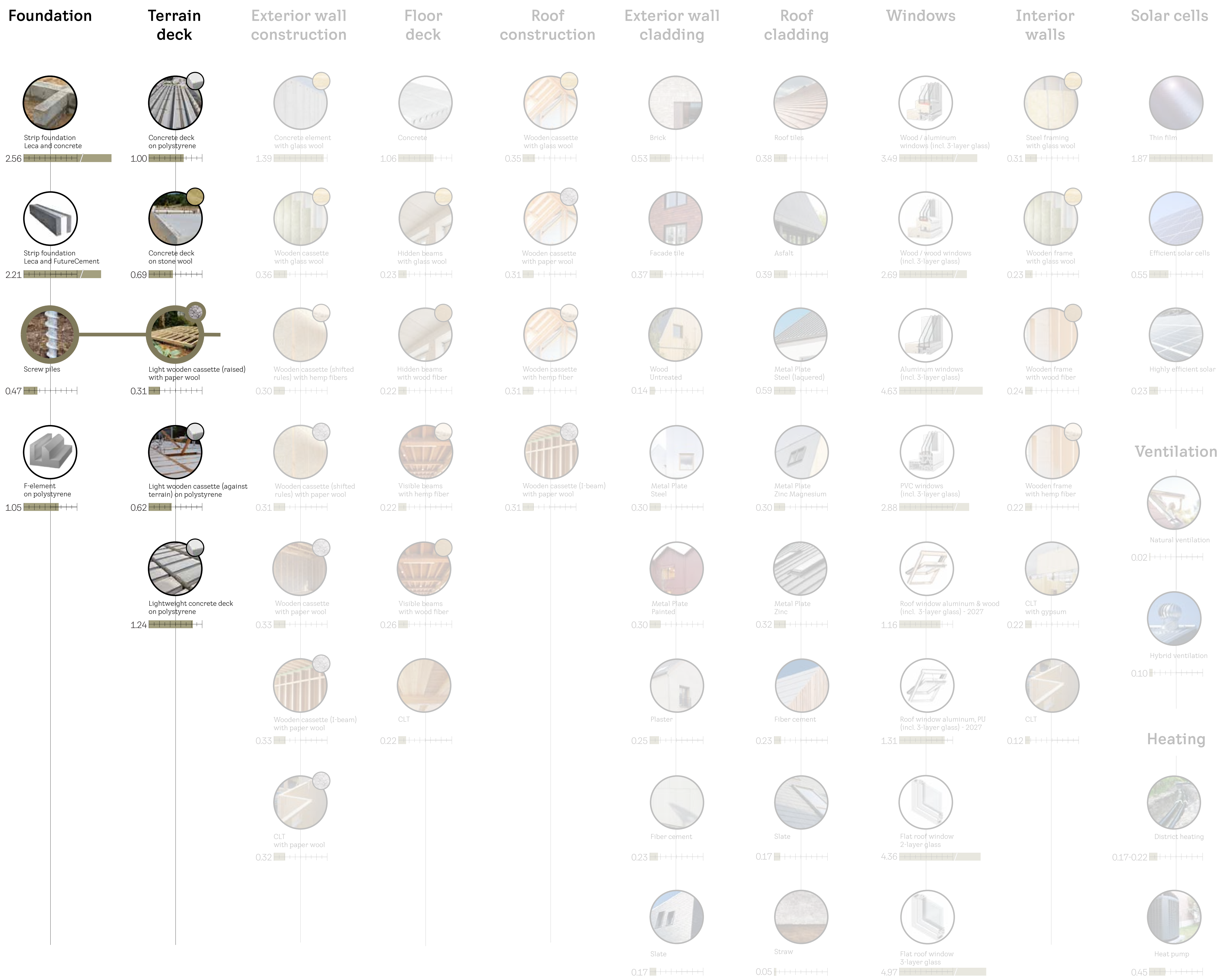
Foundation	19 units
Terrain deck	52 m^2
Exterior wall / Cladding	140 m^2
Deck	57 m^2
Roof / Cladding	116 m^2
Facade windows	22 m^2
Roof windows	17 m^2
Interior wall	139 m^2

Source: LCA calculations done by Artelia, 2022.

Components optimization:

Terrain deck

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.



LCA [kgCO$_2$eq/m^2/year] m^2 of material

Material usage

Foundation — 19 units

Terrain deck — 52 m^2

Exterior wall / Cladding — 140 m^2

Deck — 57 m^2

Roof / Cladding — 116 m^2

Facade windows — 22 m^2

Roof windows — 17 m^2

Interior wall — 139 m^2

Source: LCA calculations done by Artelia, 2022.

Selected Build-up

Light wooden deck

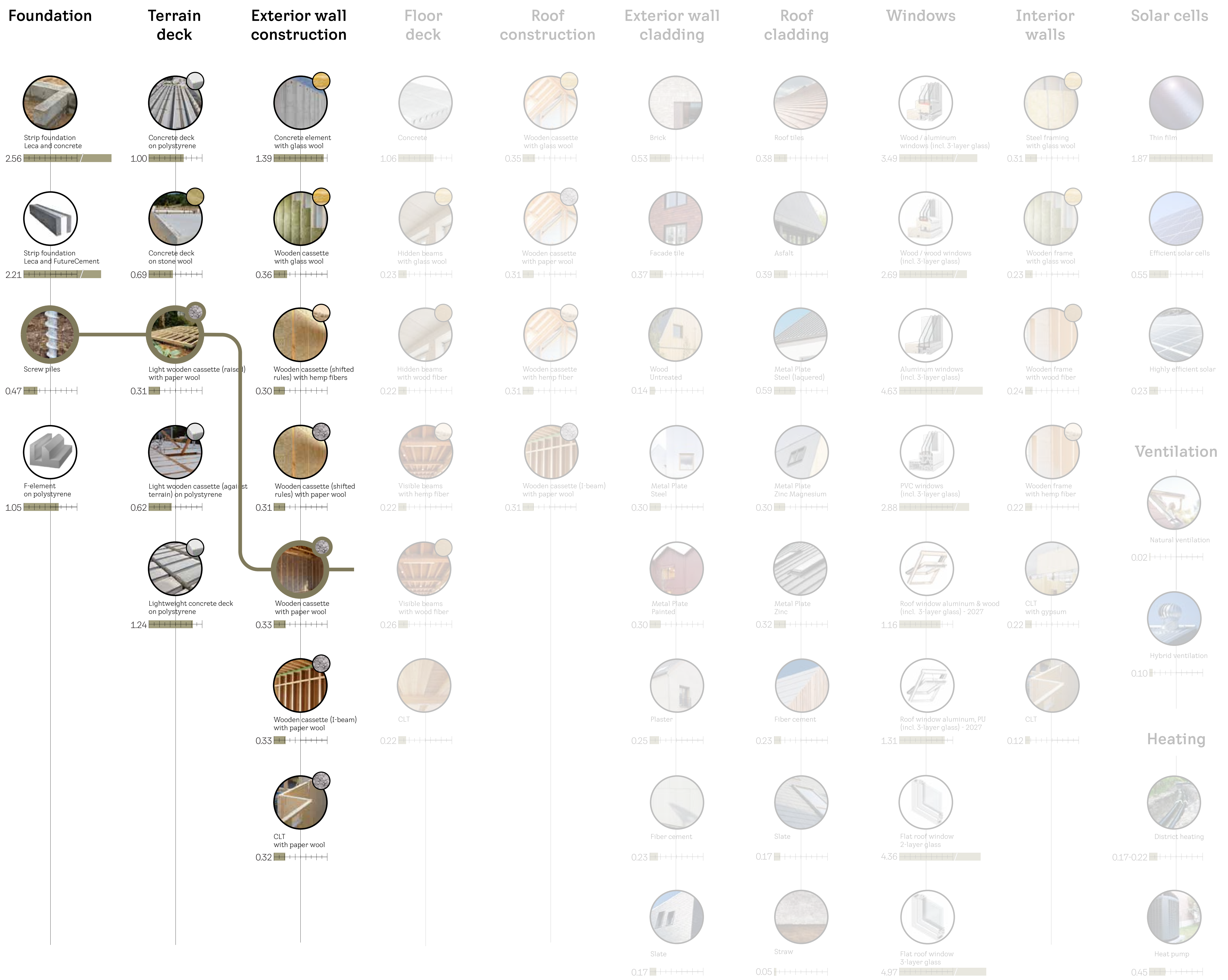
Light wooden deck + paper wool

LCA: 0,21 kgCO$_2$eq/m^2/year

Components optimization:

Exterior walls

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.



LCA [$kgCO_2eq/m^2/year$] m^2 of material

Material usage

Foundation 19 units

Terrain deck 52 m^2

Exterior wall / Cladding 140 m^2

Deck 57 m^2

Roof / Cladding 116 m^2

Facade windows 22 m^2

Roof windows 17 m^2

Interior wall 139 m^2

Selected Build-up

Wooden cassette

Wooden cassette + paper wool

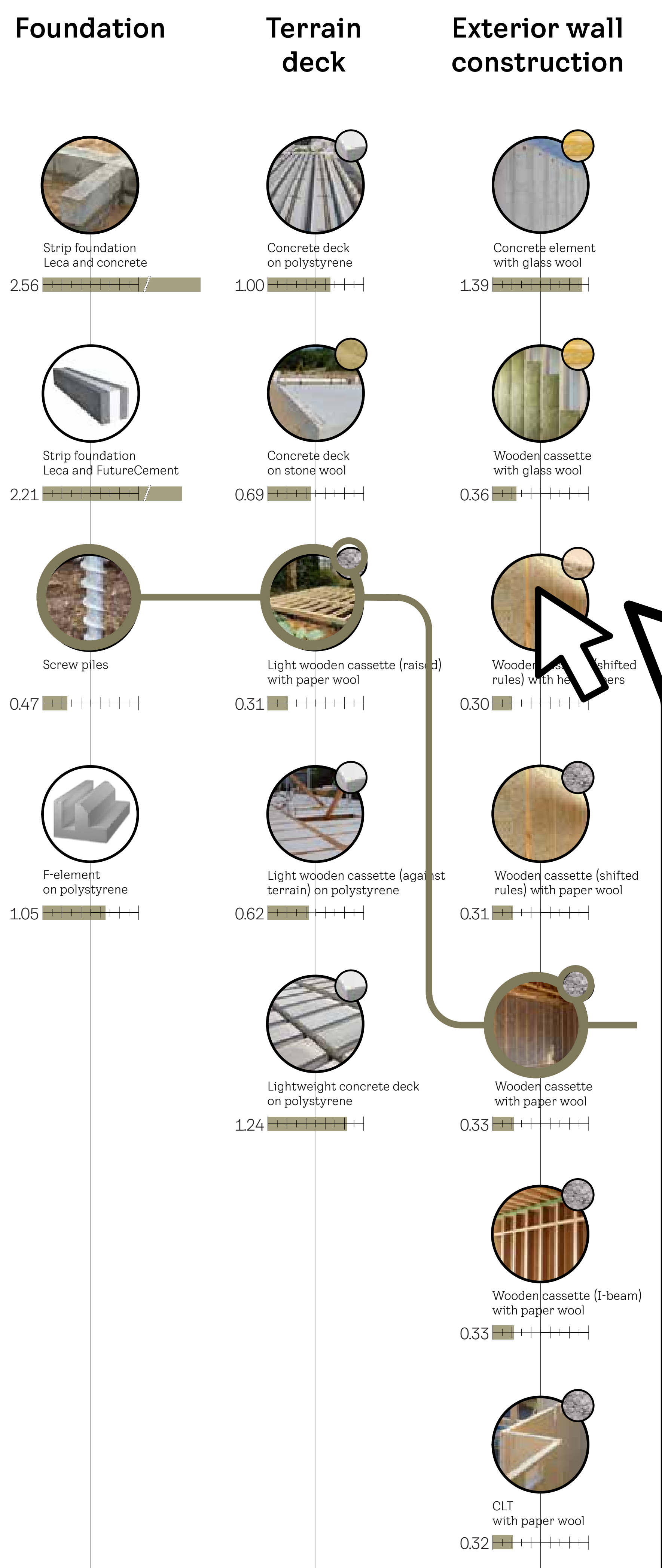
LCA: 0,38 $kgCO_2eq/m^2/year$

Source: LCA calculations done by Artelia, 2022.

Components optimization:

Exterior walls

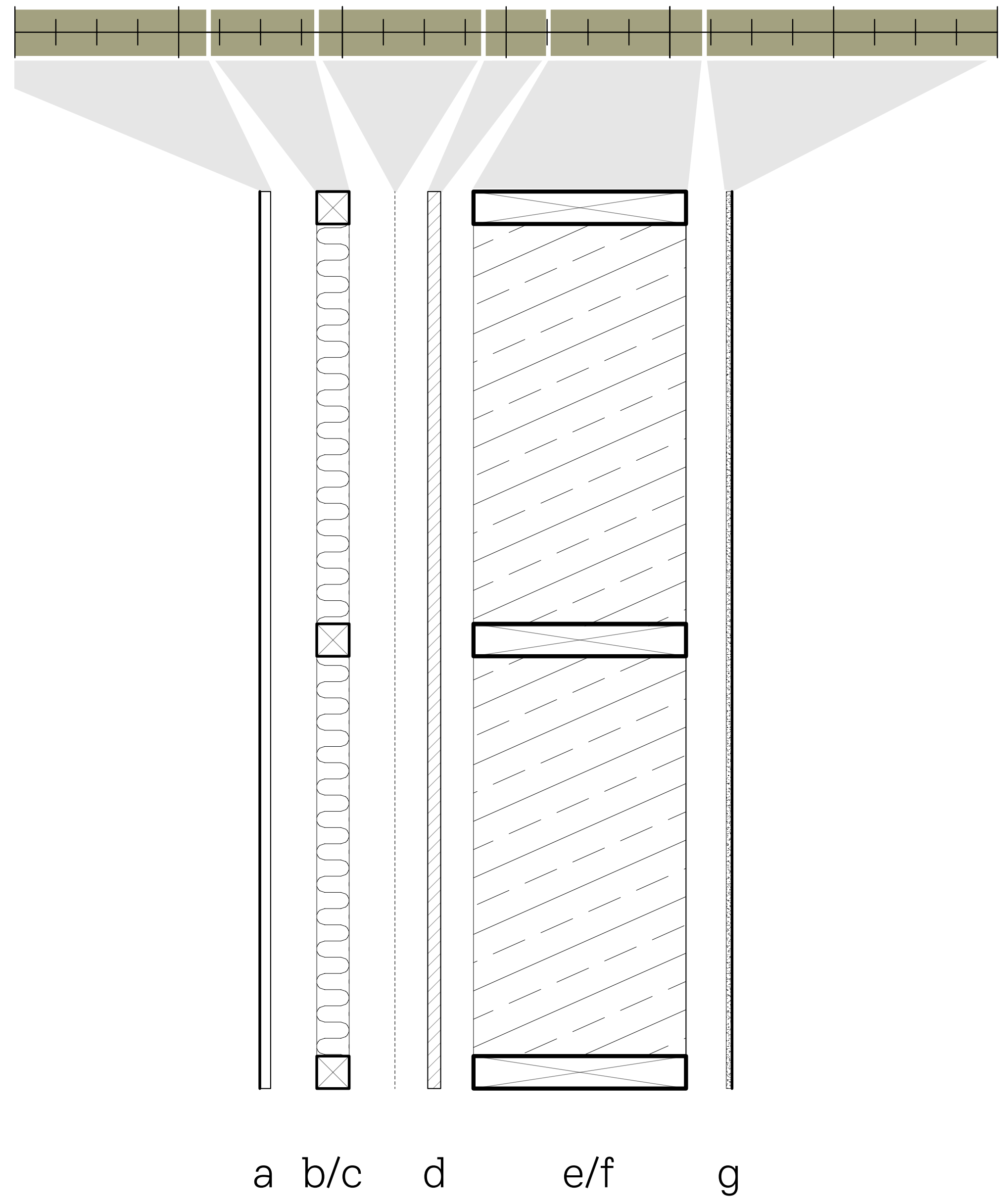
We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.



Exterior Wall Construction

Wooded Cassette
Paper Wool Insulation

LCA: 0,30 $kgCO_2eq/m^2/year$



Layers

a. 8 mm Wind panel Premium (diffusion open)
b. 45x295 mm studs, K18 c / c 600 mm
c. 295 mm paper wool insulation, at 37 - Granules
d. 18mm OSB plate G3
e. 45x70 mm studs c / c 450 mm
f. 45 mm wood fiber bats, at 38 fire class B-s2, d0
g. 15 mm fiber gypsum board cladding

Selected Build-up

Wooden cassette

Wooden cassette + paper wool
LCA: 0,38 $kgCO_2eq/m^2/year$

Material usage

Foundation — 19 units
Terrain deck — 52 m²
Exterior wall / Cladding — 140 m²
Deck — 57 m²
Roof / Cladding — 116 m²
Facade windows — 22 m²
Roof windows — 17 m²
Interior wall — 139 m²

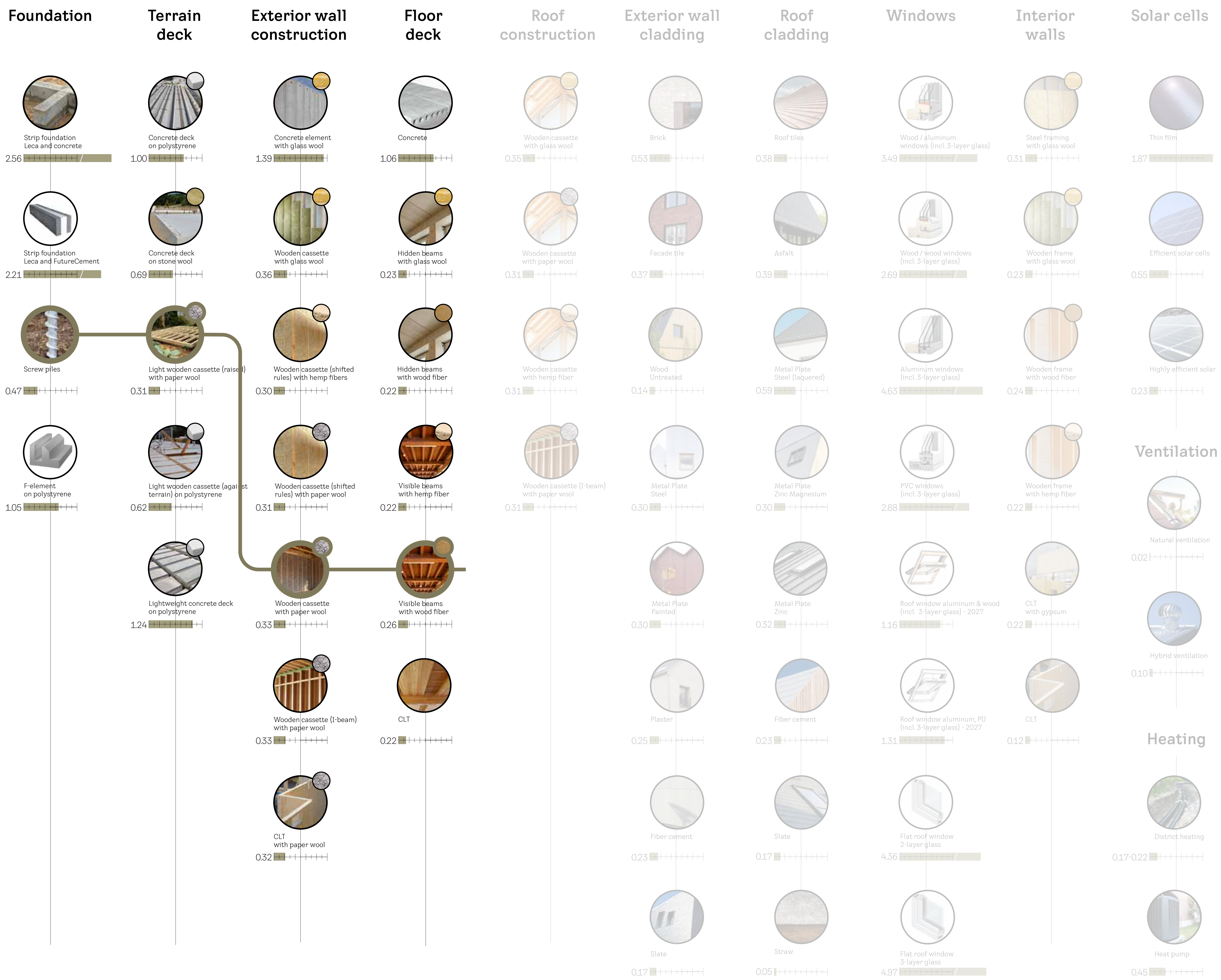
LCA [$kgCO_2eq/m^2/year$] m² of material

Source: LCA calculations done by Artelia, 2022.

Components optimization:

Floor deck

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.



Material usage

Foundation 19 units

Terrain deck 52 m²

Exterior wall / Cladding 140 m²

Deck 57 m²

Roof / Cladding 116 m²

Facade windows 22 m²

Roof windows 17 m²

Interior wall 139 m²

LCA [$kgCO_2eq/m^2/year$] m² of material

Source: LCA calculations done by Artelia, 2022.

Selected Build-up

Visible wooden beams

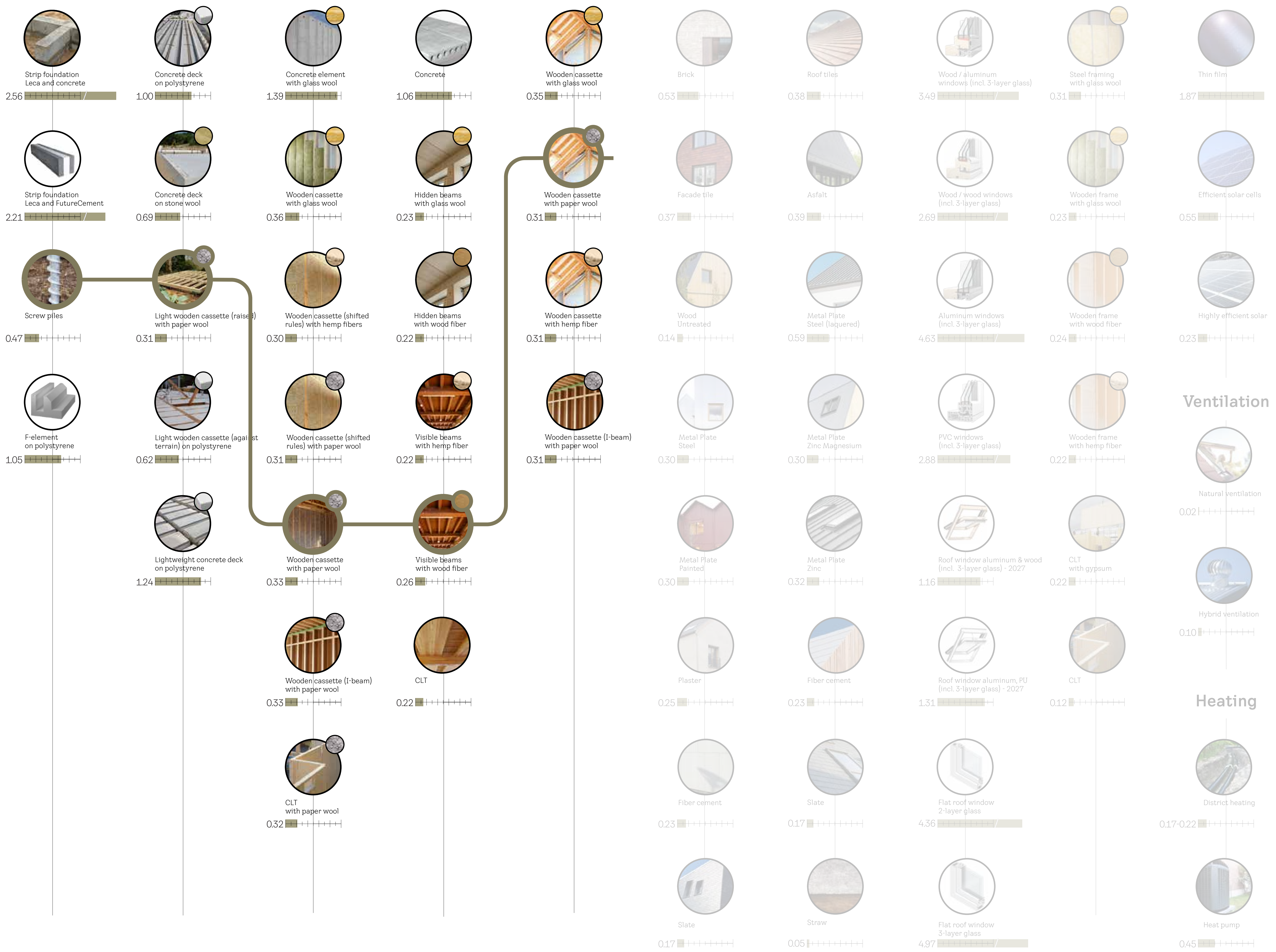
Visible wooden beams

LCA: 0,14 $kgCO_2eq/m^2/year$

Components optimization:

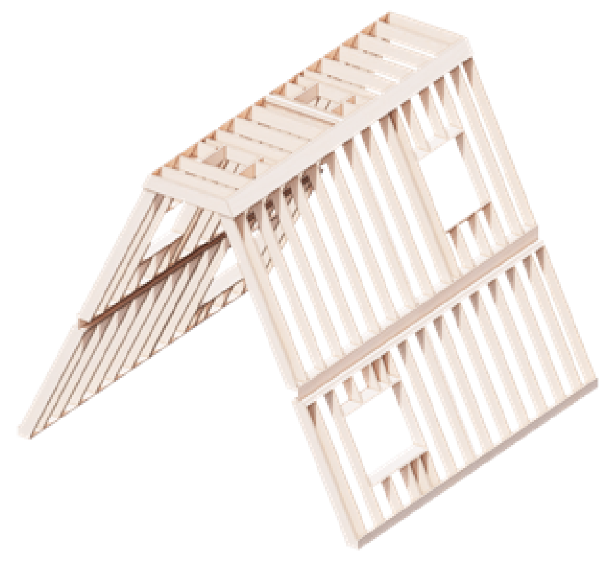
Roof construction

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.



Selected Build-up

Wooden cassette



Wooden cassette + paper wool

LCA: 0,42 $kgCO_2eq/m^2/year$

Material usage

Foundation — 19 units

Terrain deck — 52 m²

Exterior wall / Cladding — 140 m²

Deck — 57 m²

Roof / Cladding — 116 m²

Facade windows — 22 m²

Roof windows — 17 m²

Interior wall — 139 m²

LCA [$kgCO_2eq/m^2/year$] m² of material

Source: LCA calculations done by Artelia, 2022.

Components optimization:

Facade cladding

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.

LCA [kgCO$_2$eq/m^2/year] m^2 of material

Selected Build-up

Untreated wood cladding

Wooden cassette + paper wool
Untreated wood cladding

LCA: 0,18 kgCO$_2$eq/m^2/year

Material usage

Foundation — 19 units

Terrain deck — 52 m^2

Exterior wall / Cladding — 140 m^2

Deck — 57 m^2

Roof / Cladding — 116 m^2

Facade windows — 22 m^2

Roof windows — 17 m^2

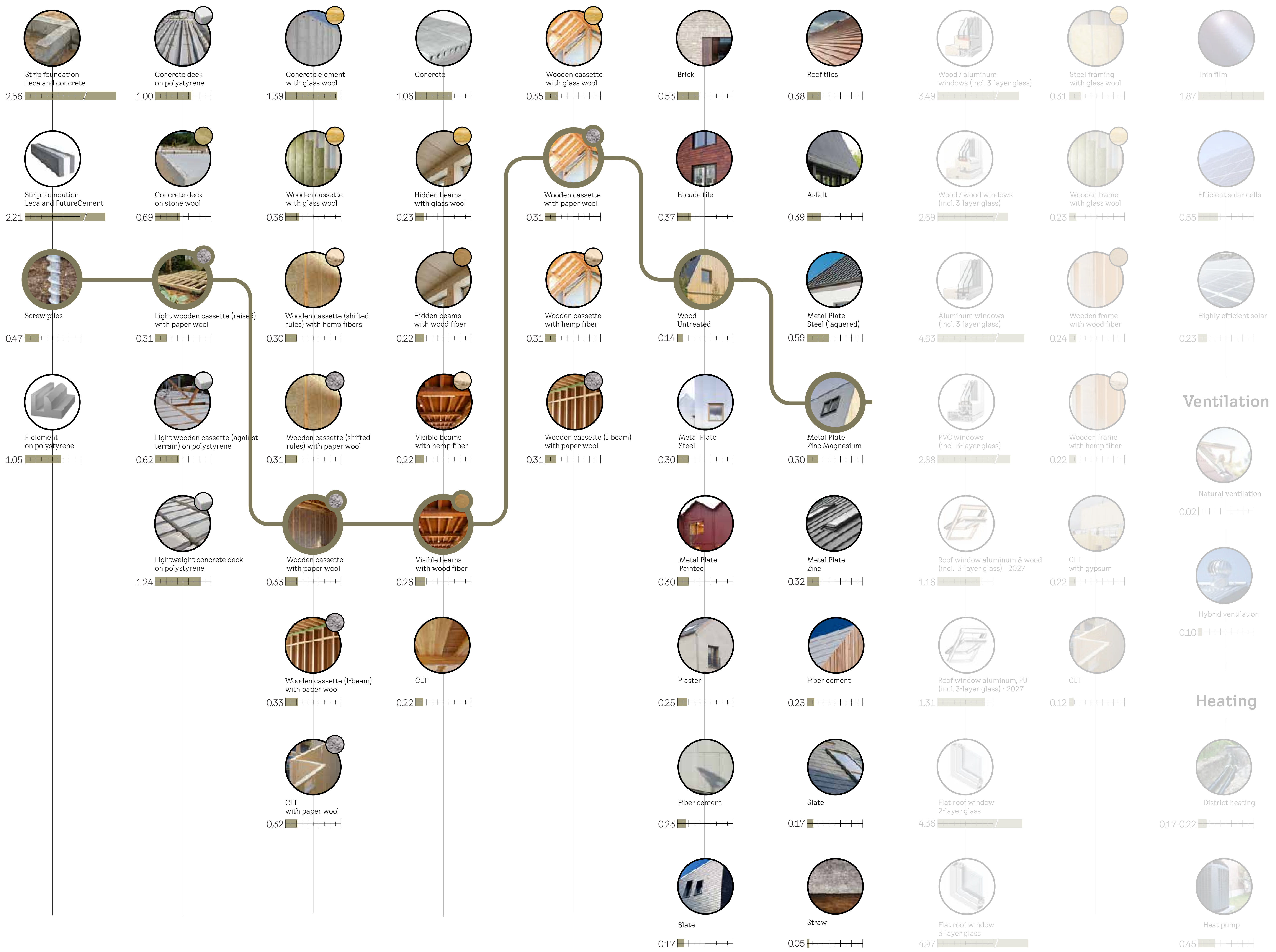
Interior wall — 139 m^2

Source: LCA calculations done by Artelia, 2022.

Components optimization:

Roof cladding

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.



LCA [kgCO$_2$eq/m²/year] m² of material

Selected Build-up

Steel plates

Steel plates. Zink-magnesium

LCA: 0,32 kgCO$_2$eq/m²/year

Material usage

Foundation — 19 units

Terrain deck — 52 m²

Exterior wall / Cladding — 140 m²

Deck — 57 m²

Roof / Cladding — 116 m²

Facade windows — 22 m²

Roof windows — 17 m²

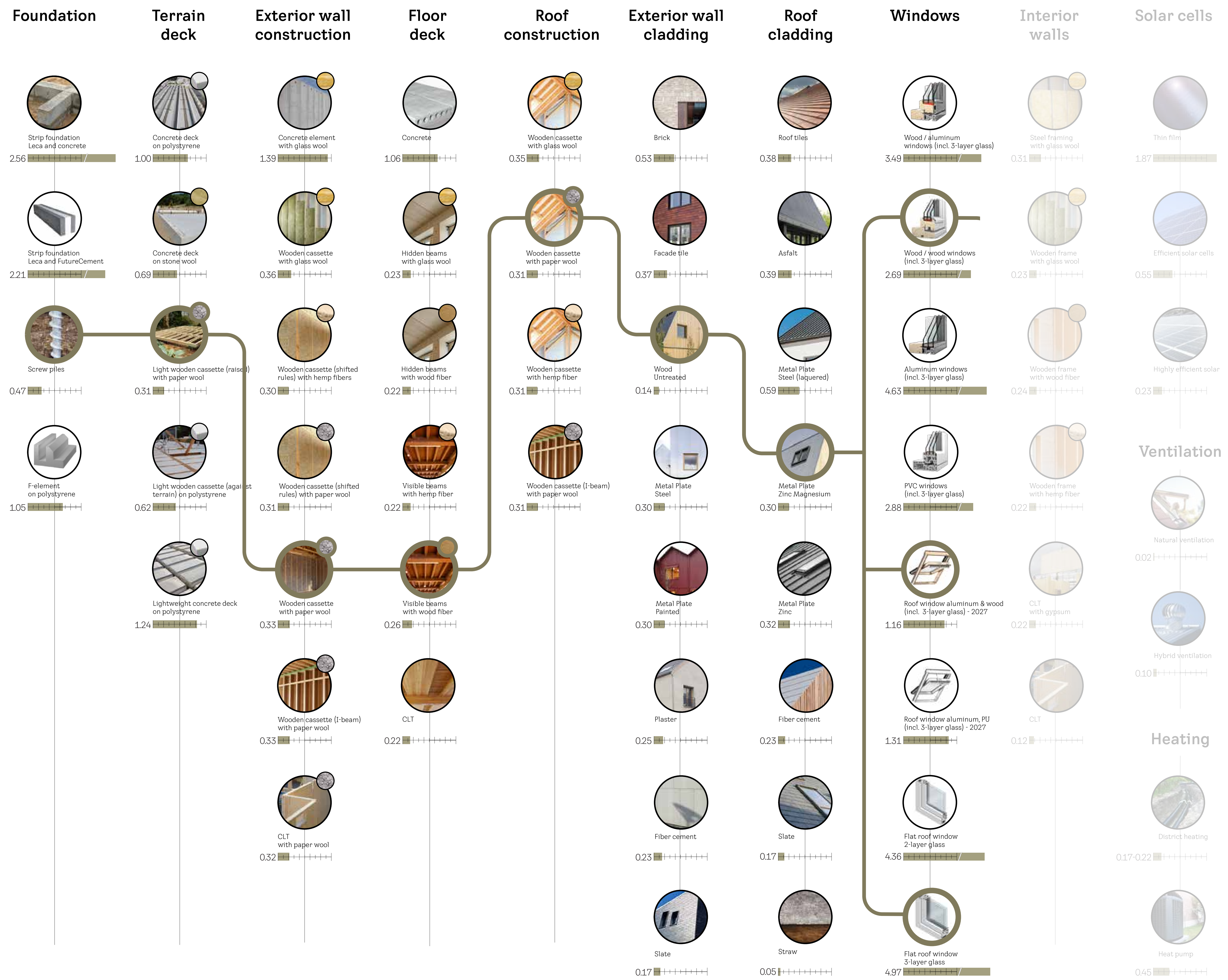
Interior wall — 139 m²

Source: LCA calculations done by Artelia, 2022.

Components optimization:

Windows

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.



LCA [kgCO$_2$eq/m^2/year] m^2 of material

Material usage

Foundation	19 units
Terrain deck	52 m^2
Exterior wall / Cladding	140 m^2
Deck	57 m^2
Roof / Cladding	116 m^2
Facade windows	22 m^2
Roof windows	17 m^2
Interior wall	139 m^2

Source: LCA calculations done by Artelia, 2022.

Selected Build-up

Wood windows & Aluminium-wood roof windows

Wood windows
Aluminium-wood roof windows

LCA: 0,68 kgCO$_2$eq/m^2/year

Components optimization:

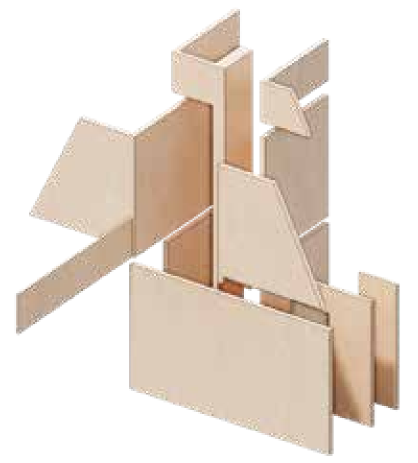
Interior walls

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.

LCA [$kgCO_2eq/m^2/year$] m^2 of material

Selected Build-up

Wooden frame



Wooden cassette + wood fiber

LCA: 0,14 $kgCO_2eq/m^2/year$

Material usage

Foundation — 19 units

Terrain deck — 52 m^2

Exterior wall / Cladding — 140 m^2

Deck — 57 m^2

Roof / Cladding — 116 m^2

Facade windows — 22 m^2

Roof windows — 17 m^2

Interior wall — 139 m^2

Source: LCA calculations done by Artelia, 2022.

Components optimization:

Technicals

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.

LCA [kgCO$_2$eq/m^2/year] m^2 of material

Material usage

Foundation	19 units
Terrain deck	52 m^2
Exterior wall / Cladding	140 m^2
Deck	57 m^2
Roof / Cladding	116 m^2
Facade windows	22 m^2
Roof windows	17 m^2
Interior wall	139 m^2

Selected Build-up

Efficient solar panels
Natural ventilation
Heat pump

Technicals (Excl. operational energy)

LCA: 0,83 kgCO$_2$eq/m^2/year

Source: LCA calculations done by Artelia, 2022.

Living Places pathway - example

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.

Material usage

Size:	147
Floors:	3
Building principle:	Timberframe
Foundation:	Screw pile
Floor height:	3 m
Room height:	2.6 m
Heating application:	Air to water HP
Heating source:	Radiators
Ventilation:	Natural or hybrid
Solar panels:	11 m^2

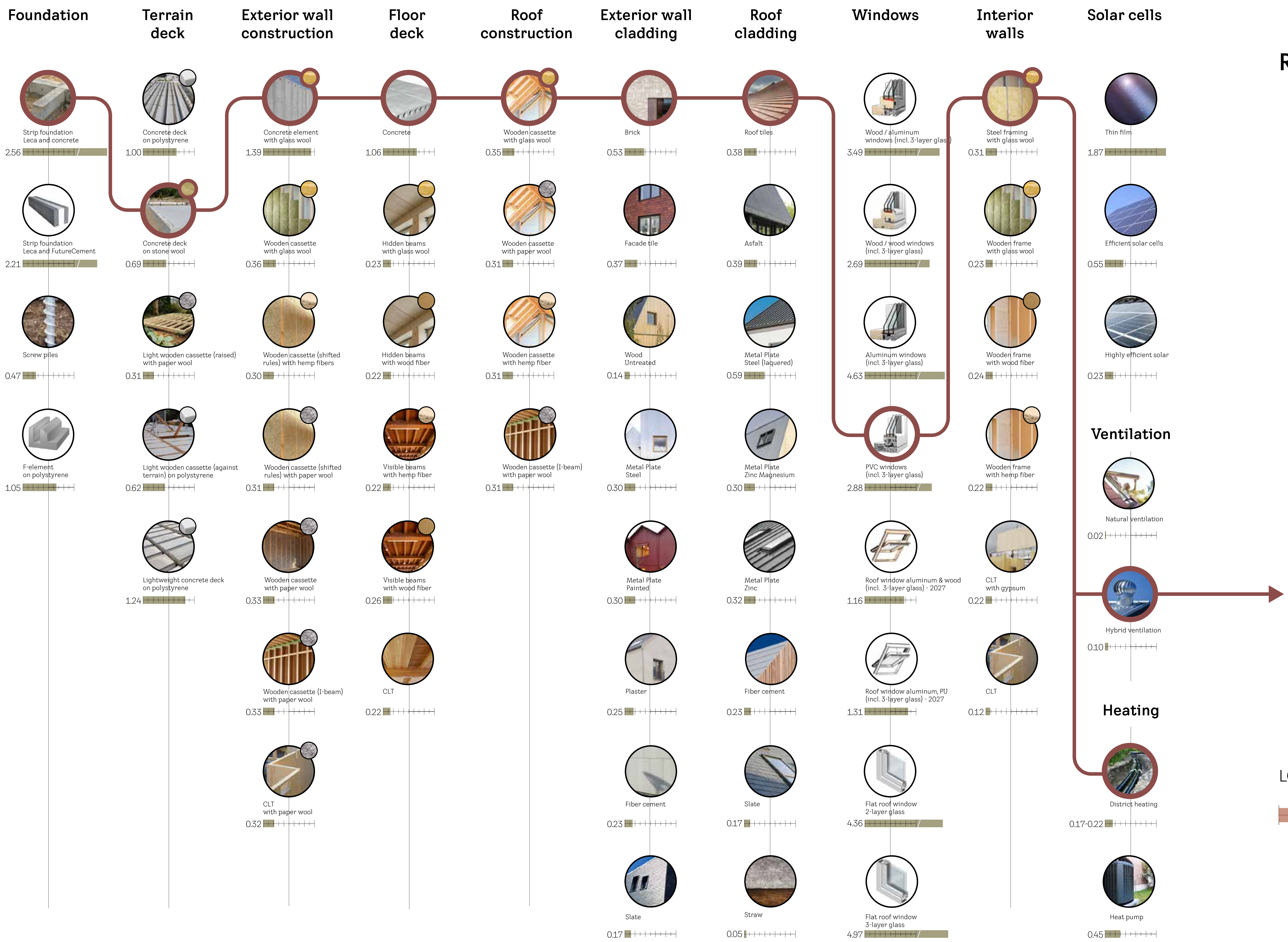
Total LCA

Living Places house

Source: LCA calculations done by Artelia, 2022.

Reference house pathway - example

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.



LCA [kgCO$_2$eq/m^2/year] m^2 of material

Total LCA

Reference house

LCA: 11,10 kgCO$_2$eq/m^2/year

Material usage

Size:	184
Floors:	1
Building principle:	Brick
Foundation:	Concrete
Floor height:	2.7 m
Room height:	2.4 m
Heating application:	District heating
Heating source:	Floor heating
Ventilation:	Mechanical
Solar panels:	7 m^2

Source: LCA calculations done by Artelia, 2022.

Comparison

We rigorously investigated each component, optimizing them individually, to ensure the selection of the one with the least environmental impact through comparative benchmarking.

LCA [$kgCO_2eq/m^2/year$] m^2 of material

Total LCA

Living Places

LCA: 3,85 $kgCO_2eq/m^2/year$

Reference house

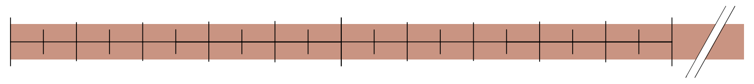
LCA: 11,10 $kgCO_2eq/m^2/year$

Source: LCA calculations done by Artelia, 2022.

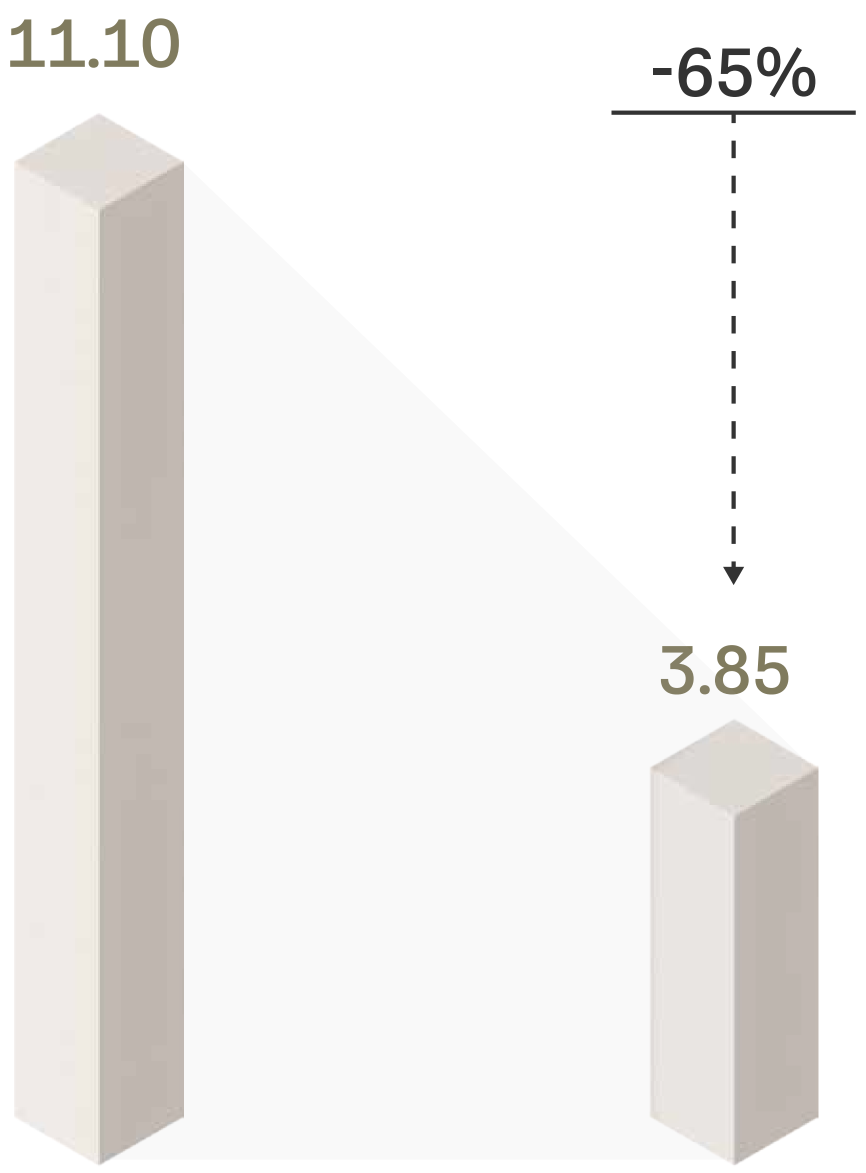
Total comparison

Comparison between the benchmark
house and Living Places full LCA analysis.

LCA: 11,10 $kgCO_2eq/m^2/year$

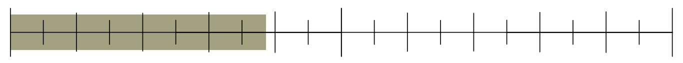


Benchmark house



Emissions comparison

LCA: 3,85 $kgCO_2eq/m^2/year$



Living Places

Source: LCA calculations done by Artelia, 2022.

People

How we assess and benchmark a building's indoor environment

From a complex system to individual components.

To ensure a first class indoor environment we have based the methodology for Living Places on the healthy building principles. These are split into 5 categories - daylight, Thermal environment, indoor air quality, acoustics and outdoor

Building

Detached house
147 m^2

Healthy building principles

Daylight

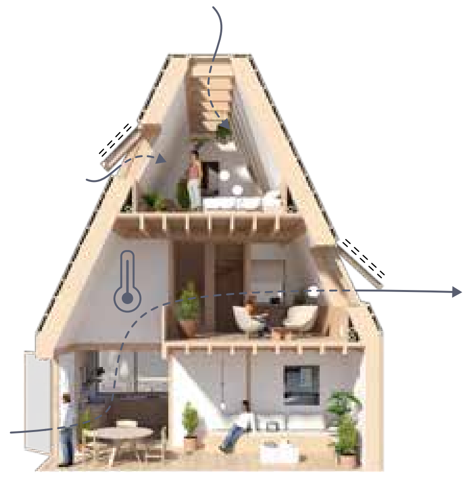
Thermal Comfort

Indoor air quality

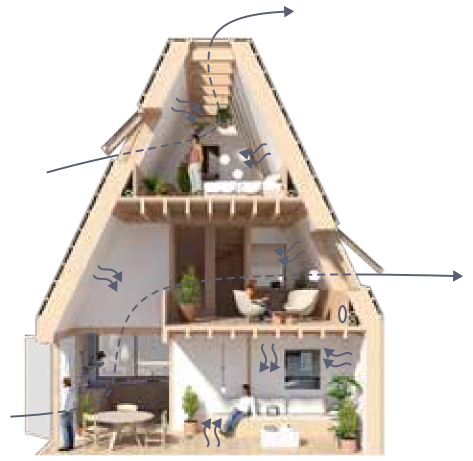
Acoustics

Outdoor connection

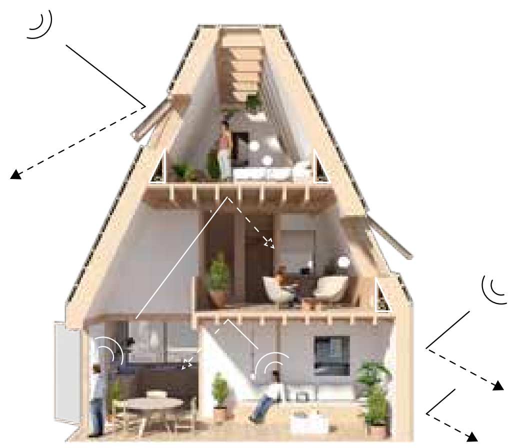
Daylight principles



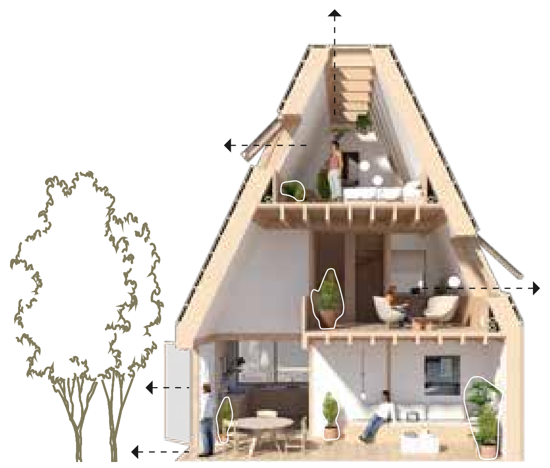
Thermal environment principles



Indoor air quality principles



Acoustics principles



Outdoor connection principles

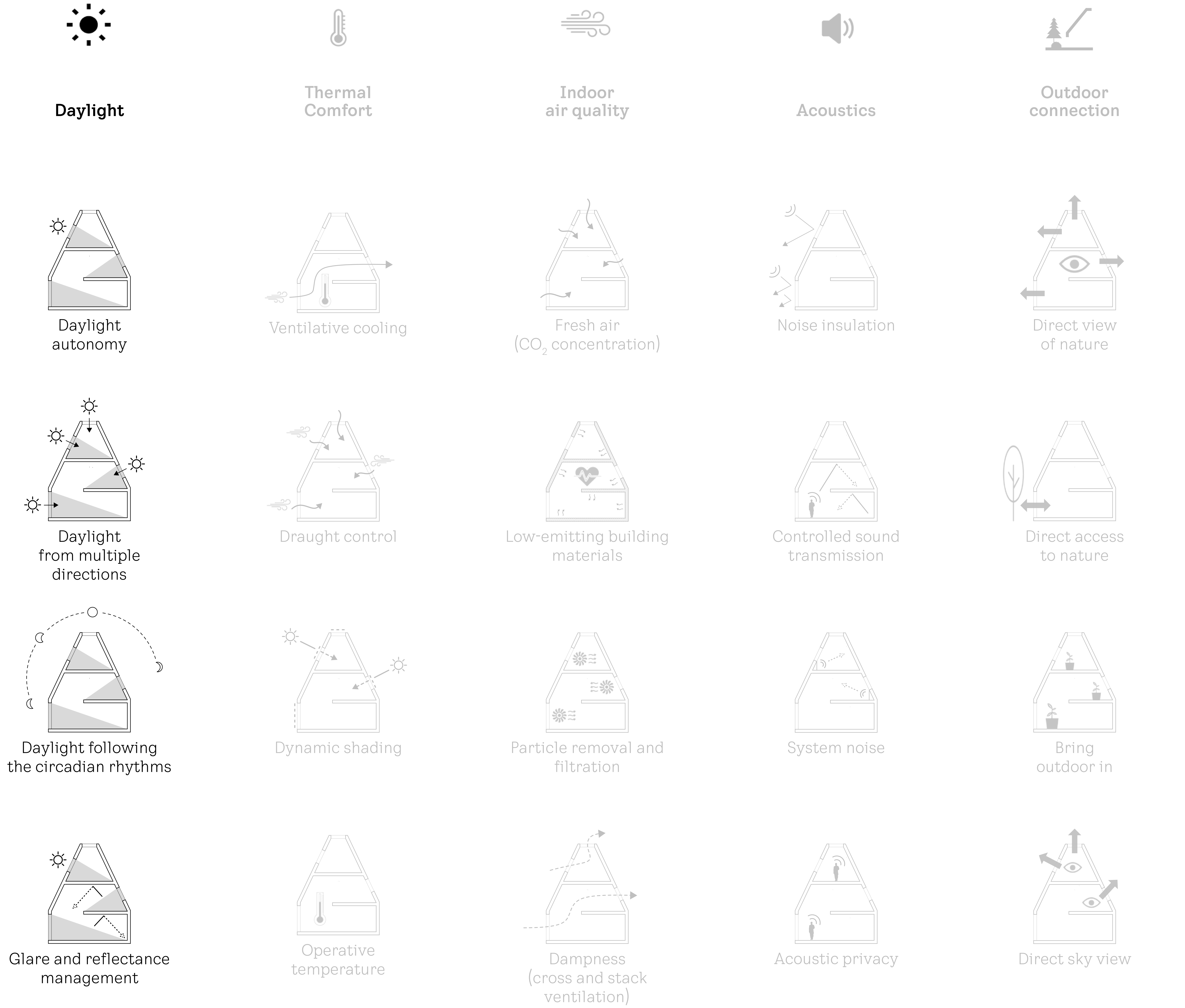
Healthy building principle:

Daylight

Light: Using daylight as a key principle in healthy building design significantly enhances the indoor environment. Natural light is known to boost mood, increase productivity, and improve overall well-being. By maximizing daylight in buildings, we reduce the need for artificial lighting, which not only saves energy but also creates a more comfortable and visually appealing space. The presence of natural light helps regulate circadian rhythms, leading to better sleep patterns and overall health. Therefore, incorporating daylight into building design is a vital strategy for creating healthier, more sustainable, and more enjoyable living and working environments.

Healthy indoor targets

	Indoor class	Active House Radar
Daylight autonomy (DA300/50)	> 50% area	> 60% area
Max operative temperature	< 26,5 °C (< 100h)	< 25,5-26,0 °C
Min operative temperature	--	< 21,0-20,0 °C
Fresh air supply	< 1000 ppm CO_2	< 400-550 ppm CO_2
VOC emissions	< 300 µg/m³ $TVOC_{28}$	< 1000 µg/m³ $TVOC_{28}$
Outdoor noise	< 25-30 dB	< 25-30 dB
Inside system noise	< 25-30 dB	< 25-30 dB
Acoustic privacy (Contact sound)	--	< 43-48 dB

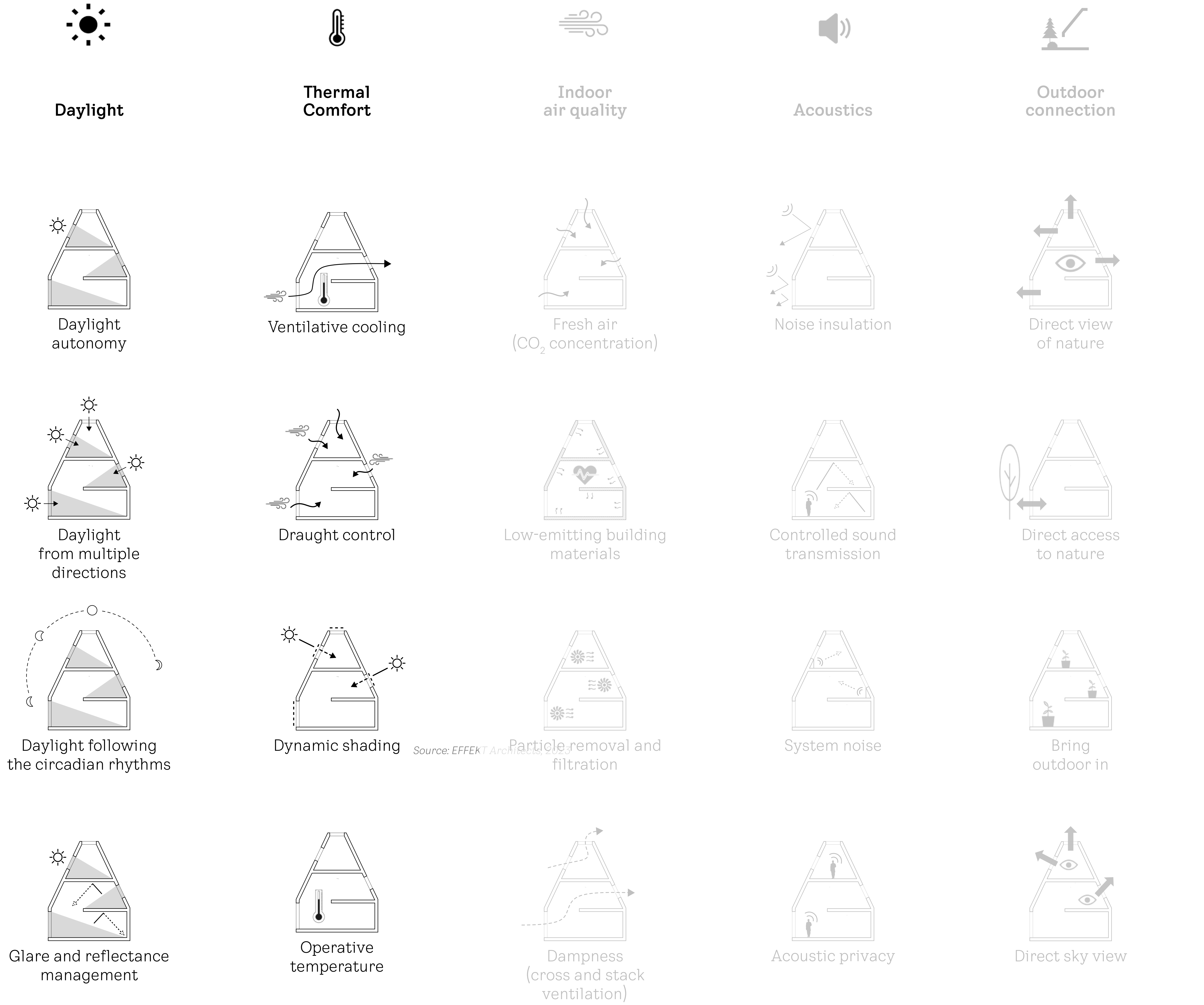


Source: EFFEKT Architects, 2023

Healthy building principle:

Thermal environment

Thermal environment in buildings is effectively achieved through methods like ventilative cooling, fresh air circulation, and dynamic shading. These techniques ensure a comfortable indoor climate by balancing temperatures, enhancing air quality, and regulating natural light. Such strategies not only provide a pleasant and healthy environment for occupants but also promote energy efficiency and sustainability in building design.



Source: EFFEKT Architects 2023

Healthy indoor targets

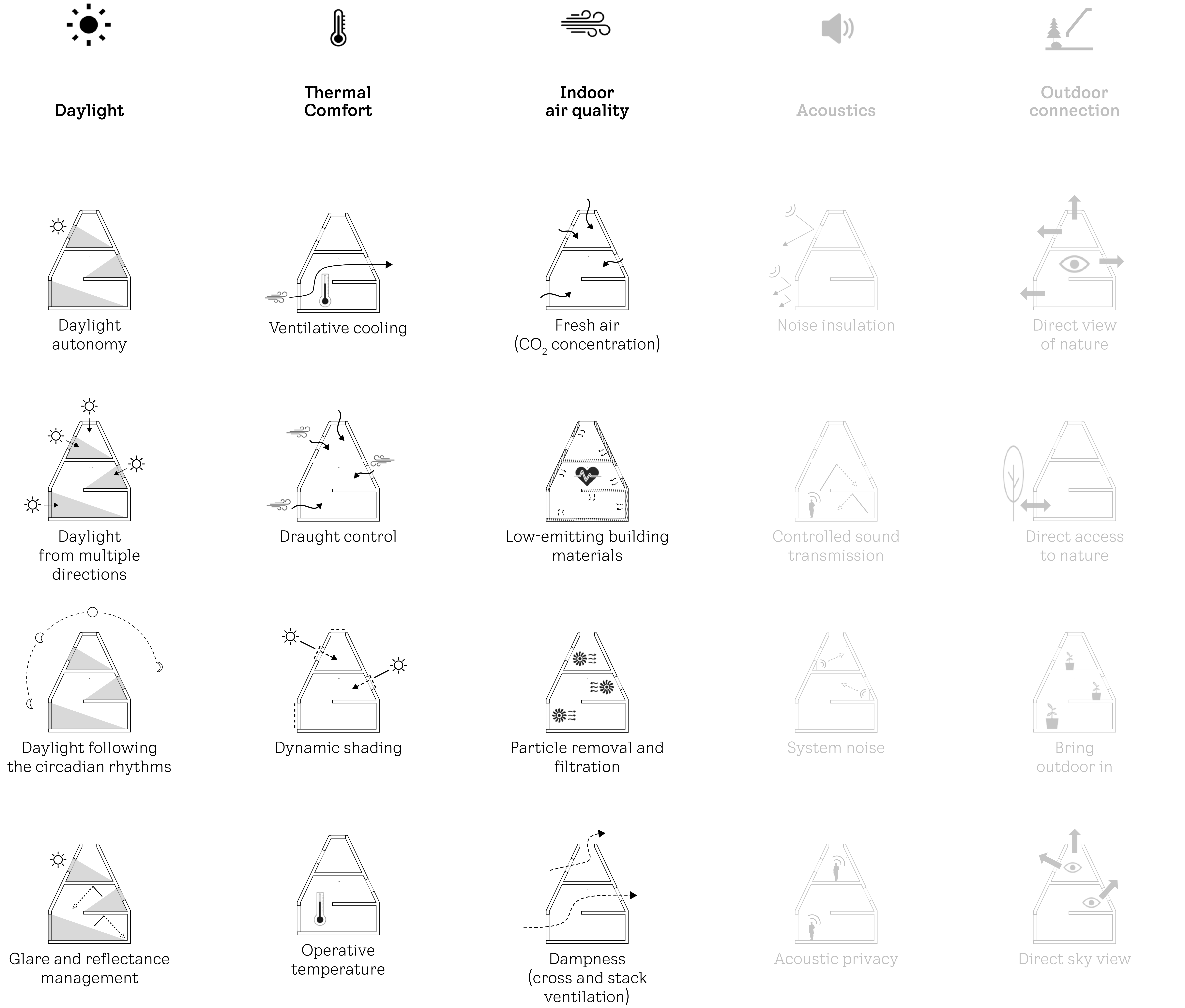
	Indoor class	Active House Radar
Daylight autonomy		(DA300/50)
	> 50% area	> 60% area
Max operative temperature		
	< 26,5 °C (< 100h)	< 25,5-26,0 °C
Min operative temperature		
	--	< 21,0-20,0 °C
Fresh air supply		
	< 1000 ppm CO_2	< 400-550 ppm CO_2
VOC emissions		
	< 300 µg/m³ $TVOC_{28}$	< 1000 µg/m³ $TVOC_{28}$
Outdoor noise		
	< 25-30 dB	< 25-30 dB
Inside system noise		
	< 25-30 dB	< 25-30 dB
Acoustic privacy		(Contact sound)
	--	< 43-48 dB

Source: EFFEKT Architects, 2023

Healthy building principle:

Indoor air quality

Indoor air quality, a key principle for a better indoor environment, is enhanced through cross ventilation and the stack effect, which promote fresh air circulation. Using healthy building materials reduces indoor toxins, while advanced filtration systems effectively remove airborne particles. These strategies collectively ensure cleaner, healthier air, contributing significantly to occupant well-being.



Healthy indoor targets

	Indoor class	Active House Radar
Daylight autonomy (DA300/50)	> 50% area	> 60% area
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VOC emissions	< 300 µg/m³ $TVOC_{28}$	< 1000 µg/m³ $TVOC_{28}$
Outdoor noise	< 25-30 dB	< 25-30 dB
Inside system noise	< 25-30 dB	< 25-30 dB
Acoustic privacy (Contact sound)	--	< 43-48 dB

Source: EFFEKT Architects, 2023

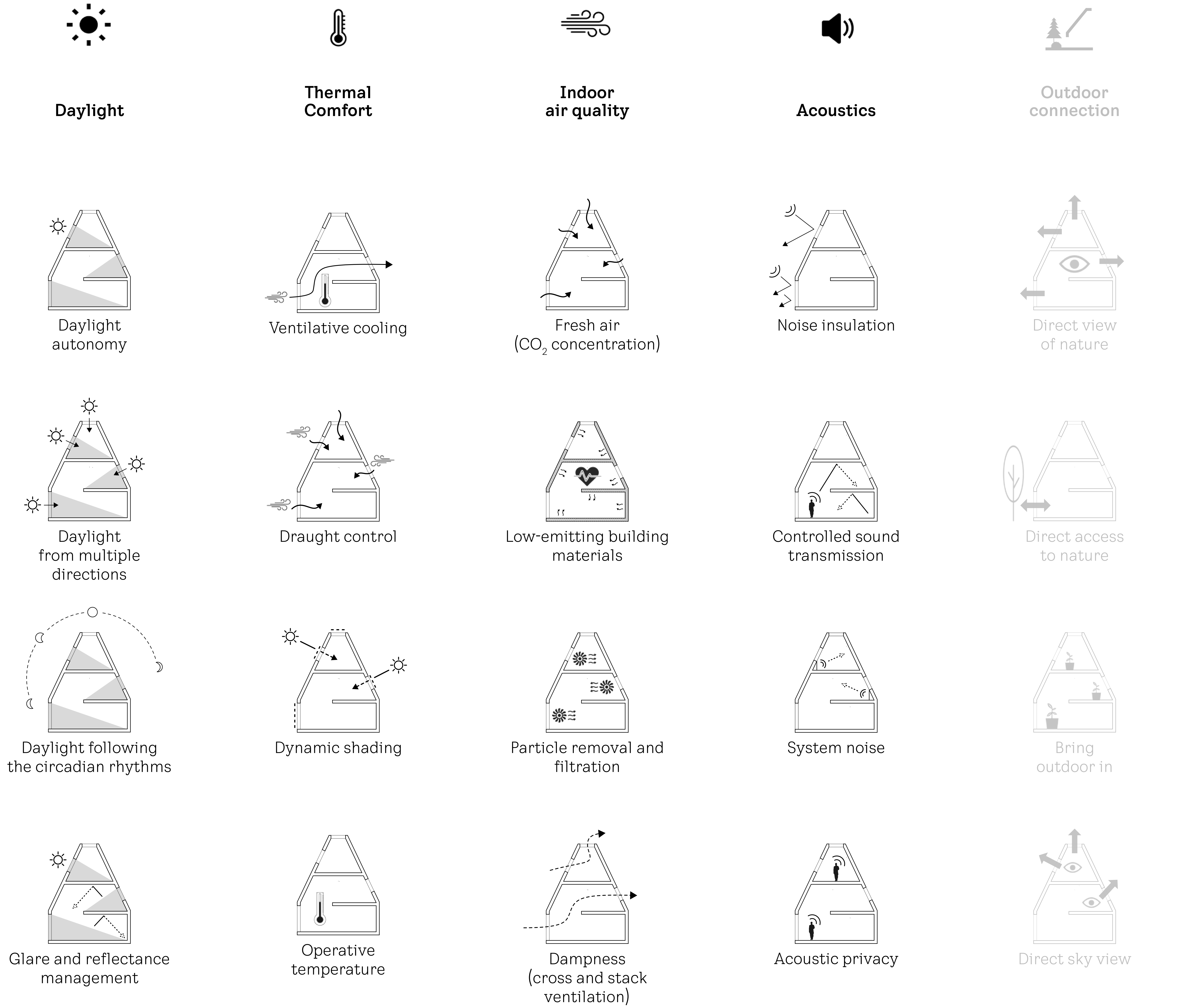
Healthy building principle:

Acoustics

Outdoor connection, as a healthy building principle, enhances indoor environments by providing direct views of nature, easy access to outdoor spaces, and incorporating natural elements indoors. These approaches create a serene atmosphere, promote well-being, and bridge the indoor-outdoor divide, significantly improving the quality of life for occupants.

Healthy indoor targets

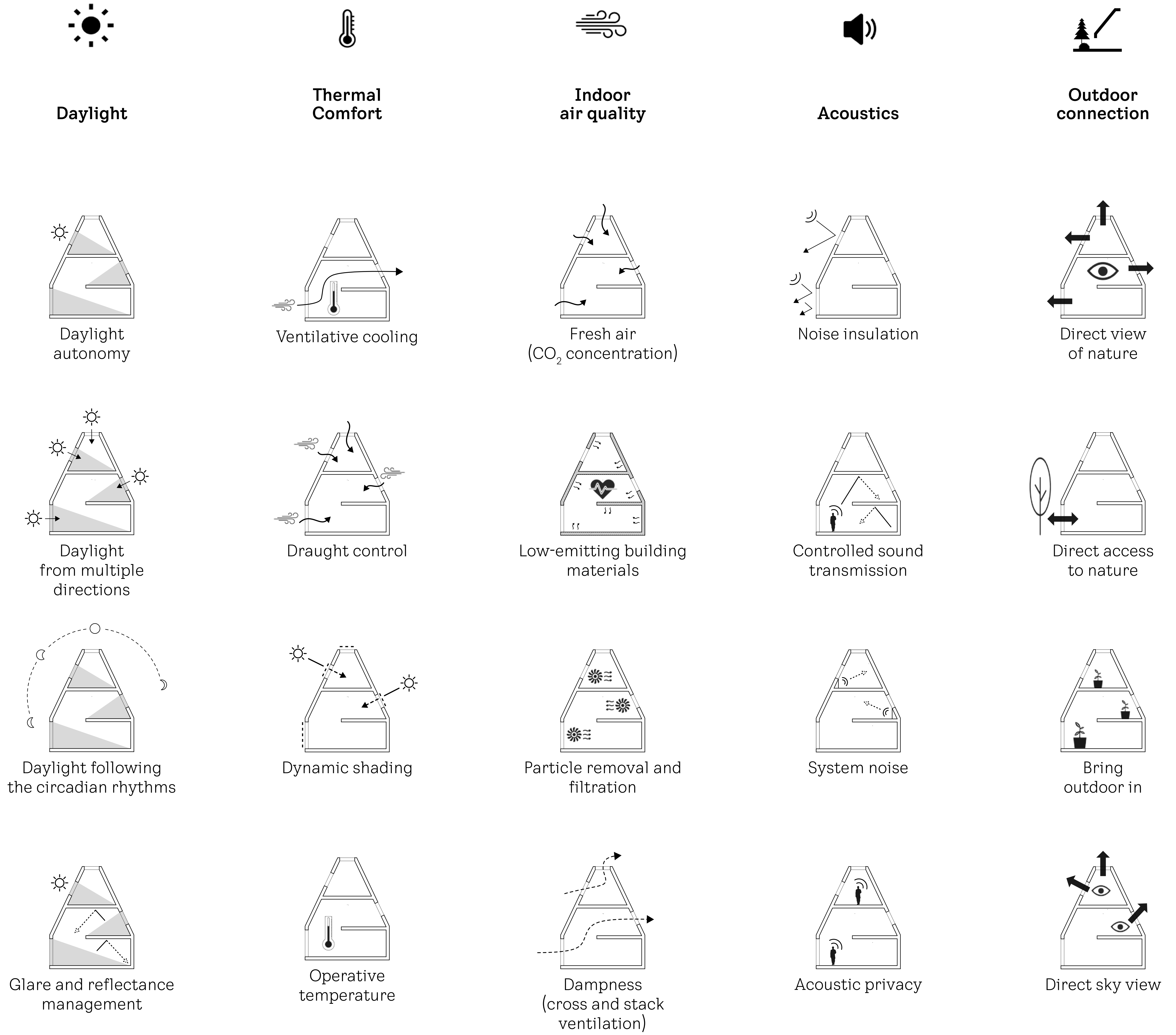
	Indoor class	Active House Radar
Daylight autonomy		(DA300/50)
	> 50% area	> 60% area
Max operative temperature		
	< 26,5 °C (< 100h)	< 25,5-26,0 °C
Min operative temperature		
	--	< 21,0-20,0 °C
Fresh air supply		
	< 1000 ppm CO_2	< 400-550 ppm CO_2
VOC emissions		
	< 300 µg/m³ $TVOC_{28}$	< 1000 µg/m³ $TVOC_{28}$
Outdoor noise		
	< 25-30 dB	< 25-30 dB
Inside system noise		
	< 25-30 dB	< 25-30 dB
Acoustic privacy		(Contact sound)
	--	< 43-48 dB



Source: EFFEKT Architects, 2023

Healthy building principle:
Outdoor connection

Acoustics, as a healthy building principle, improves indoor environments through noise insulation, controlled sound transmission, and reduced system noise. These measures create a quieter, more peaceful space, enhancing comfort and focus for occupants, and contributing to overall well-being.



Healthy indoor targets

	Indoor class	Active House Radar
Daylight autonomy		(DA300/50)
	> 50% area	> 60% area
Max operative temperature		
	< 26,5 °C (< 100h)	< 25,5-26,0 °C
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Fresh air supply		
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VOC emissions		
	< 300 µg/m³ $TVOC_{28}$	< 1000 µg/m³ $TVOC_{28}$
Outdoor noise		
	< 25-30 dB	< 25-30 dB
Inside system noise		
	< 25-30 dB	< 25-30 dB
Acoustic privacy		(Contact sound)
	--	< 43-48 dB

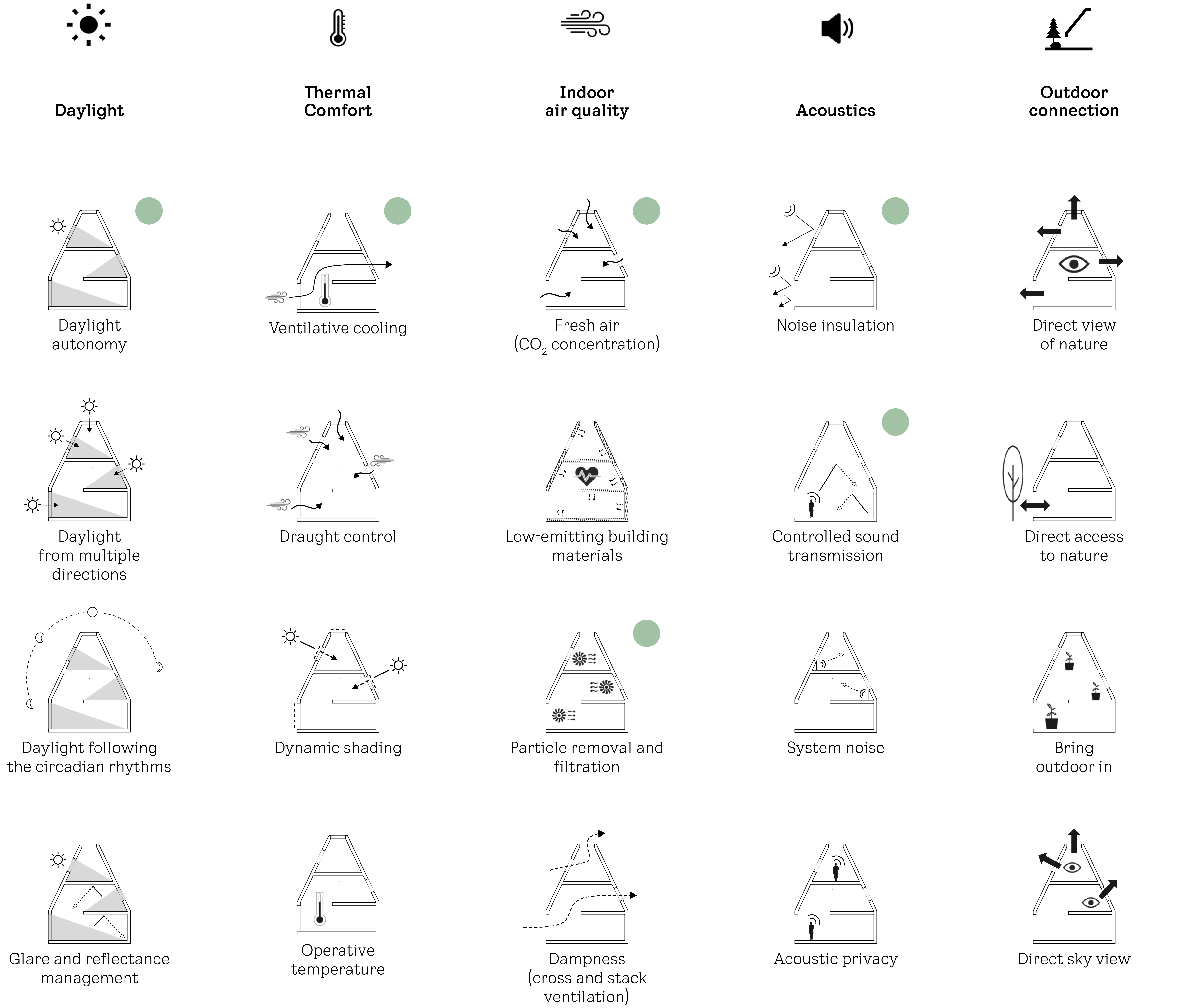
Source: EFFEKT Architects, 2023

Healthy building principle:

Reference house

REFERENCE HOUSE SELECTION

In our analysis, we compared the reference house with the Active House Radar, focusing on healthy building principles. We evaluated key factors like energy efficiency, indoor climate, and environmental impact. This helped us gauge how well the house aligned with Active House standards and overall healthy living criteria.



Indoor class score:

Class 3

Daylight autonomy (DA300/50)
20% area

Overheating
< 28,0 °C

Fresh air supply
< 1700 ppm CO_2

VOC emissions
< 1000 µg/m³ $TVOC_{28}$

Outdoor noise
< 35 dB

Source: EFFEKT Architects, 2023

Healthy building principle:

Living Places

LIVING PLACES SELECTION

To enhance the indoor environment, Living Places has incorporated numerous healthy building principles. This integration has resulted in a best-in-class indoor environment, ensuring optimal living conditions. By focusing these five principles, these spaces promote health and well-being. Additionally, this approach aligns with environmentally friendly practices, making these houses not only comfortable but also environmentally responsible.

Indoor class score:

Class 1

Daylight autonomy (DA300/50)
>50% area

Overheating
< 26,5 °C

Fresh air supply
< 1000 ppm CO_2

VOC emissions
< 300 µg/m³ $TVOC_{28}$

Outdoor noise
< 27 dB

Source: EFFEKT Architects, 2023

04

Living Places principles

Living Places a new set of principles to enable better built environment

Living Places Principles Description

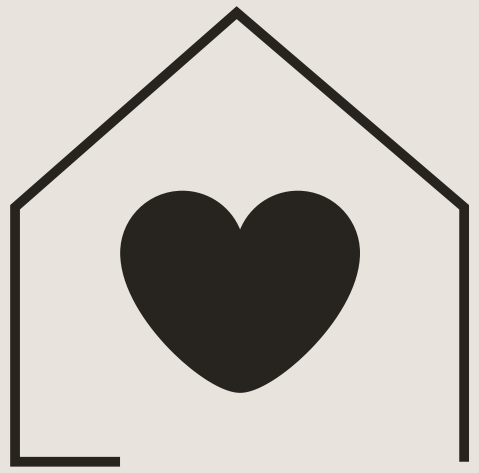
This chapter outlines the ambitious goals of the Living Places five guiding principles. Healthy, Shared, Simple, Adaptive and Scalable.

These principles are designed to cultivate a harmonious balance between human well-being and environmental health. Firstly, they promote lifestyles conducive to the health of people and the planet. Secondly, they advocate for community enrichment through shared living spaces, fostering stronger social ties.

Thirdly, the principles support simple living and building designs that facilitate easy updates and longevity. Fourthly, they aim for inclusivity, offering a variety of living options to cater to diverse needs. Lastly, they focus on scalability, ensuring that housing with low emission and affordable housing is accessible to a broader population. This chapter will delve into how each principle contributes to a vision of sustainable, community-oriented, and flexible living spaces for all.

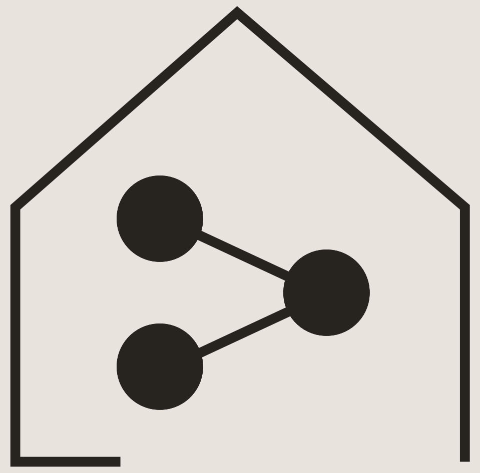
@ Adam Mork

Living Places Principles Description



Healthy principle

Benefiting both people and planet, through the careful selection of materials, building techniques, utilities, and design configuration of indoor and outdoor spaces

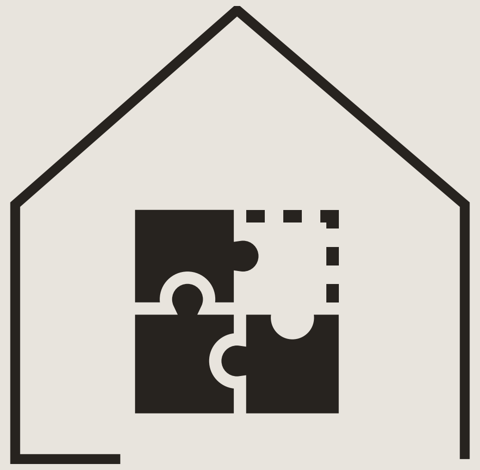


Shared principle

Strengthening the sense of community by combining private dwellings with shared spaces, resources, outdoor areas, and amenities.

Simple principle

Offering a simple modular building system that requires little to no maintenance and can easily be upgraded, repaired and fitted with smart appliances



Adaptive principle

Creating a scalable solution that responds to the needs for more ways of living

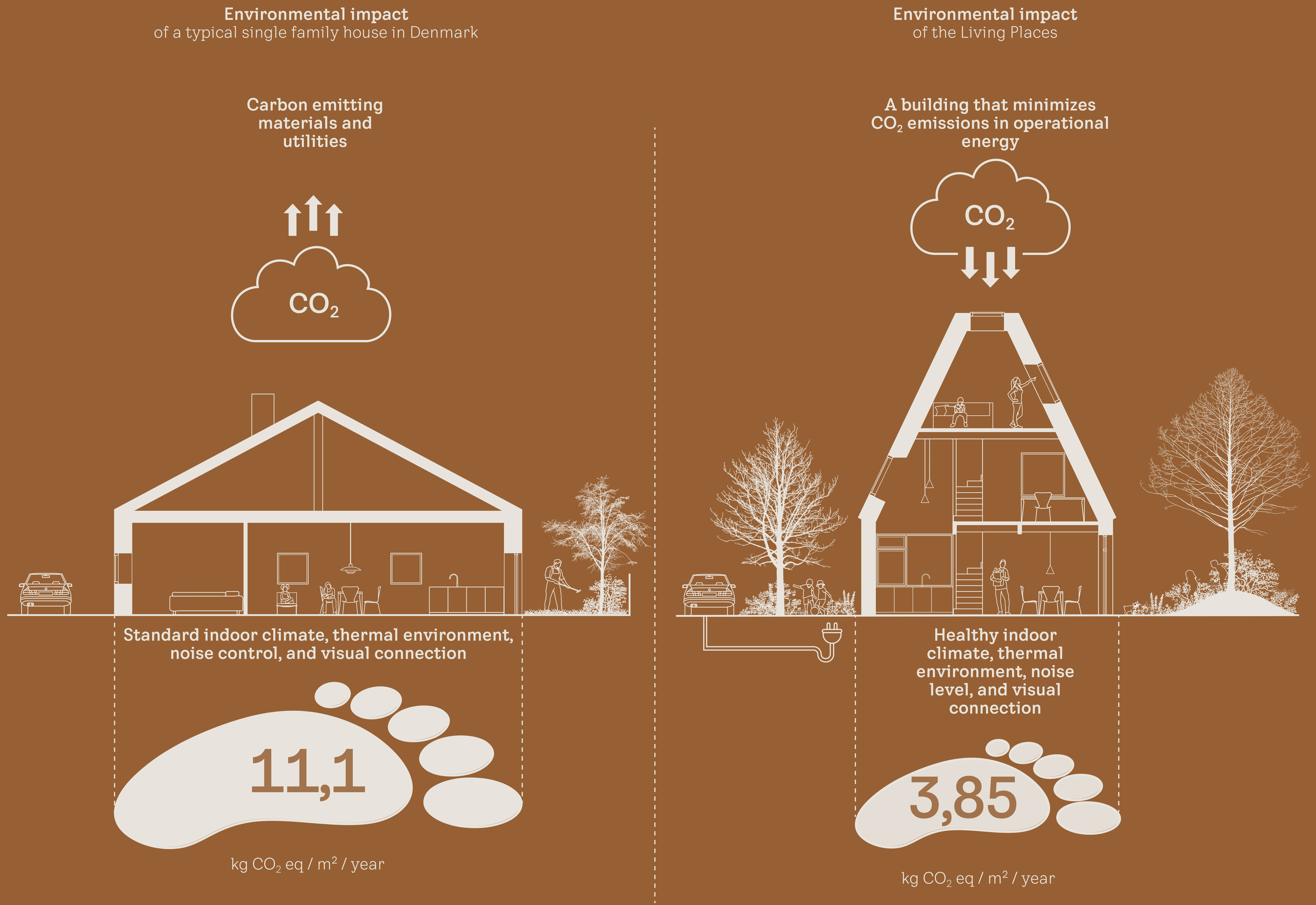
Scalable principle

By creating homes that challenge the way we design, plan, and finance homes we can unlock housing for the many.

Healthy Planet

What if we could reduce the environmental impact, while enhancing the health and wellbeing for people?

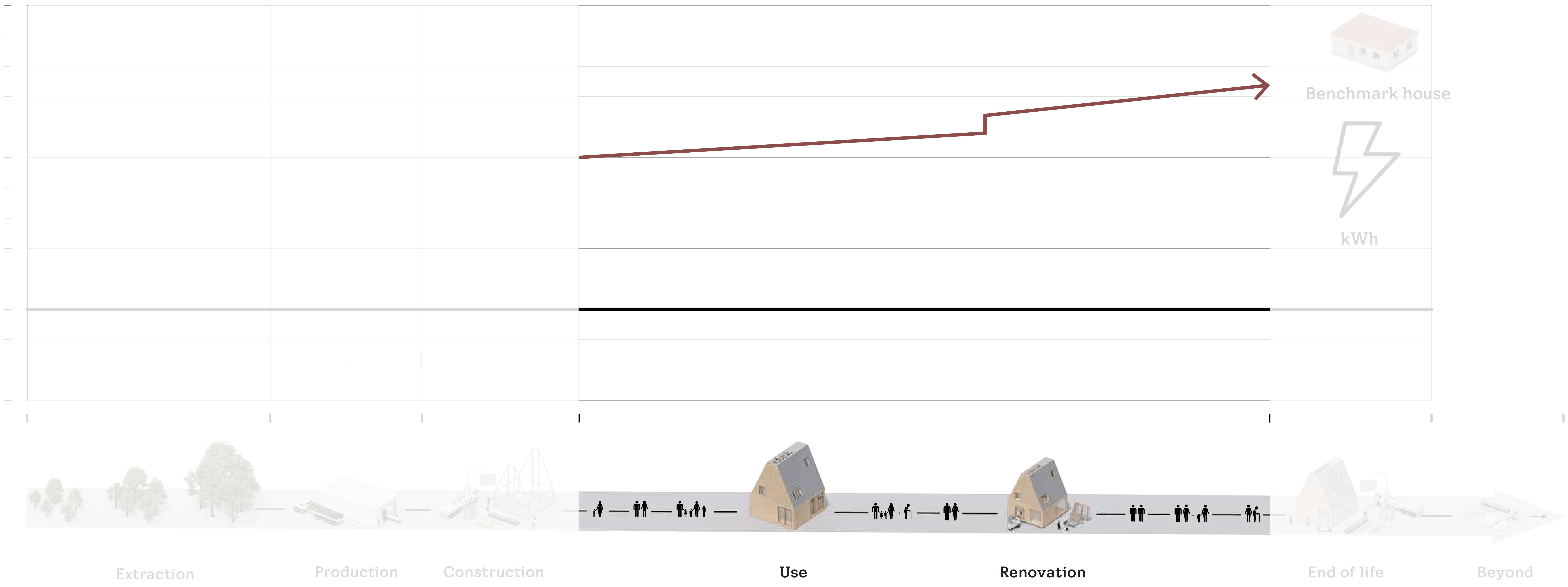
Benefiting both people and planet, through the careful selection of materials, building techniques, utilities, and design configuration of indoor and outdoor spaces



Source: EFFEKT Architects, 2023

Sustainability focus of yesterday

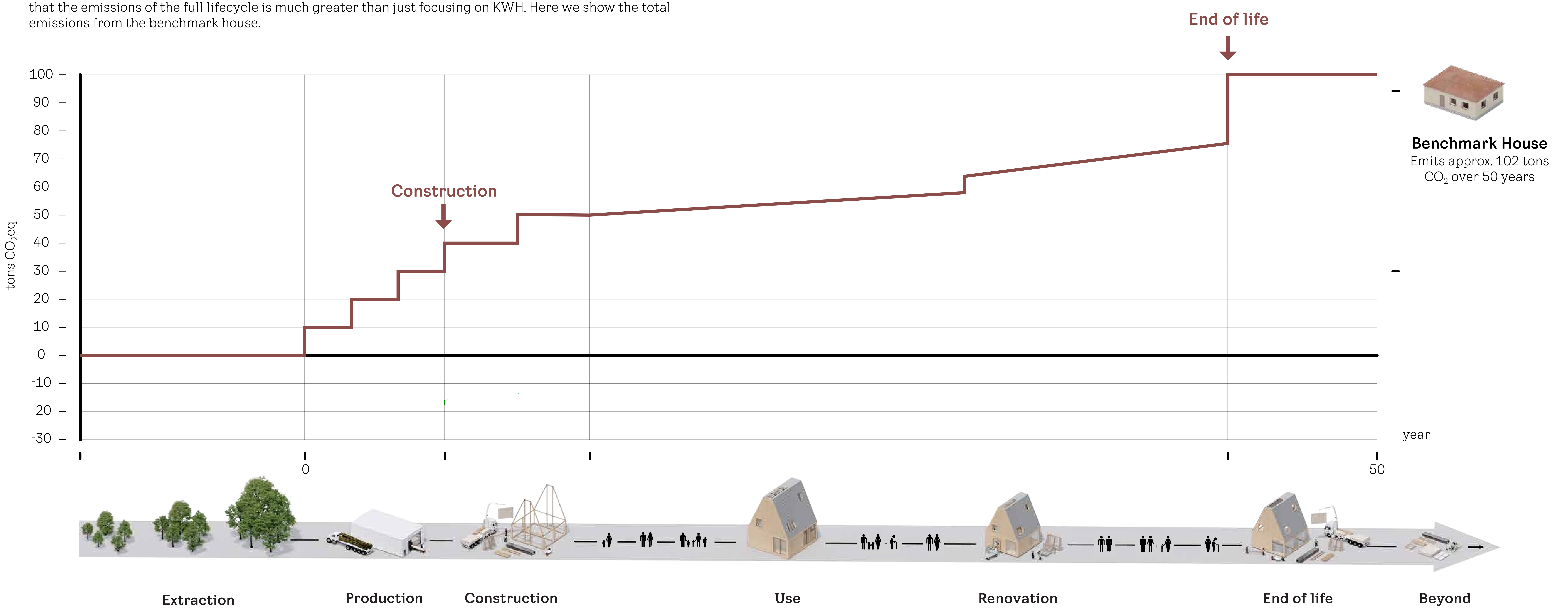
For the past last 40 years the building industry has focused solely on energy consumption during the use phase, and hereby neglecting the full life-cycle.



Source: EFFEKT Architects, 2023

Full lifecycle emissions from benchmark house

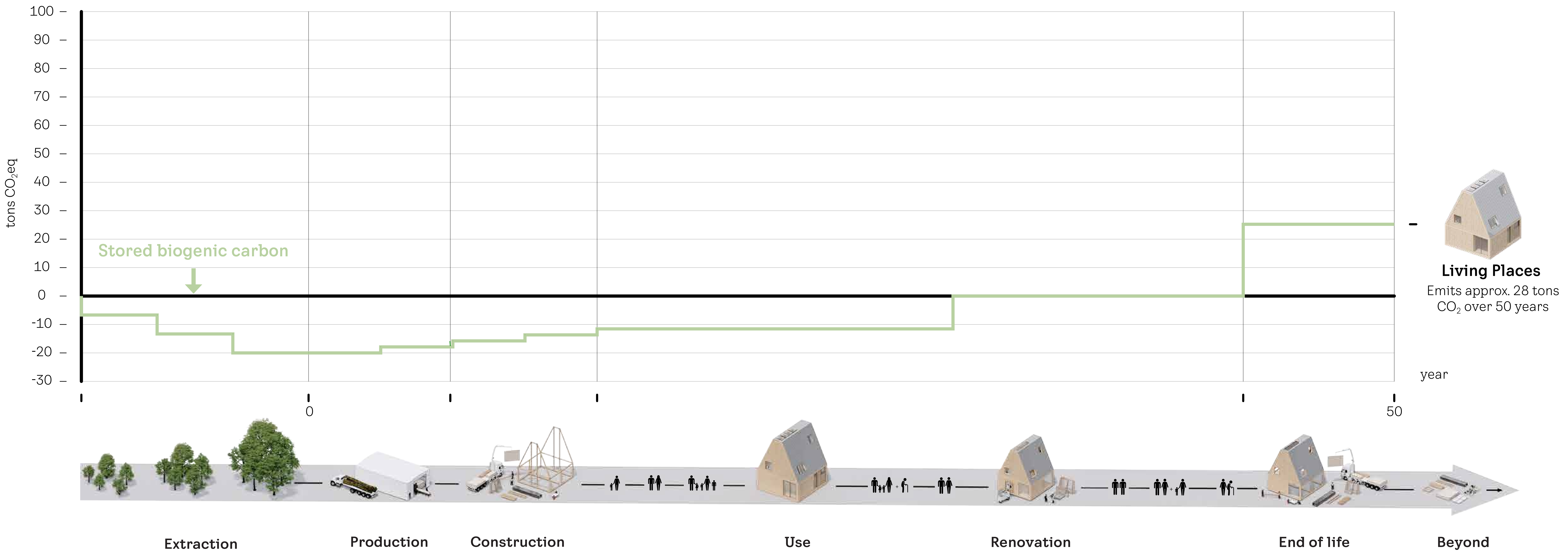
However we need to take responsibility for the entire lifecycle of a building. When doing that we realize that the emissions of the full lifecycle is much greater than just focusing on KWH. Here we show the total emissions from the benchmark house.



Source: EFFEKT Architects, 2023

Full lifecycle emissions from Living Places

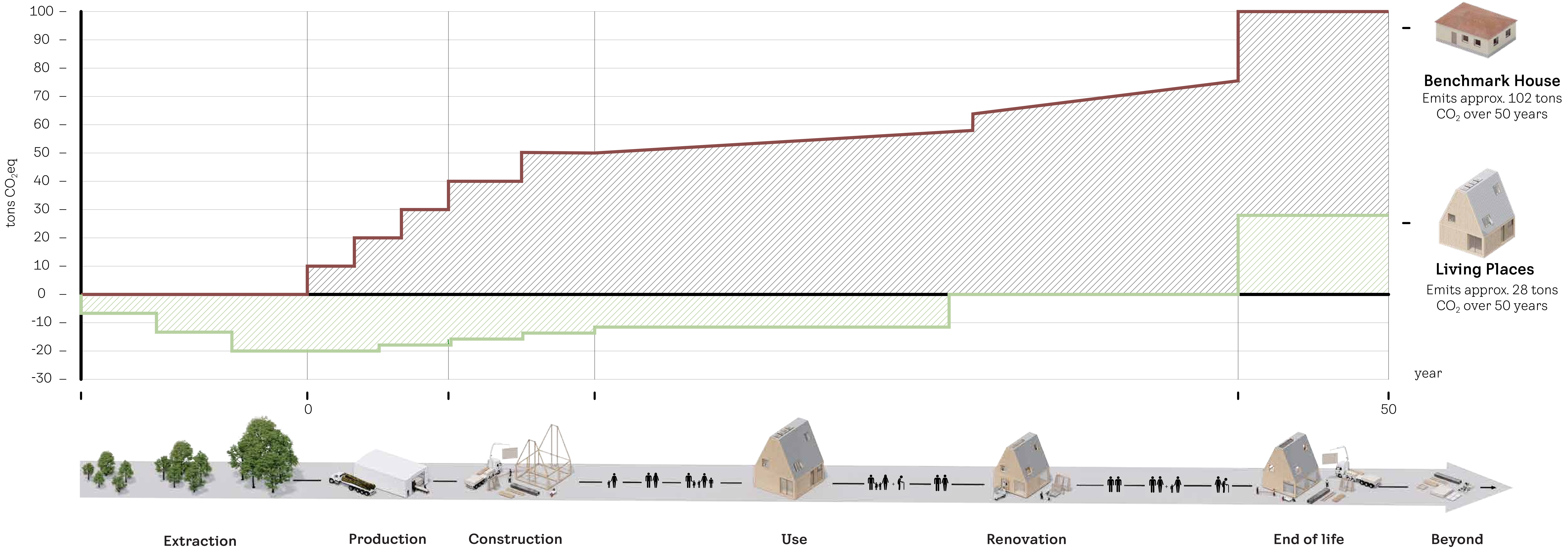
The Living Places house is CO_2-negative through most of its lifetime – partly because of the stored biogenic carbon in the trees used as building materials.



Source: EFFEKT Architects, 2023

Full lifecycle emissions
Comparison

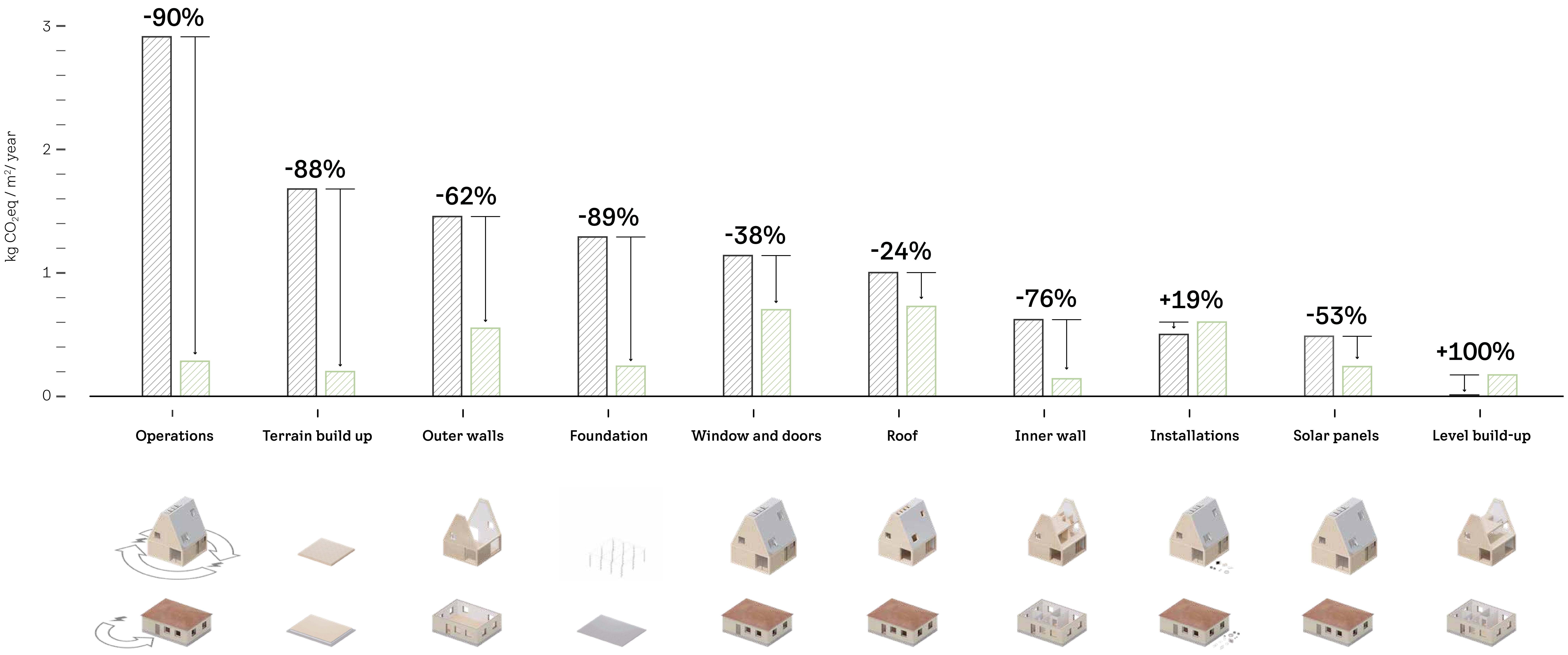
The diagram compares the CO_2 emissions of the full lifecycle of the Benchmark house and the Living Places house.



Source: EFFEKT Architects, 2023

Optimization of each component

Diagram showing the comparison between each element.
This shows where we get the biggest savings.

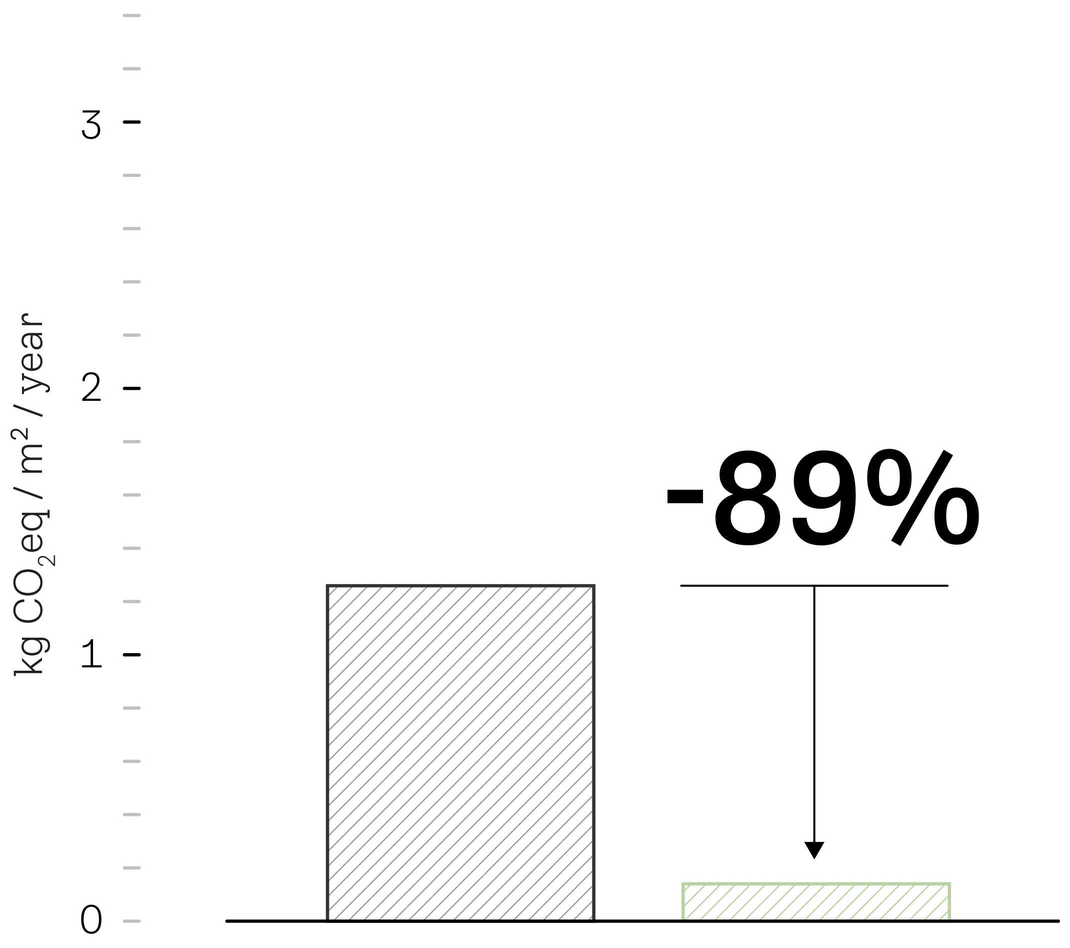


Source: LCA calculations done by Artelia, 2022.

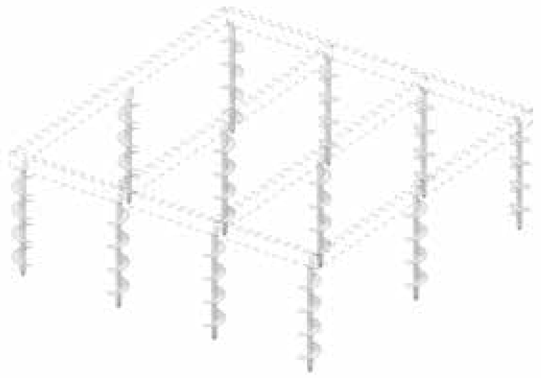
Foundation comparison

Foundation comparison between the benchmark house
(Strip foundation in Leca and concrete) and Living Places (screwpile)

Benchmark House



Emission Comparison



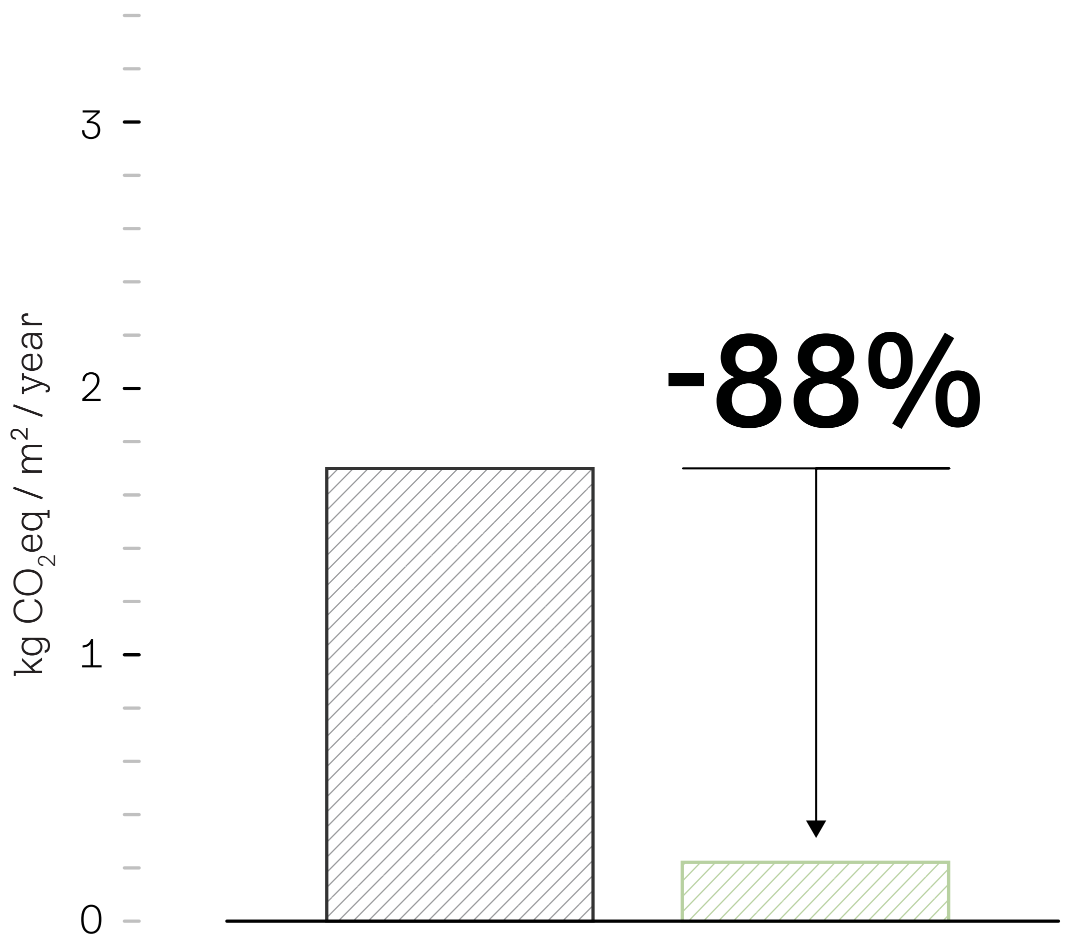
Living Places

Source: LCA calculations done by Artelia, 2022.

Terrain build-up comparison

Terrain build-up comparison between the benchmark house (traditional concrete) and Living Places (lightweight wooden cassette)

Benchmark House

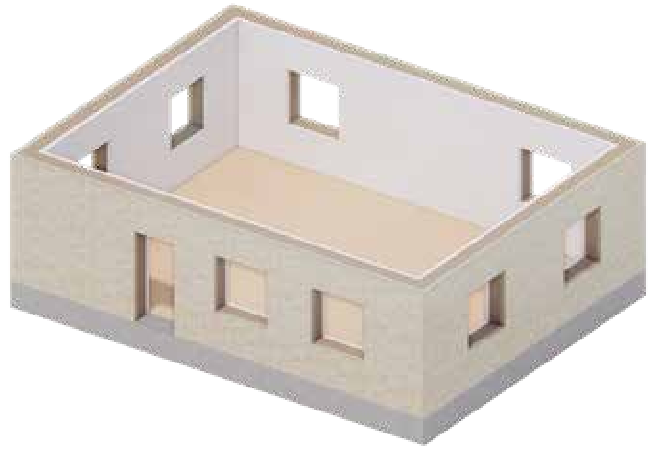


Emission Comparison

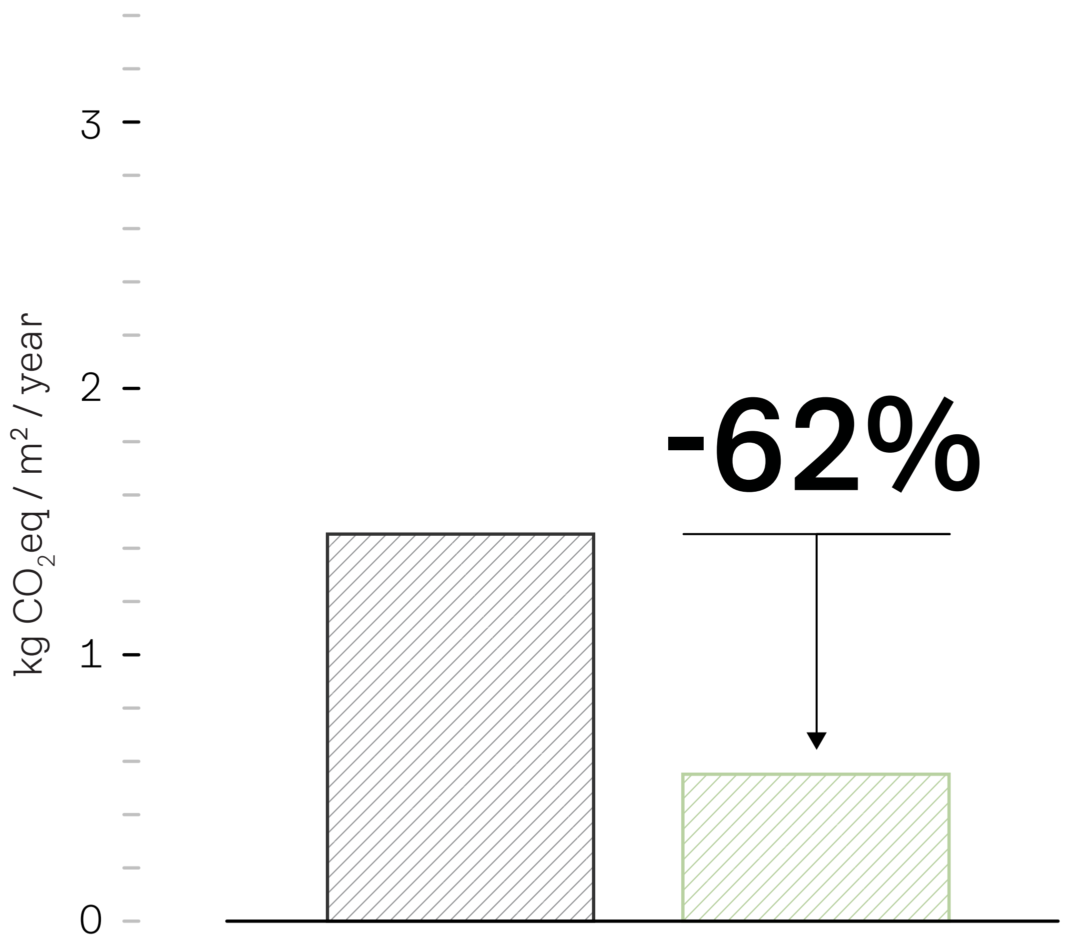
Living Places

Outer wall comparison

Outer walls comparison between the benchmark house (heavy concrete back wall & brick facade) and Living Places (wood cassette with wood fiber & wood facade)



Benchmark House



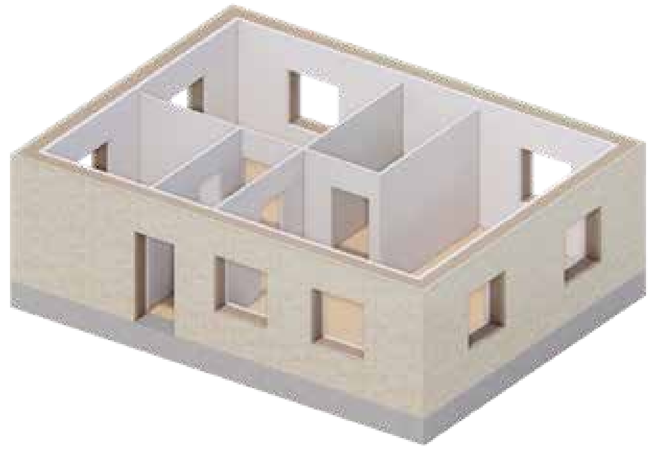
Emission Comparison

Living Places

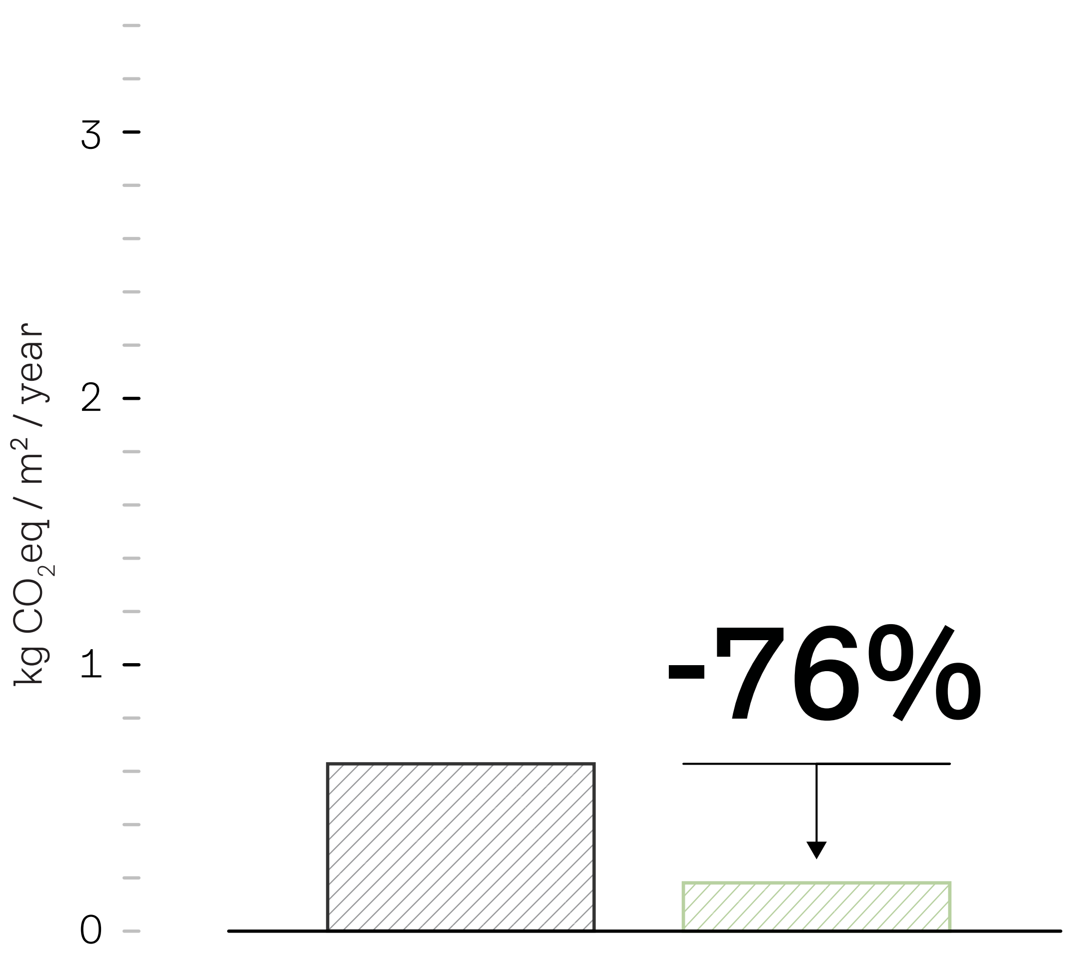
Source: LCA calculations done by Artelia, 2022.

Inner wall comparison

Inner wall comparison between the benchmark house (aerated concrete) and Living Places (Wooden frame, with osb and plaster)



Benchmark House



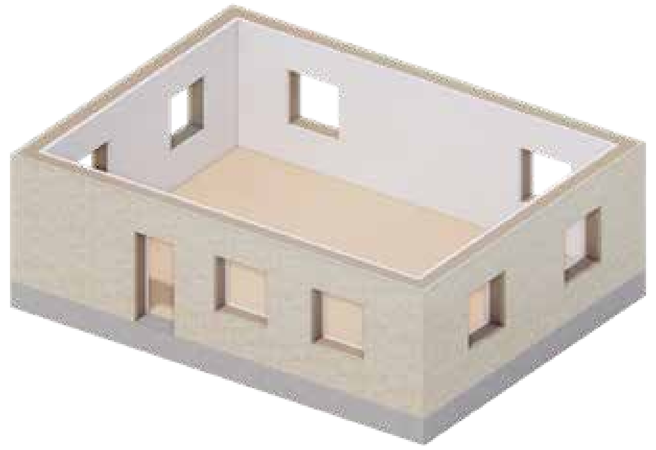
Emission Comparison

Living Places

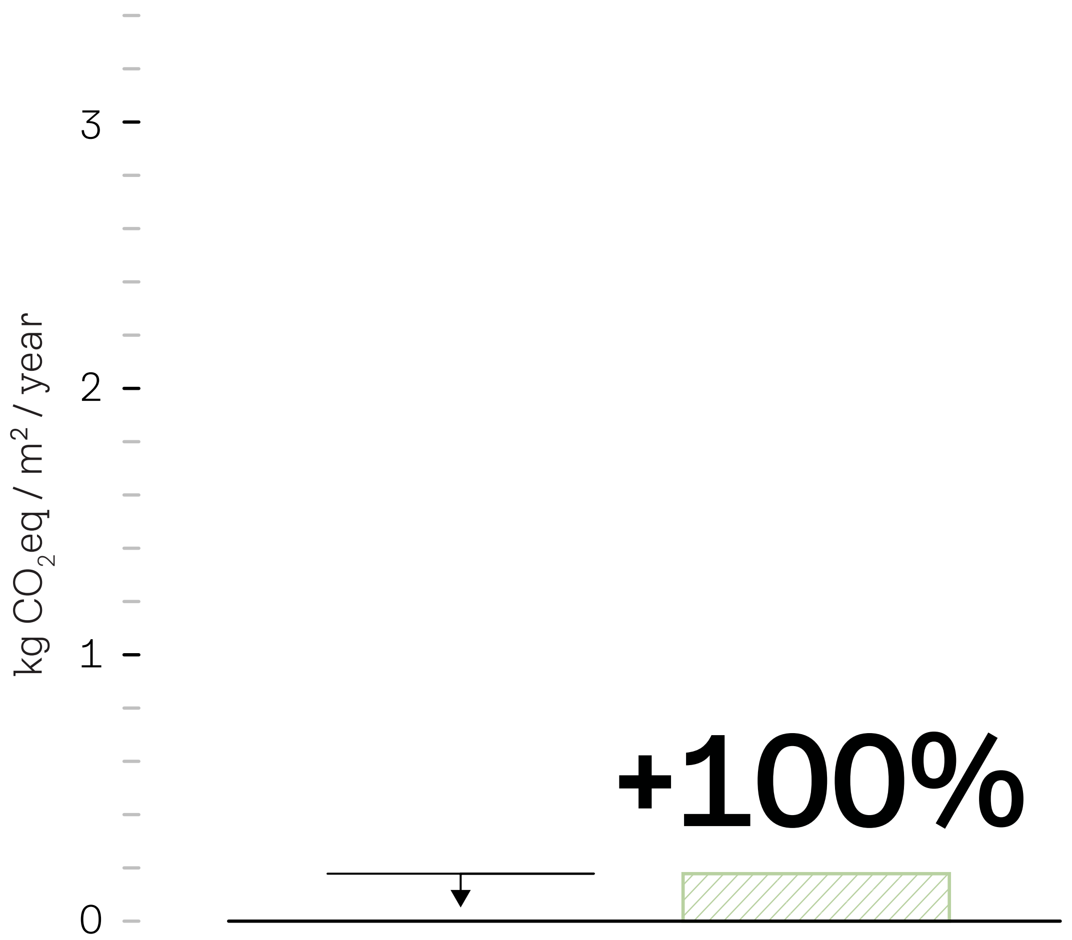
Source: LCA calculations done by Artelia, 2022.

Level build-up comparison

Level build-up comparison between the benchmark house (no level build-up) and Living Places (lightweight wood cassette deck with plaster)



Benchmark House



Emission Comparison

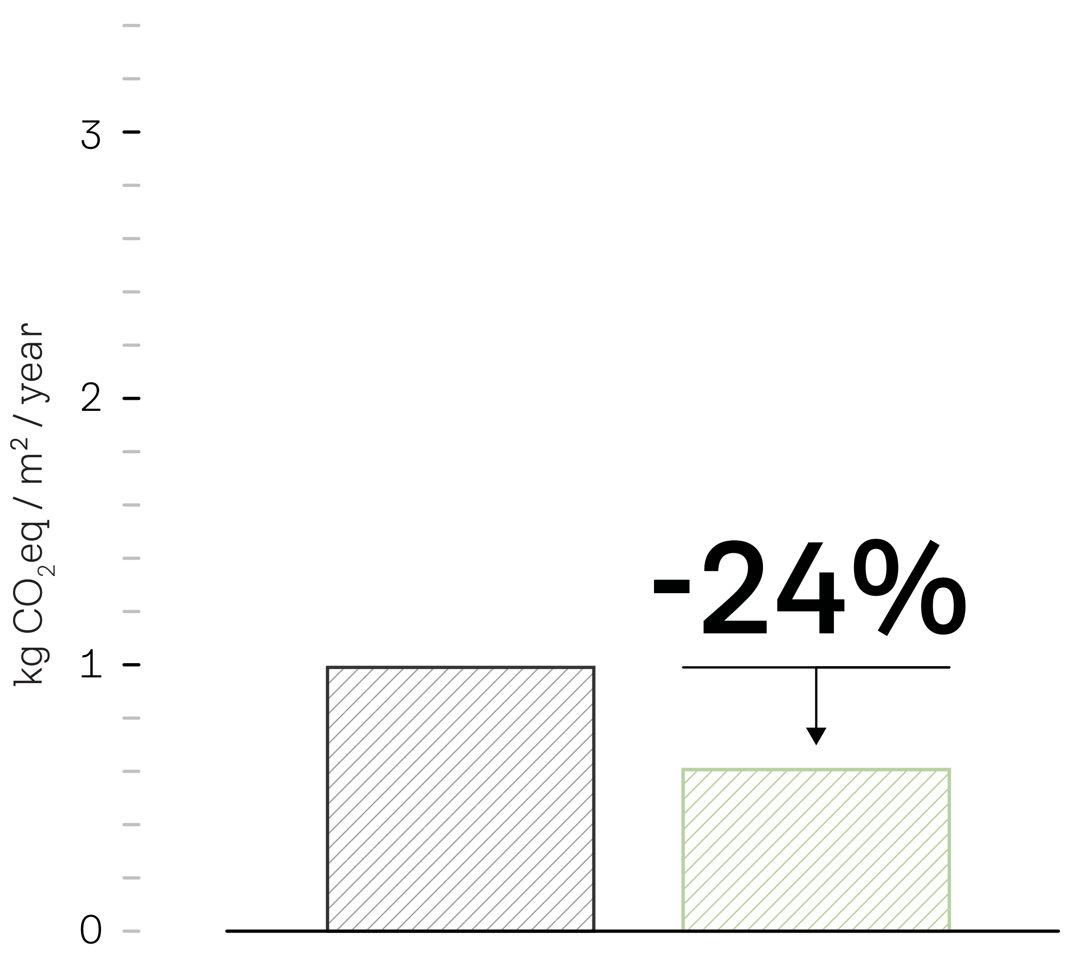
Living Places

Source: LCA calculations done by Artelia, 2022.

Roof comparison

Roof comparison between the benchmark house (barred construction with ventilated attic and roof tiles) and Living Places (lightweight wood cassette with wood fiber insulation and metal roofing)

Benchmark House



Emission Comparison

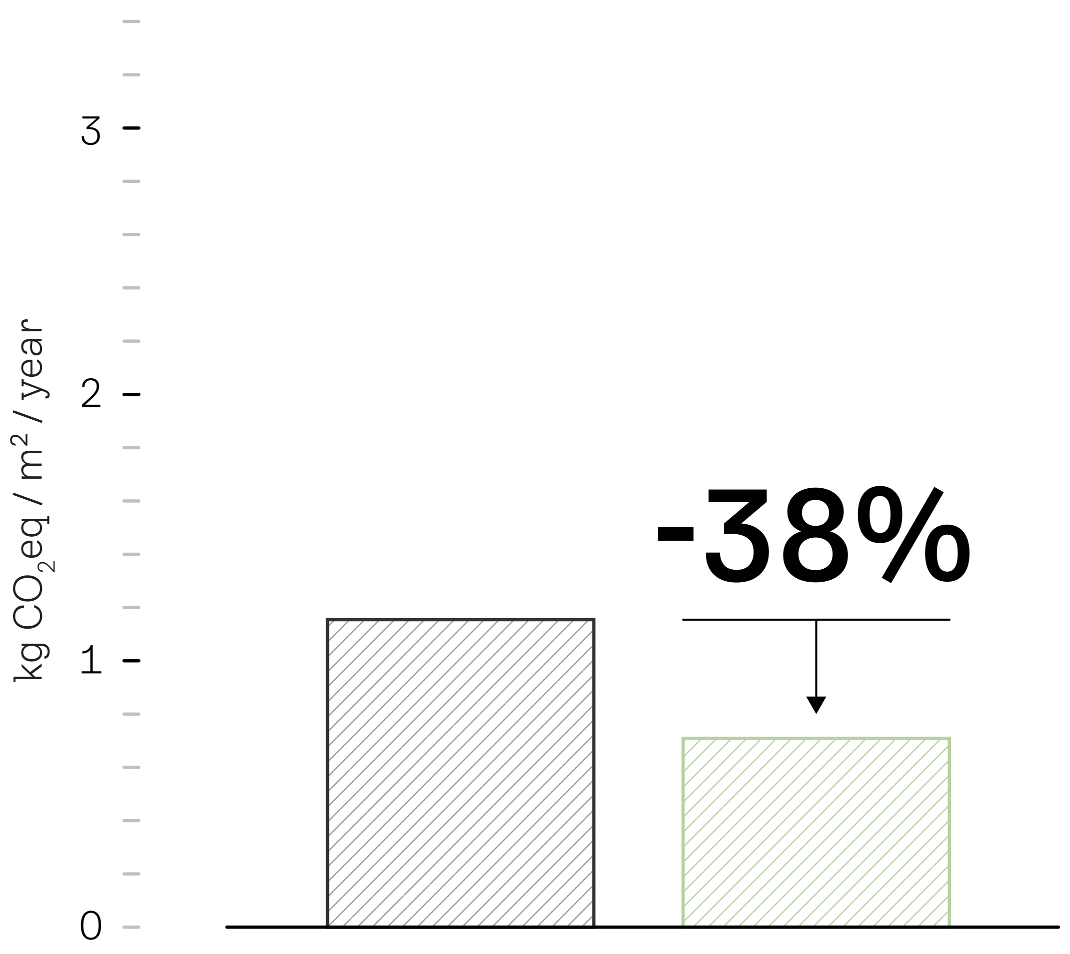
Living Places

Source: LCA calculations done by Artelia, 2022.

Windows & doors comparison

Roof comparison between the benchmark house (triple layer, wood- aluminium window) and Living Places (3 layer wood-wood window, skylight wood-aluminium)

Benchmark House



Emission Comparison

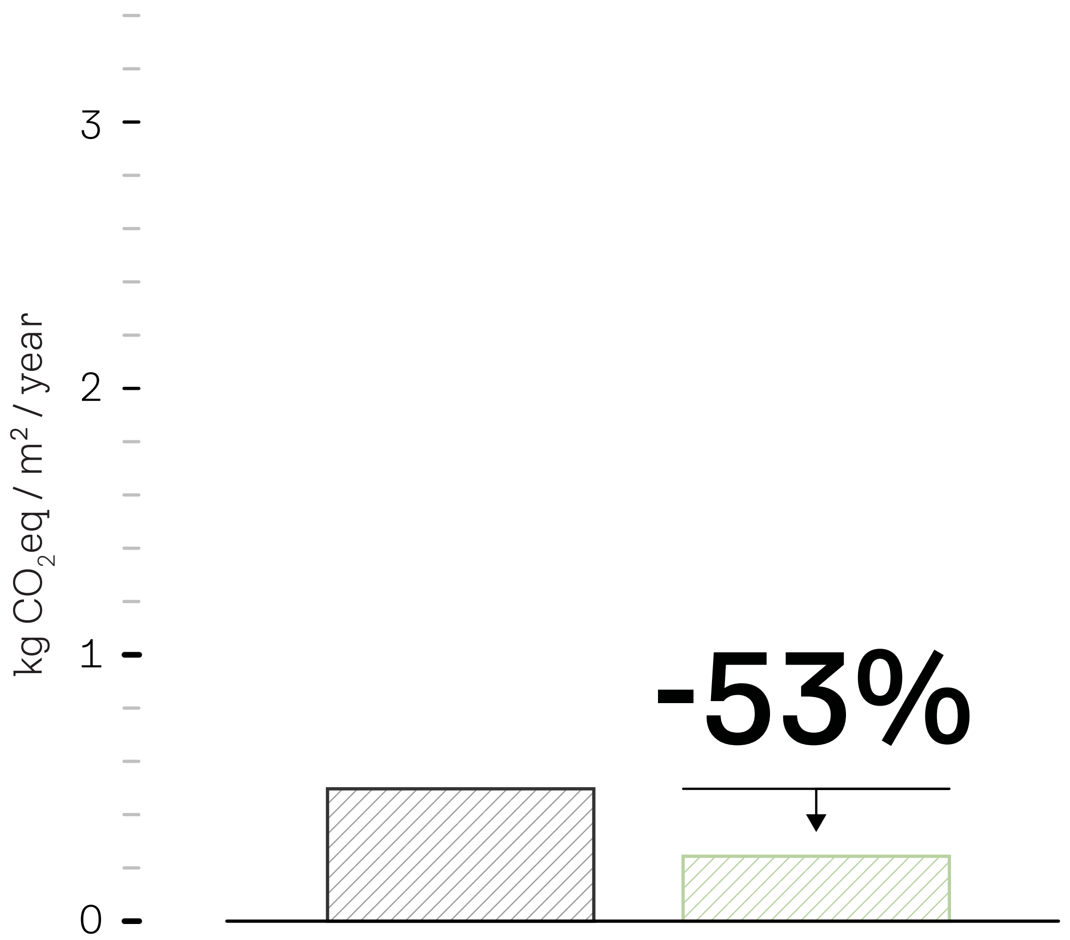
Living Places

Source: LCA calculations done by Artelia, 2022.

Solar panel comparison

Solar panel comparison between reference house and Living Places. The reduction is gained by selecting high efficiency panels.

Benchmark House



Emission Comparison

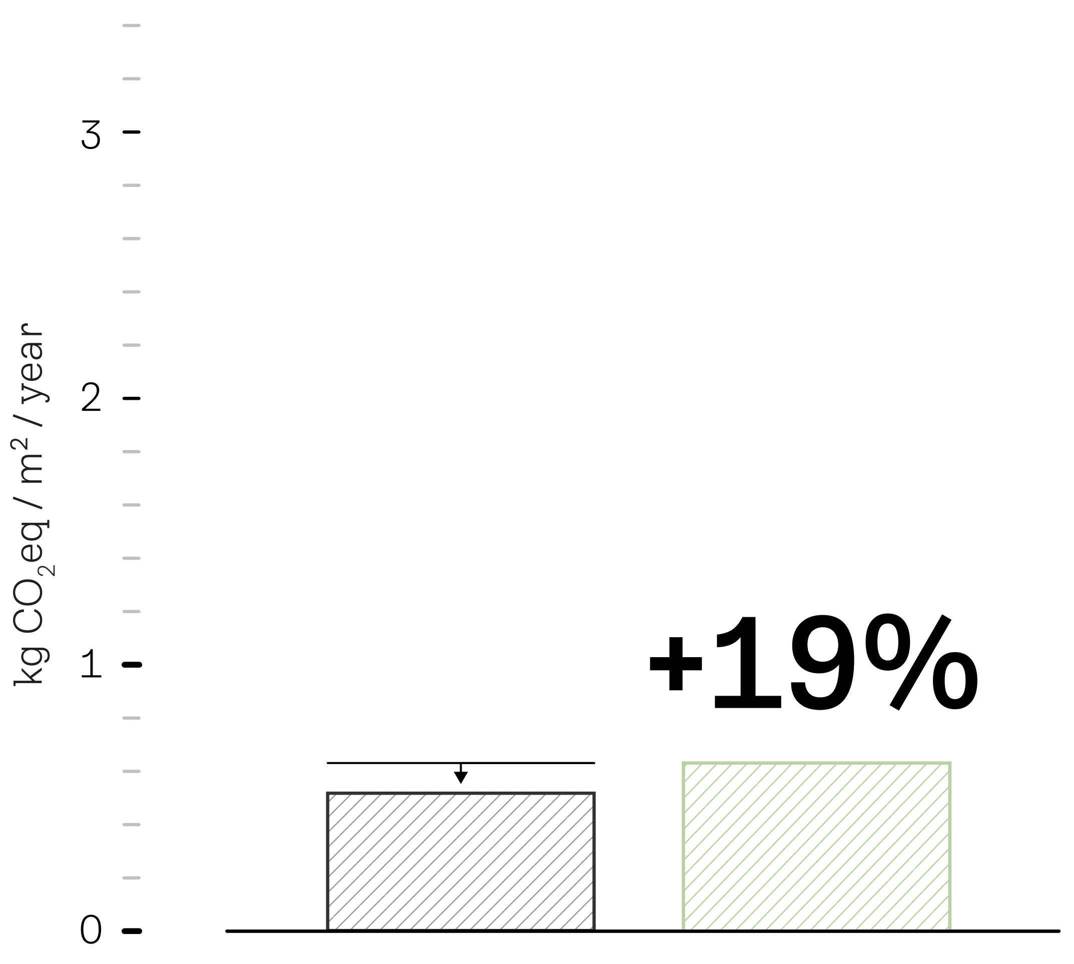
Living Places

Source: LCA calculations done by Artelia, 2022.

Installations & ventilation comparison

Installation and ventilation comparison between the benchmark house (Mechanical ventilation, solar panels) and Living Places (Highly efficient solar panels and natural ventilation)

Benchmark House



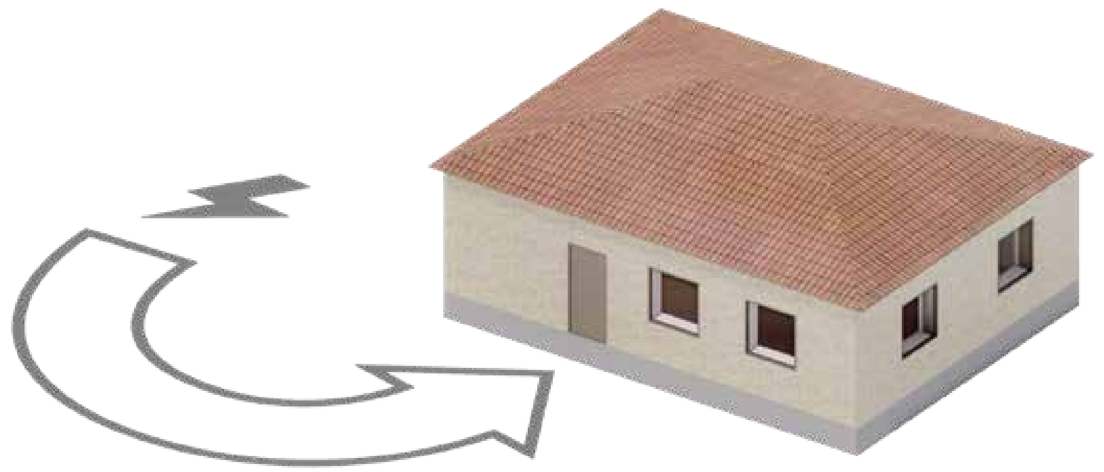
Emission Comparison

Living Places

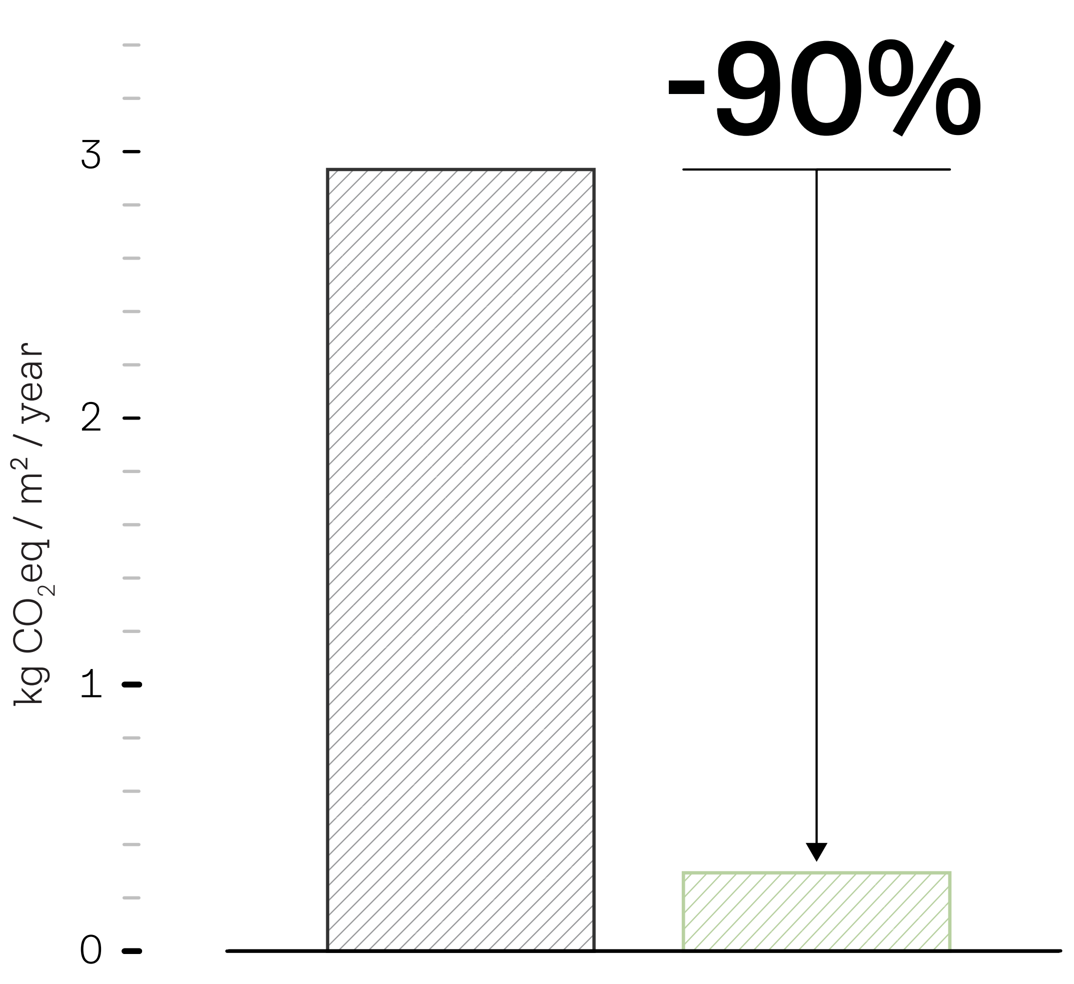
Source: LCA calculations done by Artelia, 2022.

Operation comparison

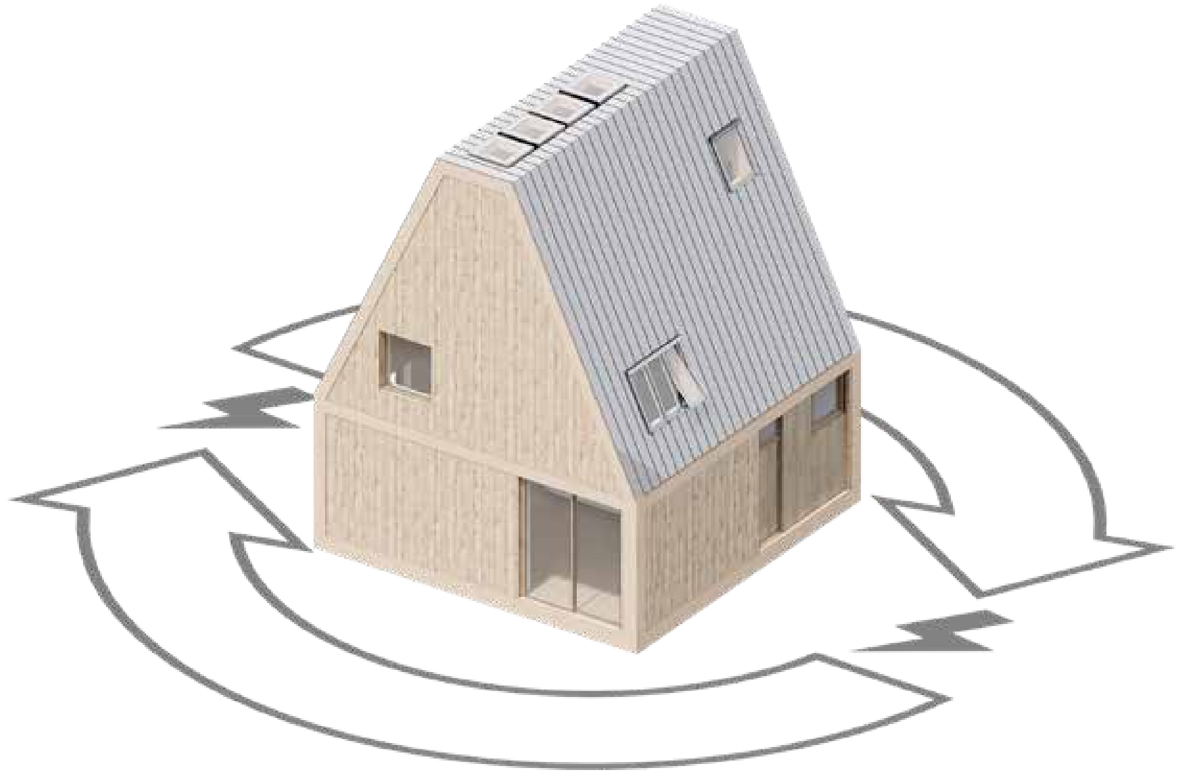
Operational comparison between the benchmark house (District heating and grid connection) and Living Places (Air to water heat pump solar panels, grid connections)



Benchmark House



Emission Comparison



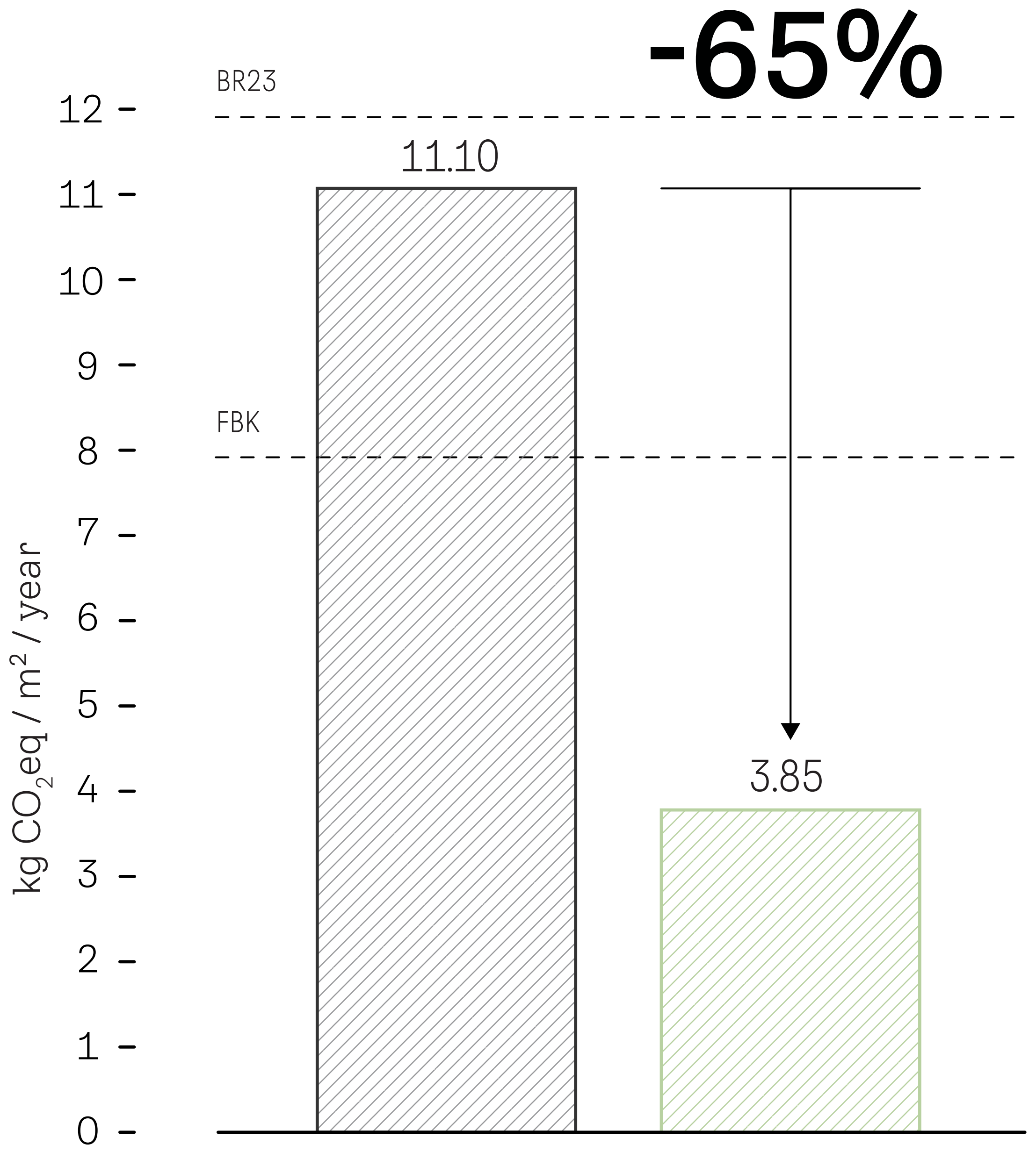
Living Places

Source: LCA calculations done by Artelia, 2022.

Total comparison comparison

Comparison between the benchmark house and Living Places full LCA analysis.

Benchmark House



Emission Comparison

Living Places

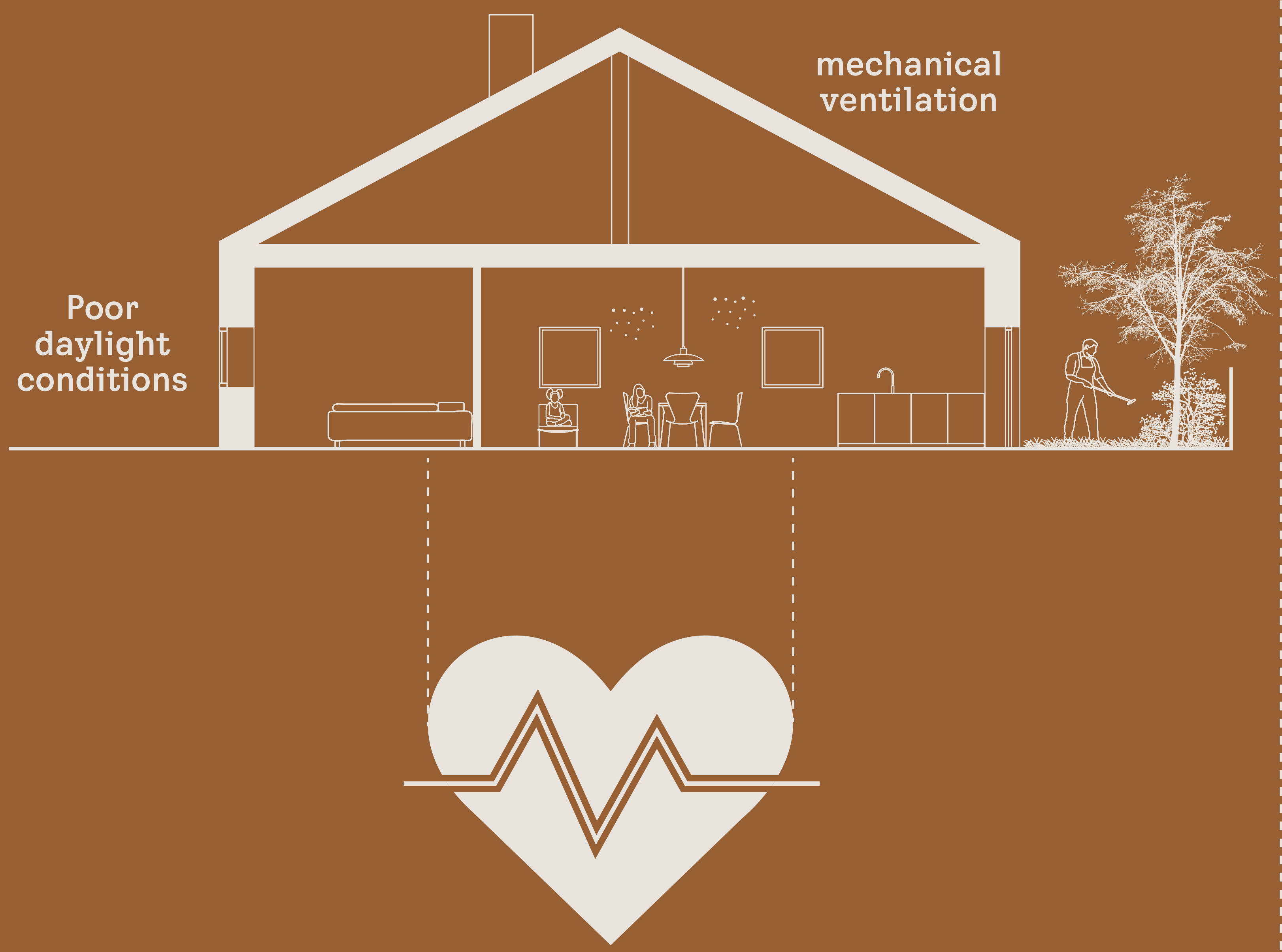
Source: LCA calculations done by Artelia, 2022.

Healthy People

What if we could reduce the environmental impact, while enhancing the health and wellbeing for people?

Benefiting both people and planet, through the use of healthy building principles. Focusing on daylight, thermal indoor environment, Indoor air quality, acoustics and connections to the outdoors we ensure homes that enhance wellbeing for people

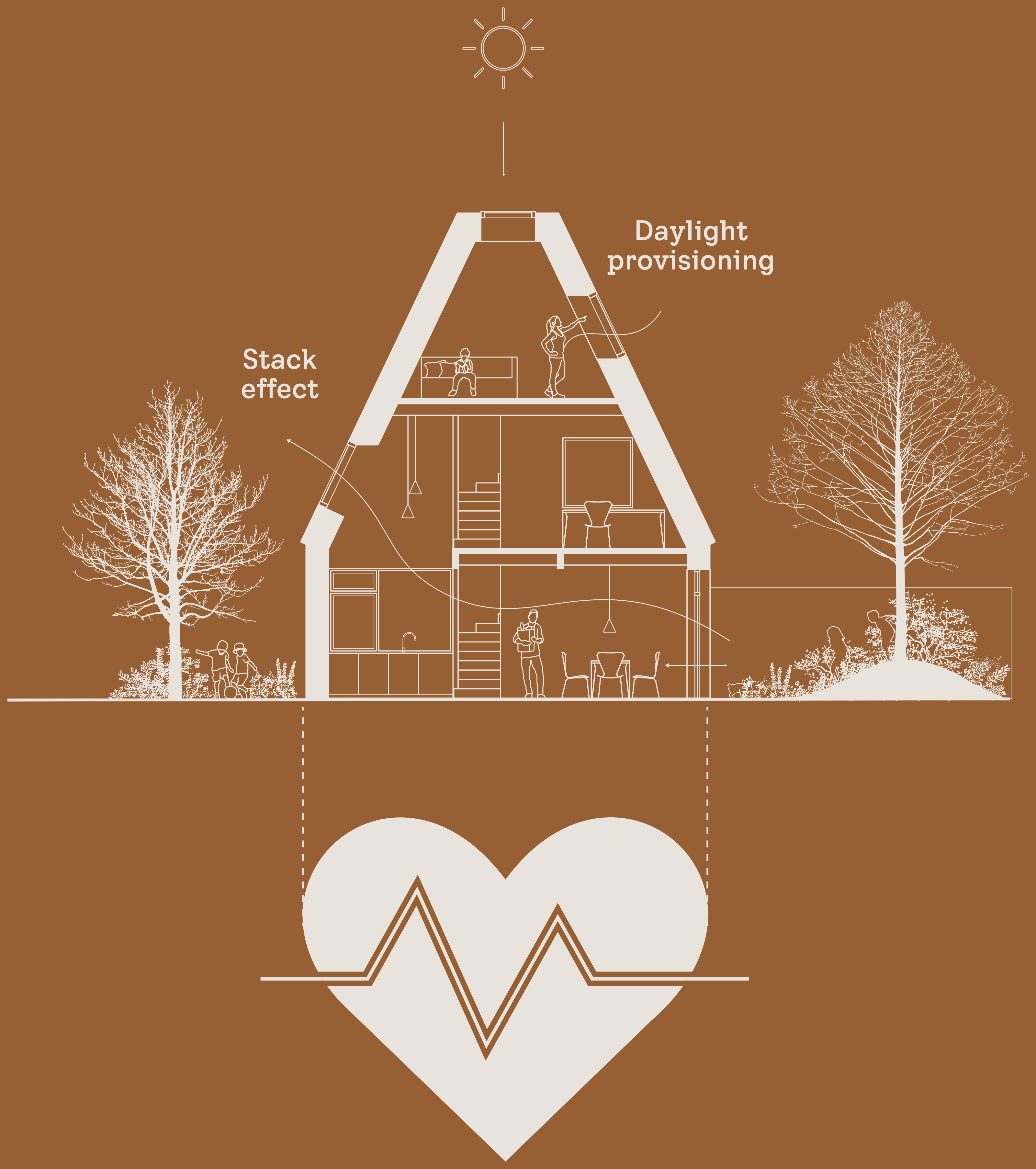
Health impact
of a typical single family house in Denmark



Indoor climate class 3

The reference house's lack of healthy building principles led to a low Active House radar score, signifying a subpar indoor environment.

Health impact
of the Living Places



Indoor climate class 1

By integrating healthy house principles, we achieve a higher Active House score and, thereby, an indoor environment that is three times better.

Source: EFFEKT Architects, 2023

Healthy Building principles

We spend 90% of our time indoors, so the way we build and live directly affects our physical and mental health. Living Places focuses not only on how we create a better living environment for our planet but also on creating a path towards a future-oriented society that enhances living conditions for people as well. Living Places showcases how we can build homes that don't just make us less sick but actually contribute to improving our health.

By combining mechanical ventilation, effective filtration of outdoor air with natural ventilation through windows and door, a healthy indoor climate is secured through the whole year, even when the outside temperature drops. Both roof windows and the mechanical ventilation is connected to sensors which automatically opens the windows, activates blinds and increases the air flow to prevent overheating and bad indoor air quality.

In addition, an effective cooker hood is installed to remove particles from the indoor air.

Installing roof windows both on the pitched and flat roof, more daylight is let into the rooms increasing the feeling of well-being and at the same time reducing the need for artificial light.

DAYLIGTH

THERMAL COMFORT

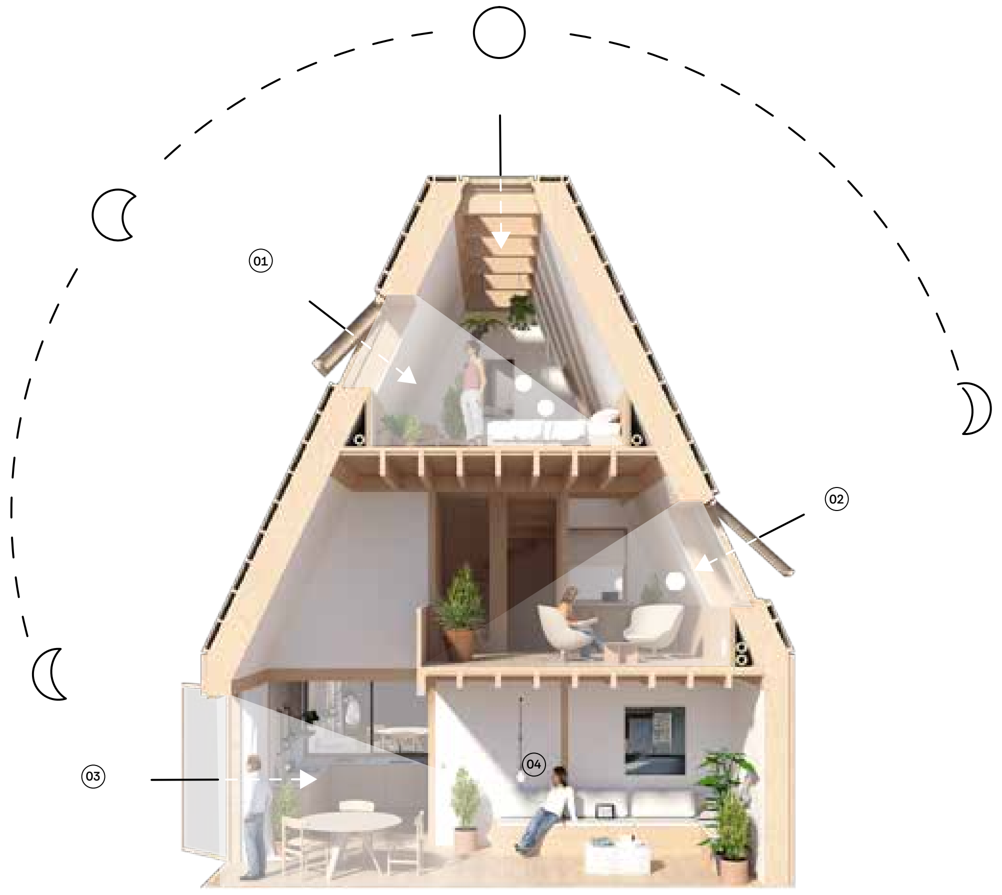
INDOOR AIR QUALITY

ACOUSTICS

OUTDOOR CONNECTION

Healthy Building principles

Daylight



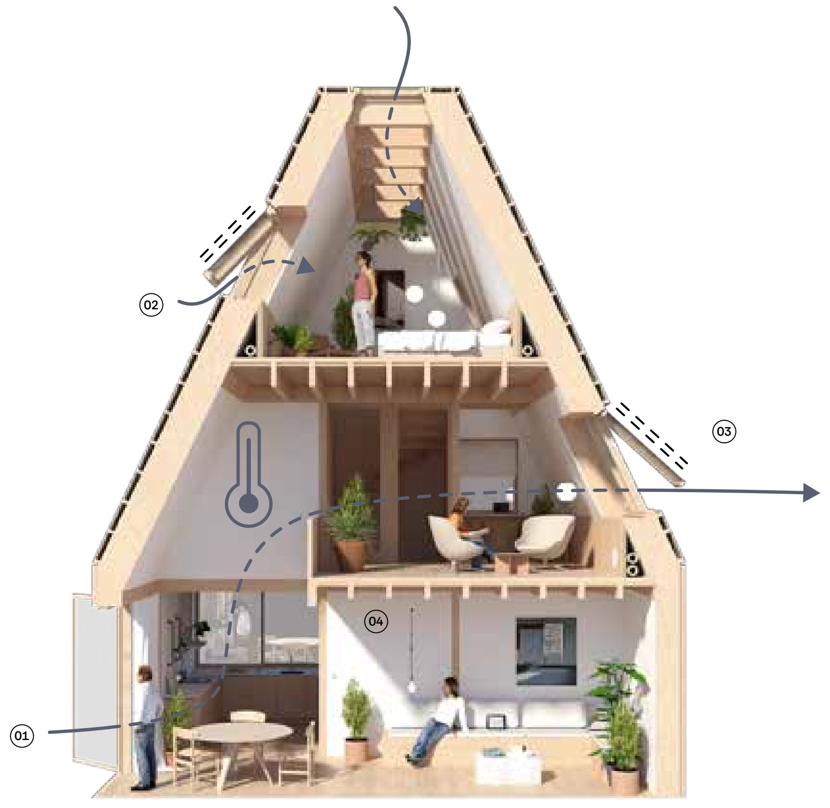
01 Daylight Autonomy

02 Daylight from multiple directions

03 Daylight following the circadian rhythms

04 Glare and reflectance management

Thermal environment



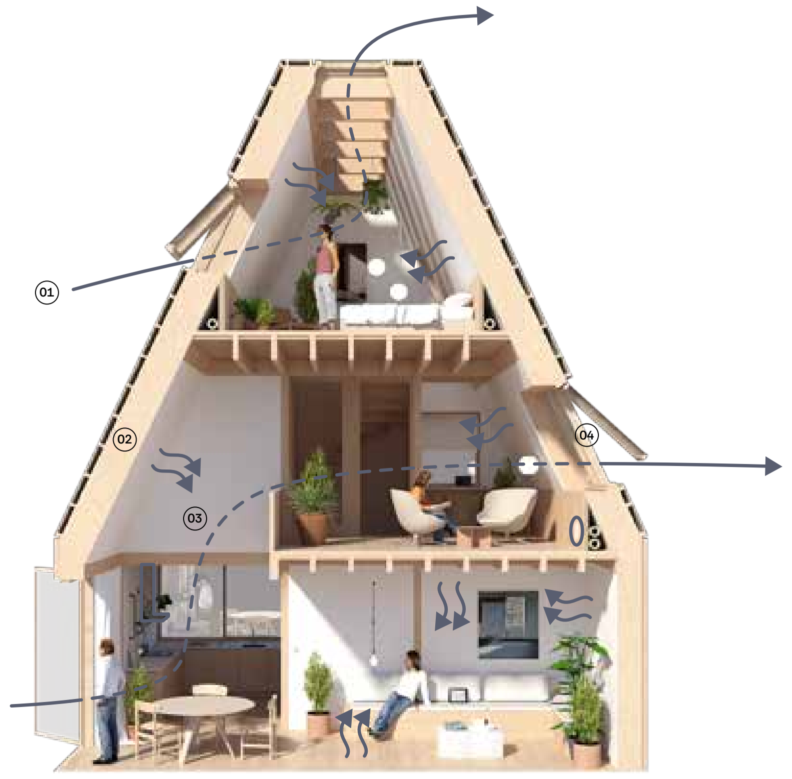
01 Ventilative cooling

02 Draught control

03 Dynamic shading

04 Operative temperature

Indoor air quality



01 Fresh air (CO_2 concentration)

02 Low-emitting building materials

03 Particle removal and filtration

04 Dampness (cross and stack ventilation)

Acoustics

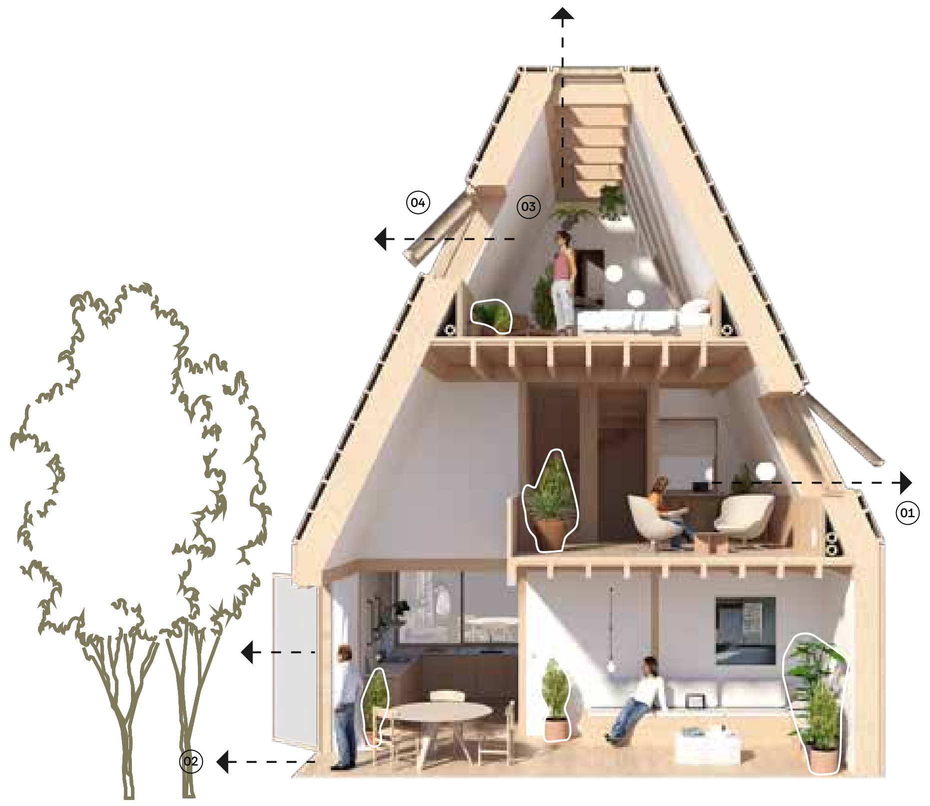
01 Noise insulation

02 Controlled sound transmission

03 System noise

04 Acoustic privacy

Outdoor connection



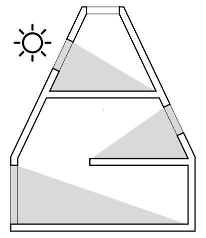
01 Direct view of nature

02 Direct access to nature

03 Bring the outdoor in

04 Direct sky view

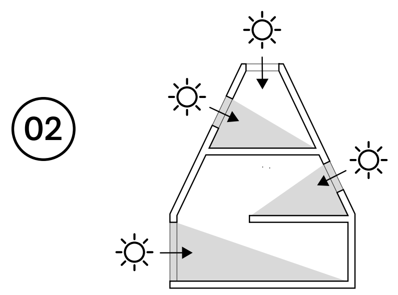
Daylight

01 

DAYLIGHT AUTONOMY

Daylight in buildings is composed of a mix – direct sunlight, diffuse skylight, and light reflected from the ground and surrounding elements. Daylighting design needs to consider orientation and building site characteristics, façade and roof characteristics, size and placement of window openings, glazing and shading systems, and geometry and reflectance of interior surfaces. Good daylighting design ensures adequate light during daytime.

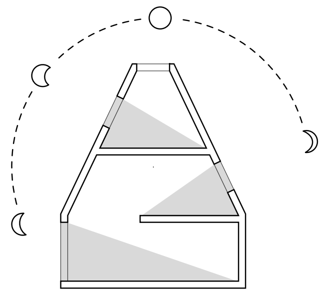
Daylight



DAYLIGHT FROM MULTIPLE DIRECTIONS

The positioning of windows will influence the distribution of daylight in the room and determine the amount of 'useful' daylight. Window position should also take into account the relation between the view to the outside and the eye level of the occupants. Windows in multiple facades/roofs ensures a good distribution throughout the day with the changing sun position.

Daylight

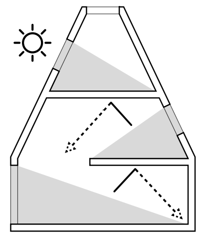
03 

DAYLIGHT FOLLOWING THE CIRCADIAN RHYTHMS

Many aspects of human physiology and behaviour are dominated by 24-hour rhythms that have a major impact on our health and well-being. They control sleep/wake cycles, alertness and performance patterns, core body temperature rhythms, as well as the production of the hormone melatonin and cortisol. These daily rhythms are called circadian rhythms and their regulation depends very much on the environment we live in. The dynamic variation of light, both daily and seasonally, is a critical factor in setting and maintaining our 24-hour daily rhythms – our circadian rhythms – which, in-turn, play a key role in the regulation of the sleep/wake cycle.

Daylight

04



GLARE AND REFLECTANCE MANAGEMENT

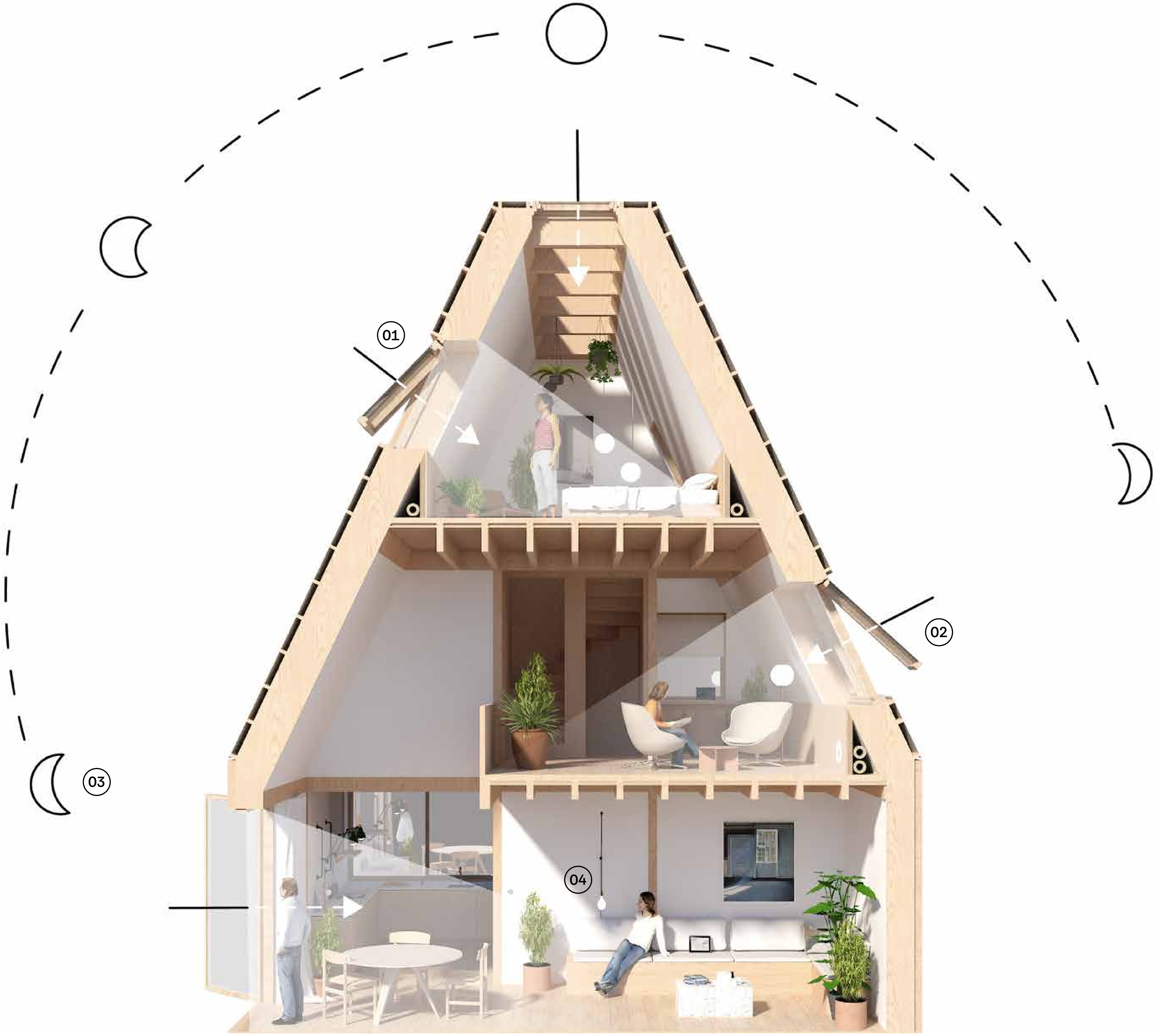
Glare and reflectance control helps to optimizing visual comfort and safety. Glare, caused by excessive brightness or intense light, can lead to discomfort and visual fatigue. Effective management involves controlling the intensity and direction of light sources to minimize these adverse effects.

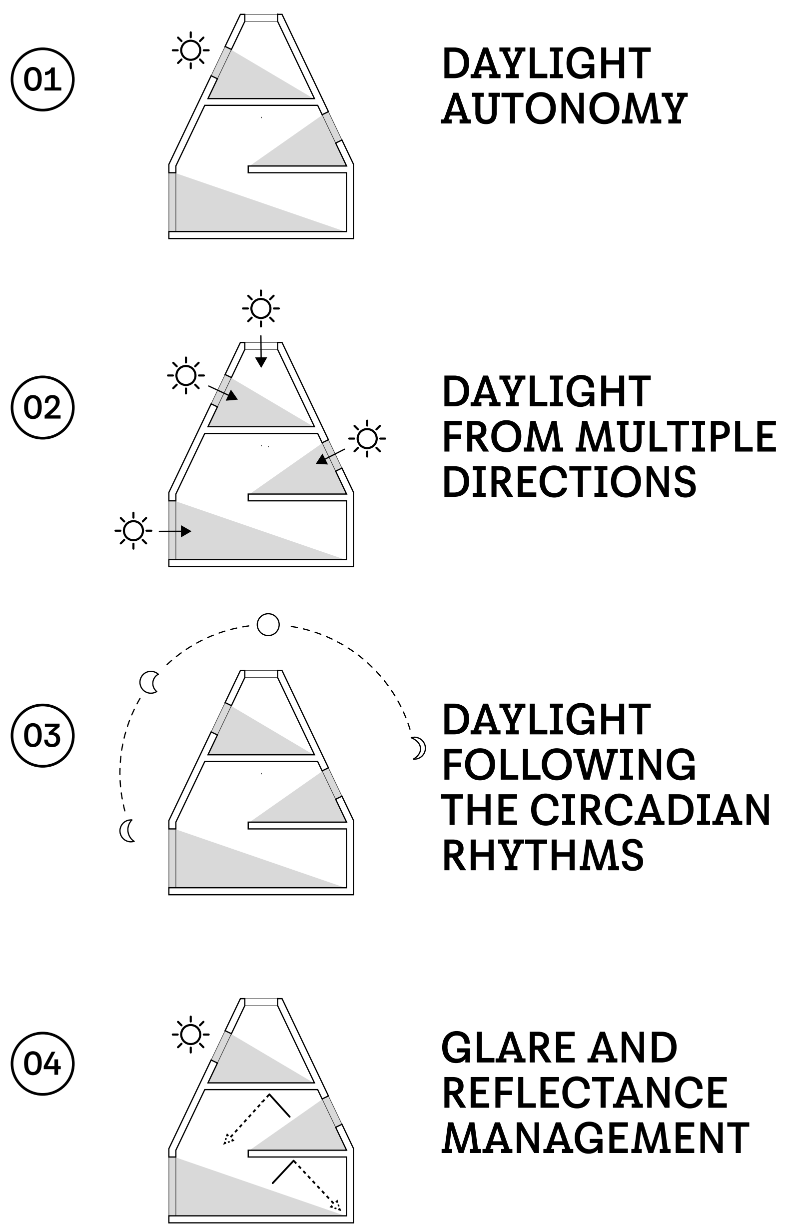
Reflectance management focuses on reducing unwanted reflections, which can hinder visibility and create distractions. This is particularly important in settings where reflective surfaces, such as glass or glossy materials, are prevalent. Employing anti-reflective coatings or strategically placing objects can help mitigate these issues.

Daylight
How we measure

By dynamic simulations of the daylight autonomy it is possible to consider factors as orientation, location, seasons and occupant requirements.

The method used is the DA300/50, a target of 300 lux at least 50% of the yearly hours.





Targets

Active House Radar

Daylight autonomy

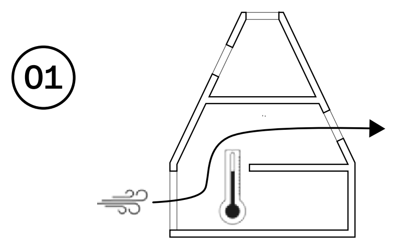
1	2	3
>70%	>60%	>50%

Reflectance

Ceiling	Wall	Floor
0,7	0,5	0,2

Source: EFFEKT Architects, 2023

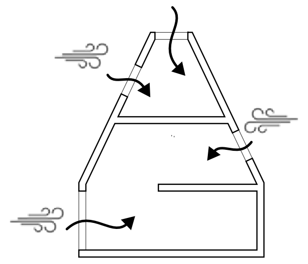
Thermal environment

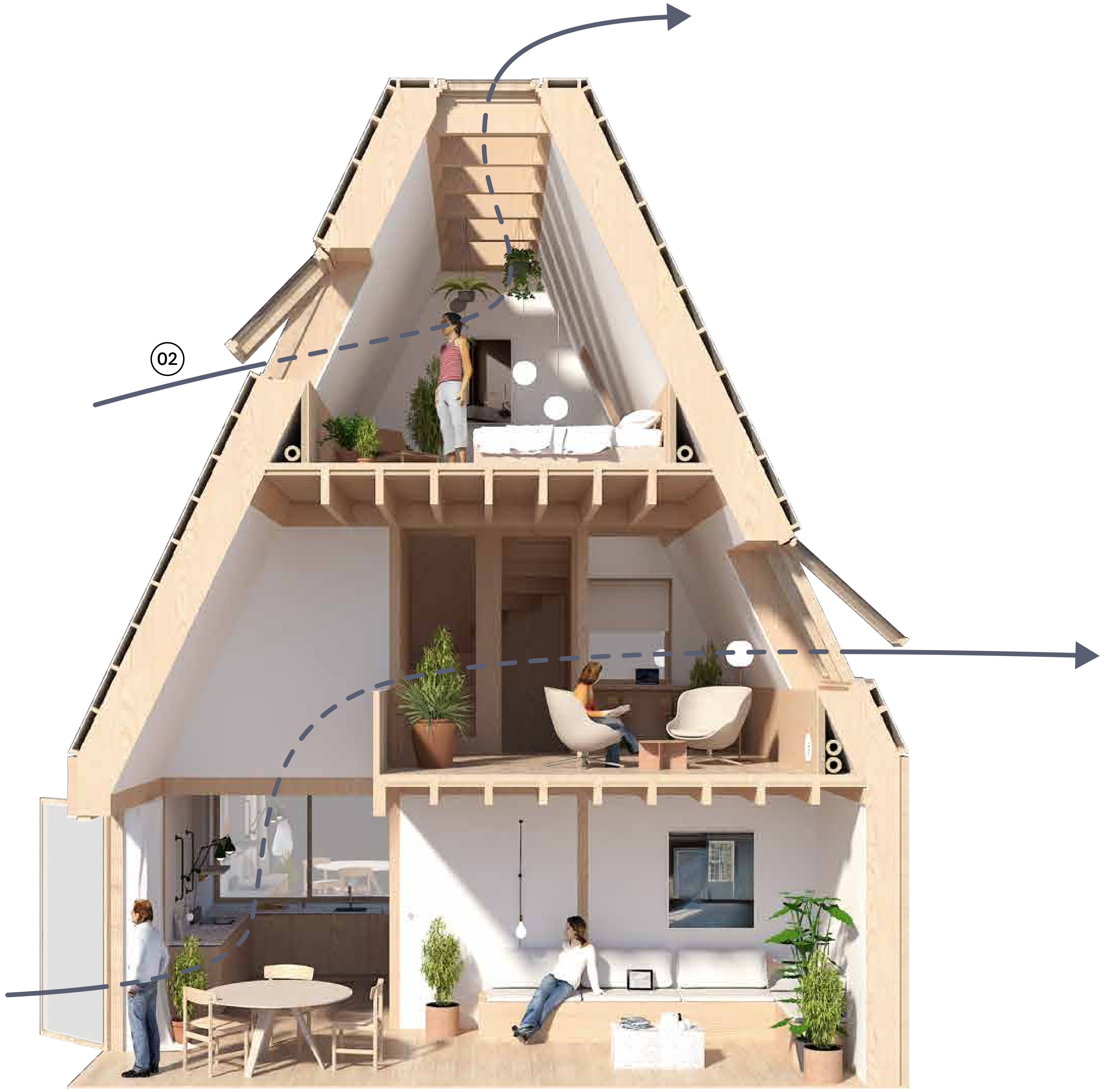


VENTILATIVE COOLING

Ventilative cooling refers to the use of natural or mechanical ventilation strategies to cool indoor spaces via outdoor air. The use of outside air reduces the energy consumption of cooling systems while maintaining Thermal environment. The most common technique is to use increased ventilation airflow rates and night ventilation. Natural ventilative cooling by opening windows is a very direct and fast method of influencing the thermal environment. An open window will cause increased air motion, and if the outdoor temperature is lower than indoors the room temperature will fall.

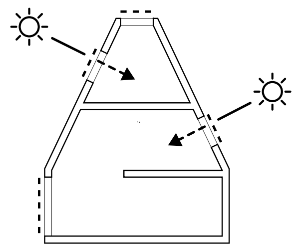
Thermal environment

02  DRAUGHT CONTROL



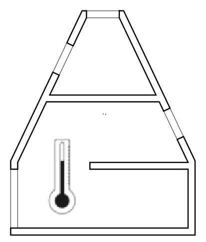
Effective draught control involves optimizing the size and placement of ventilation openings to encourage a gentle, controlled airflow. This can be achieved through the strategic use of features like adjustable vents, window design, and building orientation. Additionally, utilizing technologies such as automated sensors or airflow regulators allows for precise control, ensuring a balance between fresh air intake and draught prevention.

Thermal environment



Blinds and shutters block solar radiation and thus reduce the amount of heat entering a room. Overheating during summer can be efficiently reduced, and even eliminated, using proper solar shading. Automatic control system can be used to operate the solar shading. The most reliable solution is sensor-based control although time control can also achieve good performance. The advantage of an automatic control system is the ability to adjust the window and its accessories to match the actual needs of the occupants. If solar gain causes overheating, external shading is used; when it makes sense in relation to energy and comfort, the shading is deactivated.

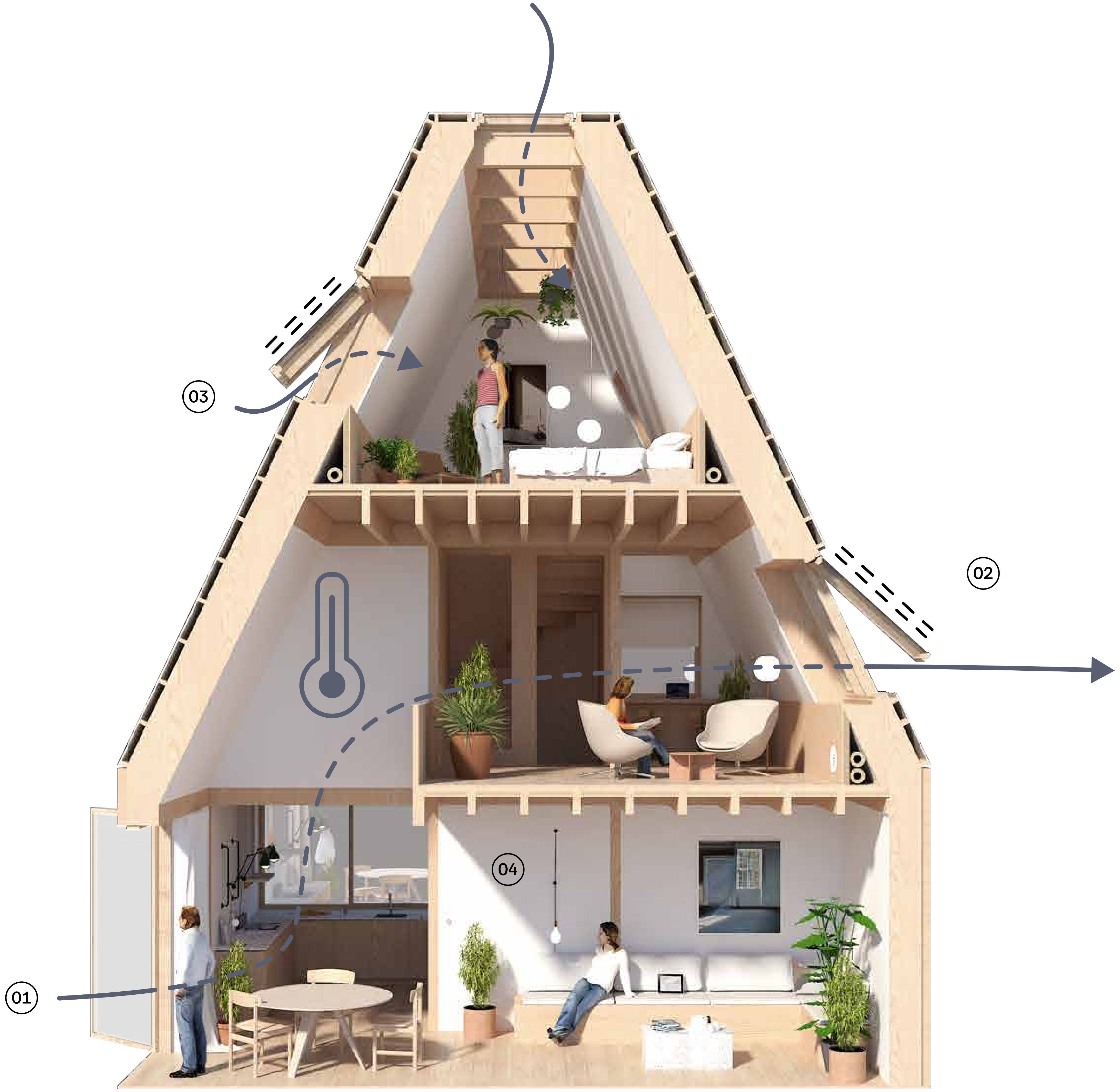
Thermal environment

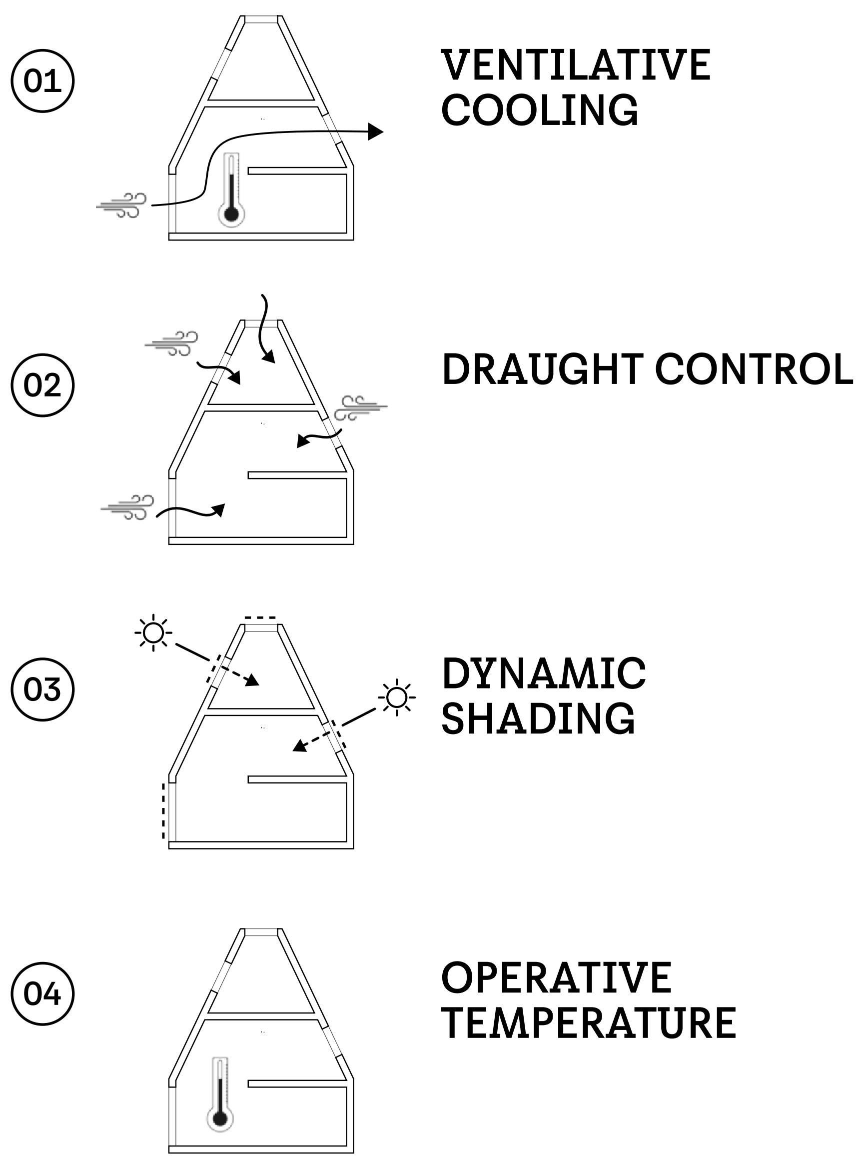
04  **OPERATIVE TEMPERATURE**

Effective draught control involves optimizing the size and placement of ventilation openings to encourage a gentle, controlled airflow. This can be achieved through the strategic use of features like adjustable vents, window design, and building orientation. Additionally, utilizing technologies such as automated sensors or airflow regulators allows for precise control, ensuring a balance between fresh air intake and draught prevention.

Thermal environment
How we measure

To objectify the risk of overheating, a dynamic thermal simulation tool is used to determine hourly values of indoor operative temperature at room level.





Targets

Active House Radar

Max operative temperature

1	2	3
<25,5 °C	<26 °C	<27 °C

Min operative temperature

1	2	3
>21 °C	>20 °C	>19 °C

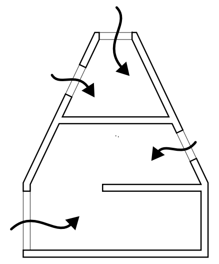
Air speed

Winter	Summer
0,20m/s	0,50m/s

Source: EFFEKT Architects, 2023

Indoor air quality

01

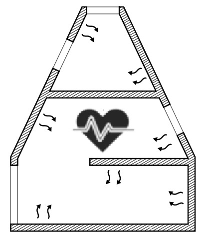


FRESH AIR
CO_2 CONCENTRATION

Fresh air and carbon dioxide (CO_2) concentration play vital roles in maintaining a healthy indoor environment, and natural ventilation is a key factor in achieving this balance. Adequate fresh air intake is essential for diluting indoor pollutants, removing odors, and promoting overall well-being.

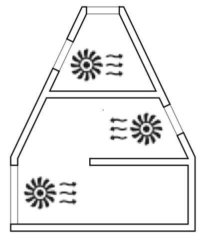
Natural ventilation, facilitated by well-designed openings such as windows and vents, allows for the exchange of stale indoor air with fresh outdoor air. This process helps regulate CO_2 levels, preventing them from reaching concentrations that can negatively impact cognitive function, concentration, and overall health. High CO_2 levels are often associated with poor ventilation and can contribute to symptoms such as headaches, fatigue, and decreased productivity.

Indoor air quality

02  LOW-EMITTING BUILDING MATERIALS

Newly installed building materials such as furniture, insulation, flooring as well as wet-applied products such as paints, sealants and coatings can significantly introduce VOCs into living spaces. VOCs encompass a wide group of volatile substances of both natural and artificial origins which have a wide range of health effects from nose, eye and throat irritation and headaches to liver, kidney and central nervous system damage. To reduce the VOC concentrations indoors, it is important to carefully select products with low or no VOC emissions.

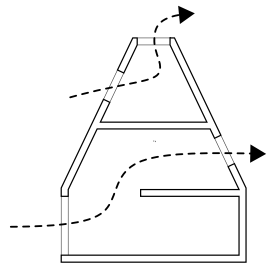
Indoor air quality



03 PARTICLE REMOVAL AND FILTRATION

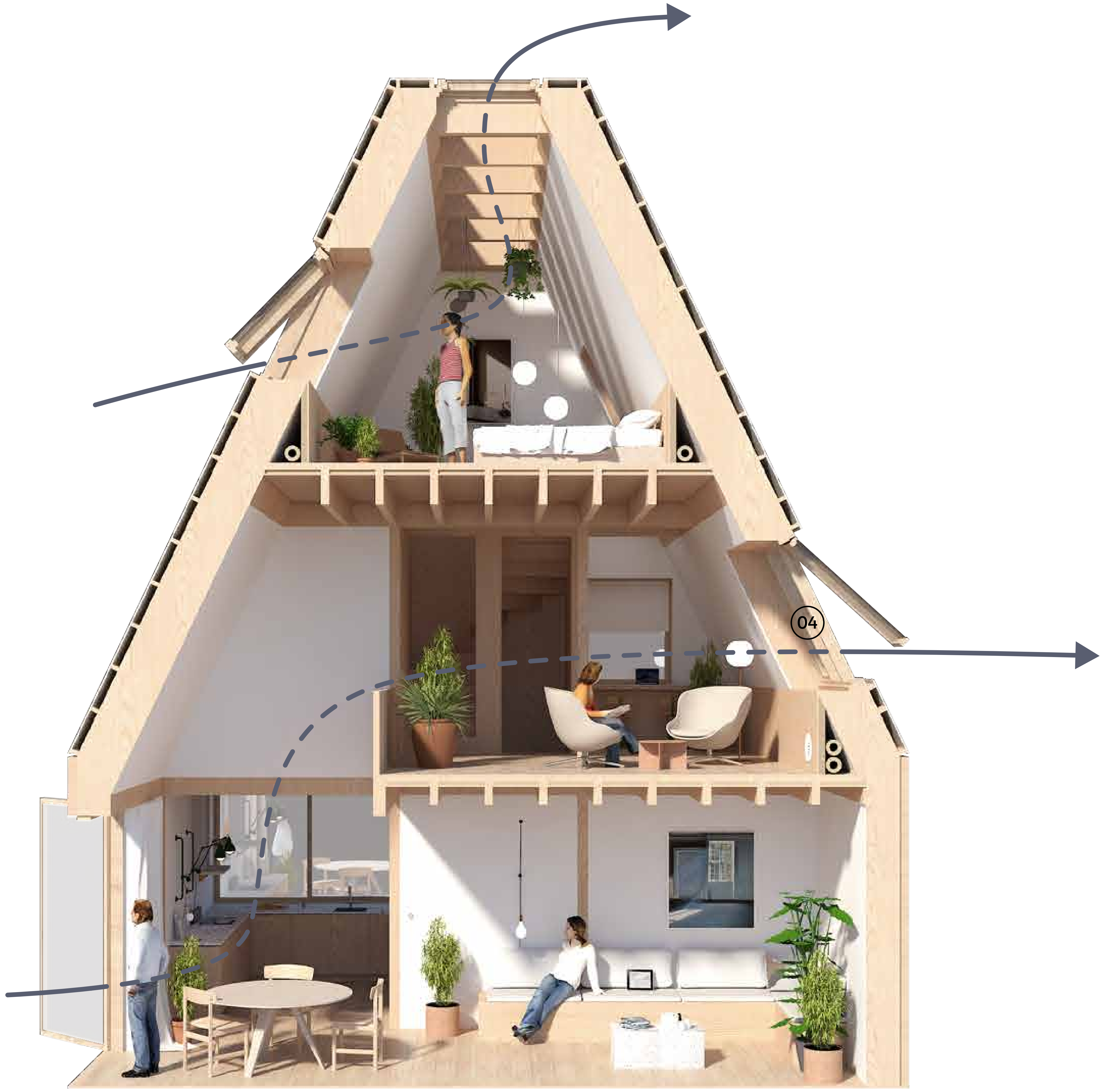
To preserve indoor air quality and maximize olfactory comfort in occupied spaces an effective kitchen hood can be installed to isolate and properly ventilate indoor pollution sources from cooking. Particles are emitted from all burning processes such as fireplaces or similar. Although these are experienced as cozy by many they should be avoided or used with caution.

Indoor air quality

04 

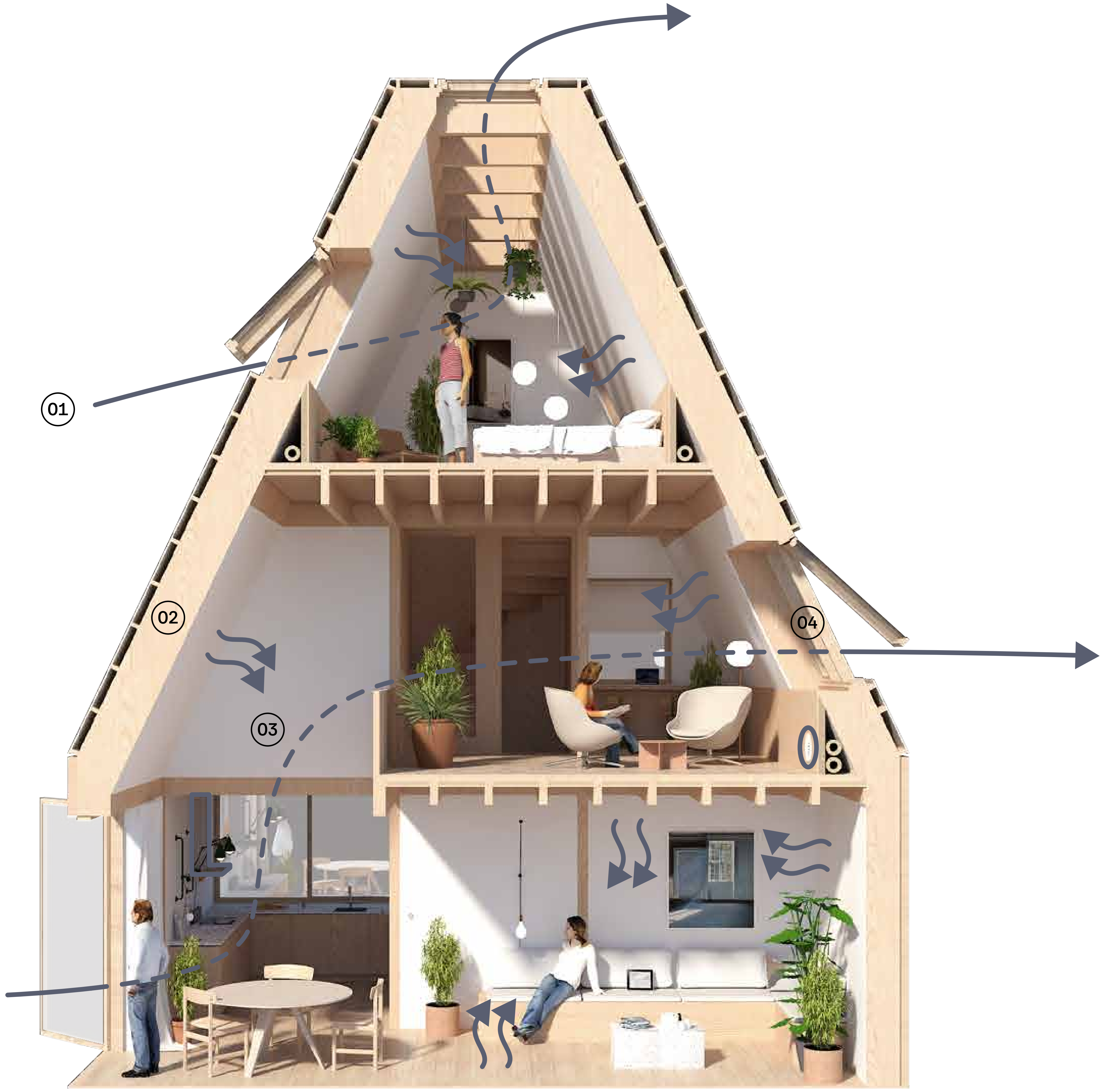
DAMPNESS
CROSS AND STACK VENTILATION

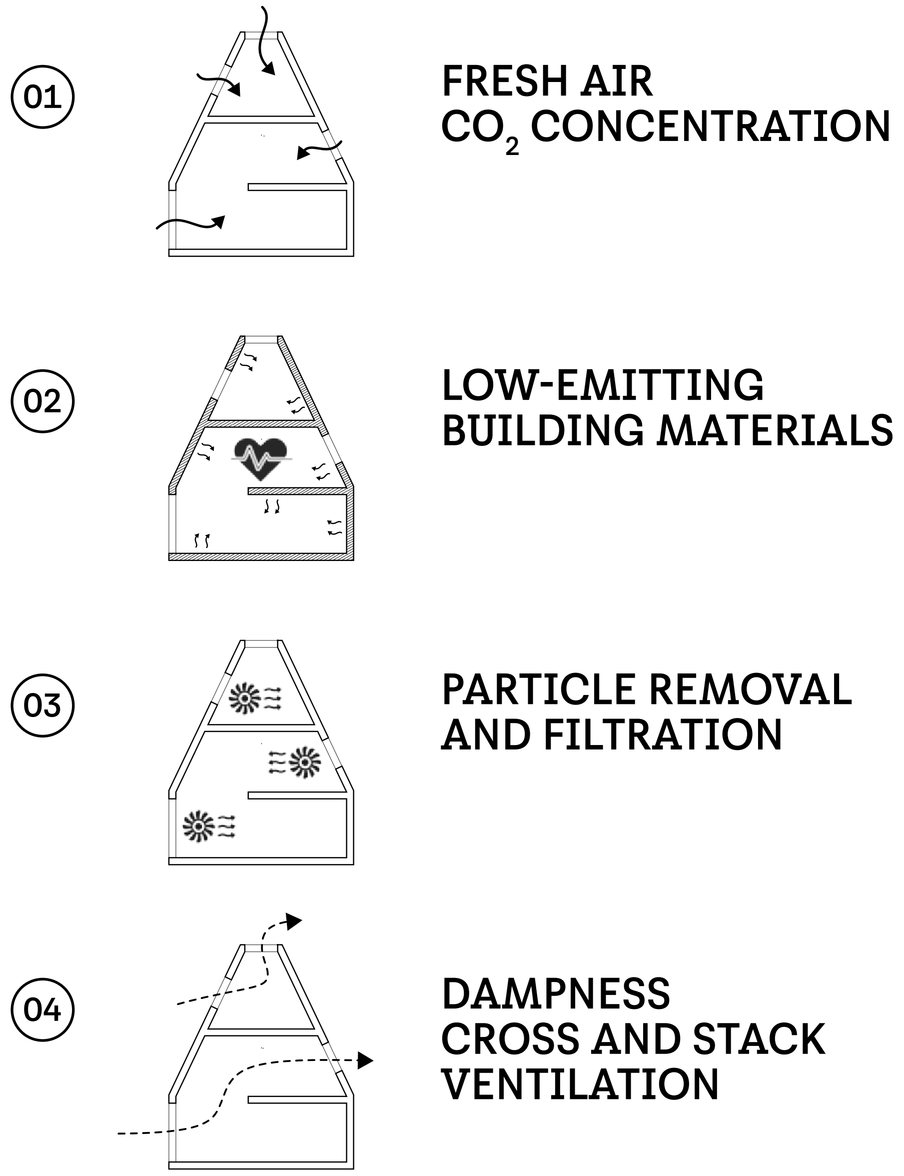
Warm air is lighter than cold air. That causes the stack effect, which means that warm air inside a building will rise. The warm air will leave the building at the top through leakages, stack ducts or open windows and be replaced by outdoor air entering the building at ground level. The higher the building, the more powerful the stack effect. For the stack effect to work efficiently, there must be air passages through the building as well as operable windows at both top and bottom. Ideally these can be controlled together.



Indoor air quality
How we measure

Multiple parameters defines the indoor air quality, such as level of particles, Carbon dioxide, Volatile organic compounds (VOC) from materials, radon and relative humidity and mold.





Targets

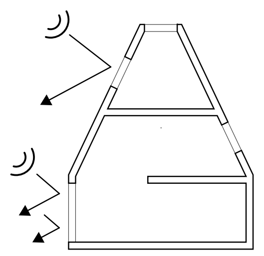
Active House Radar

Fresh air supply (ppm CO_2)

1	2	3
<400ppm	<500ppm	<800ppm

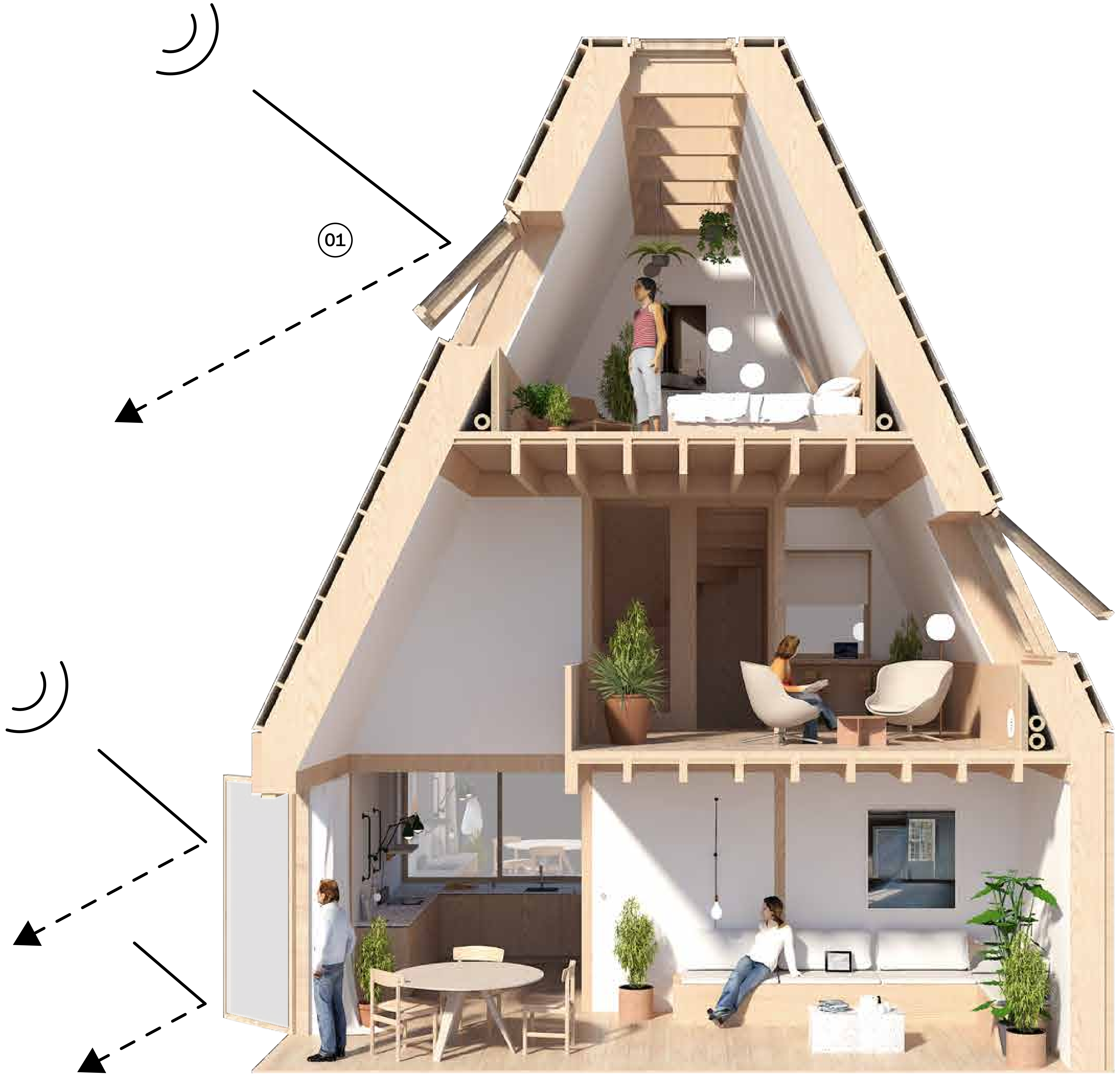
Source: EFFEKT Architects, 2023

Acoustics

01 

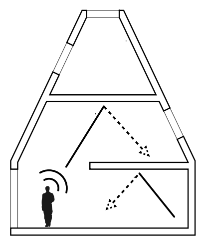
NOISE INSULATION

One important function of the building envelope is to protect the interior from unwanted outdoor noise. Sound insulation is an important parameter of building components, as outdoor noise can have negative effects on health, mood and learning capabilities.



Acoustics

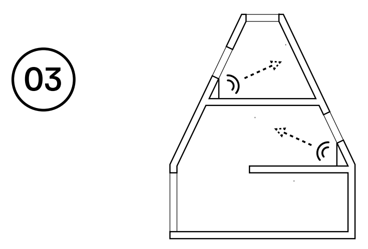
02



CONTROLLED SOUND TRANSMISSION

Reverberation time is an important parameter for the acoustical experience of indoor spaces. Buildings with ‘soft’ interior surfaces are often more appreciated by occupants and visitors. Typical examples of expected reverberation time are; 3-10 seconds in a church; 2 seconds in a concert hall or auditorium; 0.6-1 second in a classroom: and 0.5 second in a home. Intelligibility of speech is often a key factor in a room – and large rooms, with hard, parallel surfaces, can be a challenge.

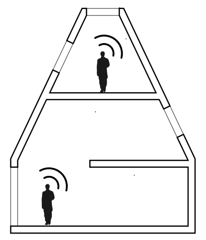
Acoustics



SYSTEM NOISE

At night, even lower noise levels are desired. It is important that occupants can adjust the settings of ventilation systems manually in order to limit noise levels when needed. Noise from heating and cooling systems must also be limited. Modern, energy-efficient buildings have increasingly complex service systems (e.g. heat pumps) – and special attention to avoid excessive noise from these systems should be taken.

Acoustics

04 

ACOUSTIC PRIVACY

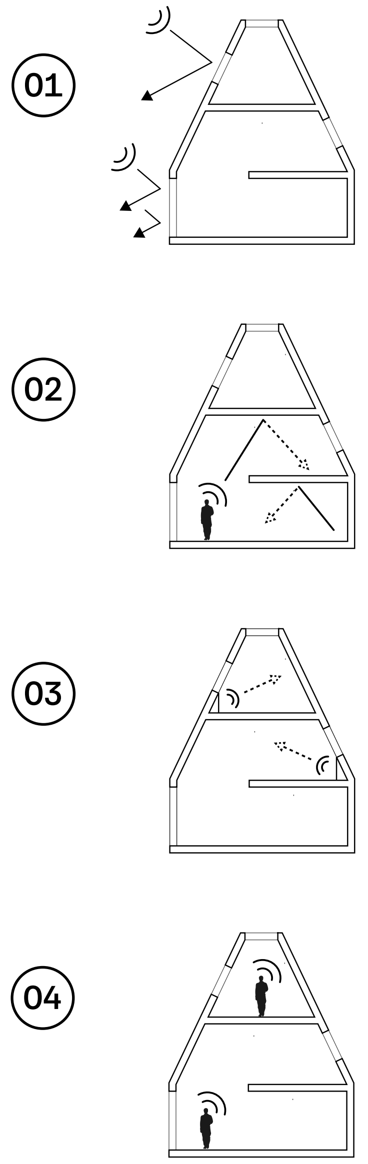
Excessive noise levels can lead to stress, sleep disturbances, and an increased risk of cardiovascular issues. Acoustic privacy becomes particularly crucial in environments where concentration and focus are essential, such as offices, classrooms, and healthcare facilities. Interruptions caused by noise can impair cognitive function, hinder communication, and contribute to elevated stress levels.

Designing spaces with acoustic privacy in mind involves implementing sound-absorbing materials, strategic layout planning, and utilizing technologies like sound masking systems. By minimizing unwanted noise and ensuring a quieter environment, individuals can experience improved concentration, enhanced productivity, and reduced stress levels.

Acoustics
How we measure

The levels are aimed at setting ambitions for calculations at the design stage.

After completion, measurements can be done. These can be done by a professional, but also with a noise meter app on a smartphone.



Targets

Active House Radar

Sound pressure level

1	2	3
<25dB	<30dB	<35dB

Inside system noise

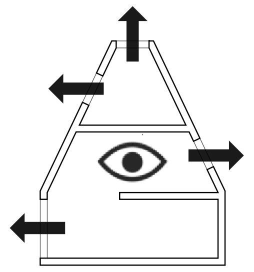
1	2	3
<25dB	<30dB	<35dB

Acoustic privacy (airbone sound)

1	2	3
>62dB	>57dB	>52dB

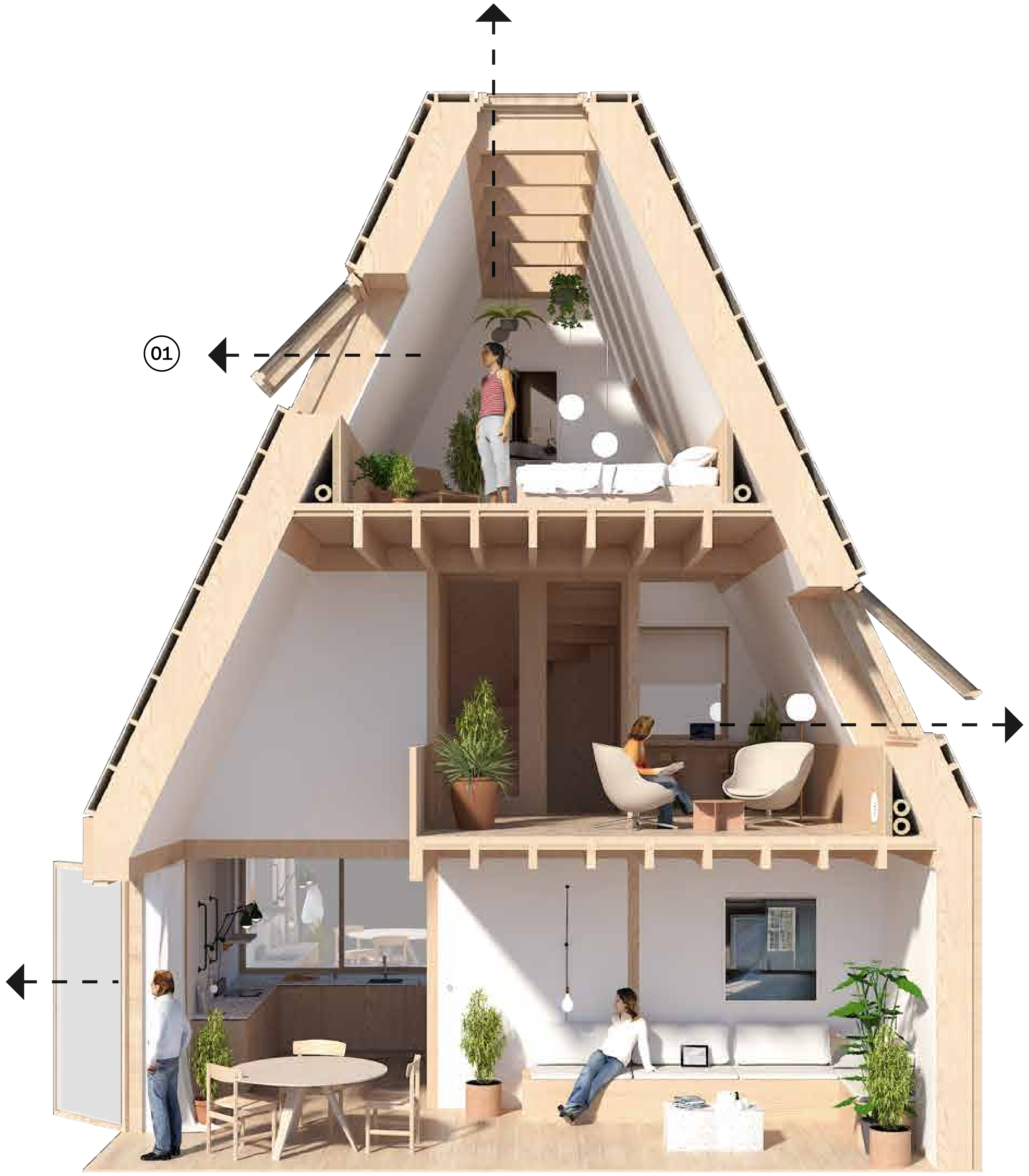
Source: EFFEKT Architects, 2023

Outdoor connection

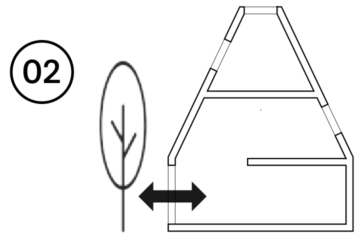
01 

DIRECT VIEW
OF NATURE

Meeting the need for contact with the outside living environment is an important psychological aspect linked to daylighting. The provision of daylight alone is not enough to satisfy user desires for views. Windows provide contact with the outside, supply information of orientation, give experience of weather changes and allow us to follow the passage of time over the day.

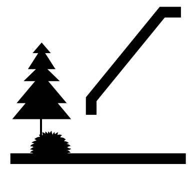


Outdoor connection



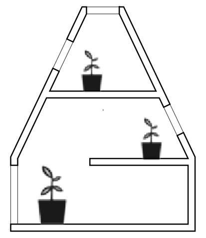
DIRECT ACCESS TO NATURE

Outdoor spaces must be treated as an extension of the house and designed to inspire the occupants to spend as much time as possible outside, offering a close contact to nature in all seasons of the year. The many associated benefits form direct access to nature and green spaces include lower levels of anxiety and depression, as well as improved mental recovery from stress and fatigue.



Outdoor connection

03

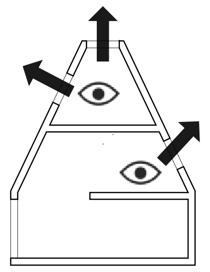


BRING THE OUTDOOR IN

Incorporation of plants in the indoor environment is among others linked with decreased levels of depression and anxiety, better recovery from stress and illness and increased psychological well-being.

Outdoor connection

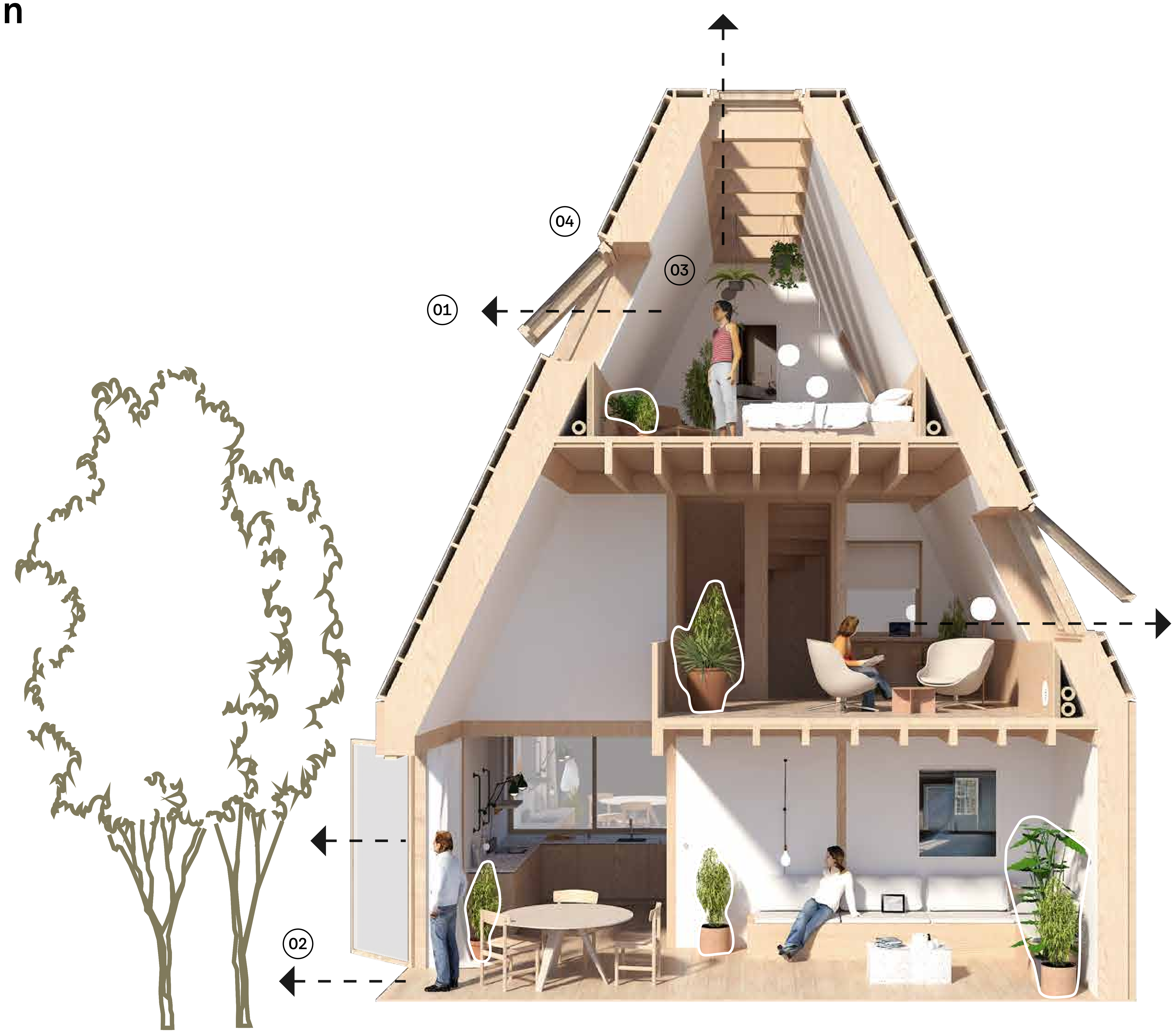
04

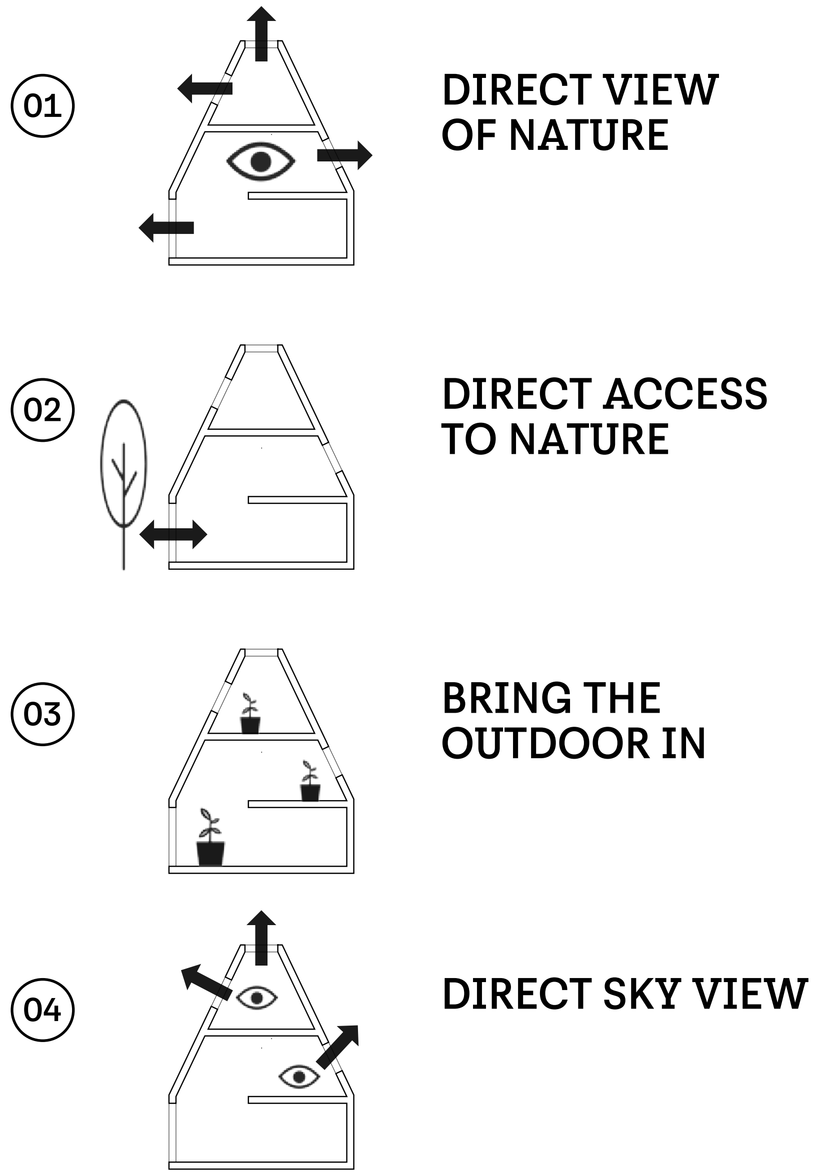


DIRECT SKY VIEW

Incorporation of plants in the indoor environment is among others linked with decreased levels of depression and anxiety, better recovery from stress and illness and increased psychological well-being.

Outdoor connection
How we measure





Indoor climate class comparison

Comparison of indoor climate simulations for Living Places and a traditional parcel house are compared by following Active House specification.

The simulations are comparing the categories achieved by each room. Simulations are based on various input and assumptions.

Reference house

Health impact

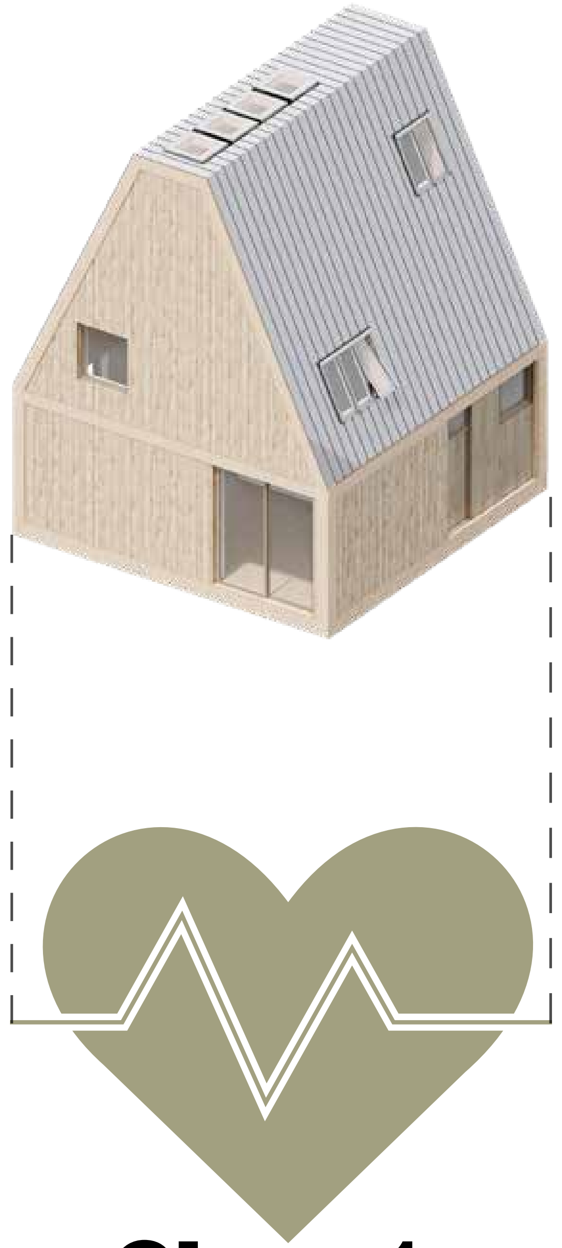
Class 3

INDOOR CLIMATE CLASS 3

The reference house, designed with few healthy building principles, achieves a low indoor climate class, reflecting its lack of focus on design principles centered around healthy people.

Living Places

Health impact



Class 1

INDOOR CLIMATE CLASS 1

Living Places, designed with healthy building principles, achieves the highest indoor climate class, reflecting its focus on design principles centered around healthy people.

Source: EFFEKT Architects, 2023

Shared Principle

Can we strengthen the sense of community by rethinking how we live?

Enabling a sense of community by combining private dwellings with shared spaces, resources, outdoor areas, and amenities.

Traditional suburban development is intensifying segregation, highlighting a divide both in space and mindset.

Shared living fosters integration through shared spaces, nurturing a sense of community and belonging amidst residents,

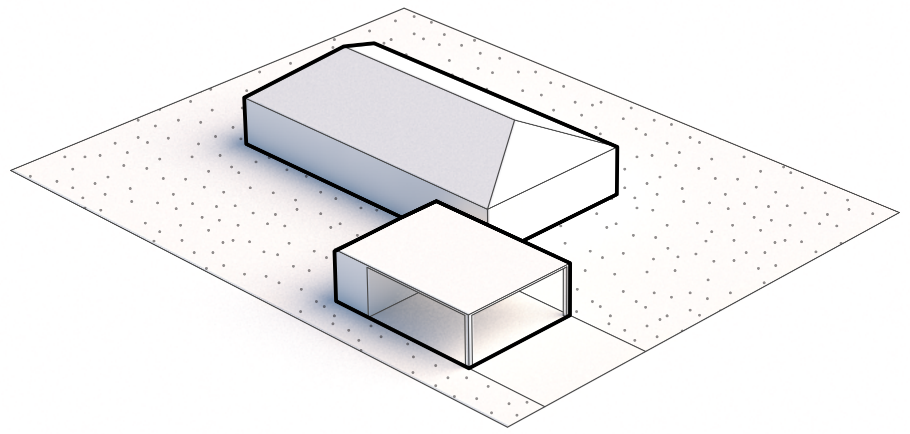
Shared Living promotes Access over ownership

What if we could move past the idea that "bigger is better" and free ourselves of the notion that more material goods will make us happier?

In fact, what if we could be happier living in smaller spaces, as long as we could access more shared services? With the above in mind, each home will combine private dwellings with shared spaces, resources, outdoor areas, and amenities.

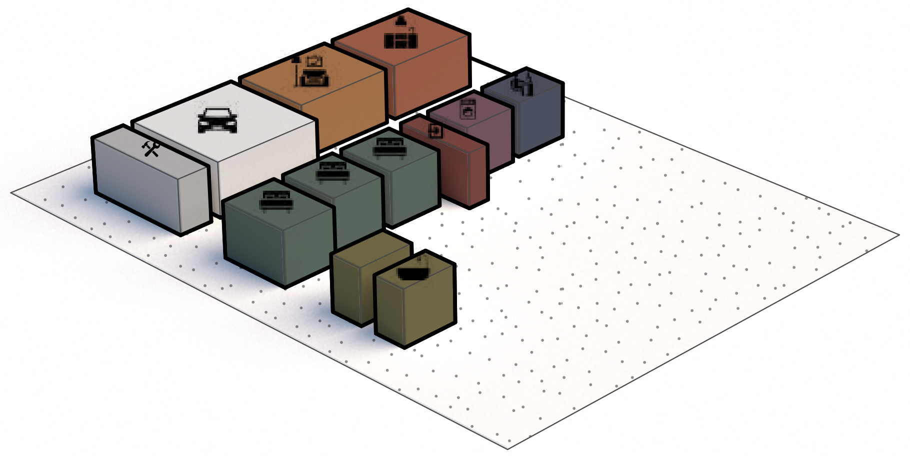
On the one hand, the shared spaces will allow people to meet their neighbours and proactively engage in shaping their community. These spaces will also reduce the costs associated with unused square meters by pooling resources into common facilities, goods, and services that promote access over ownership.

01



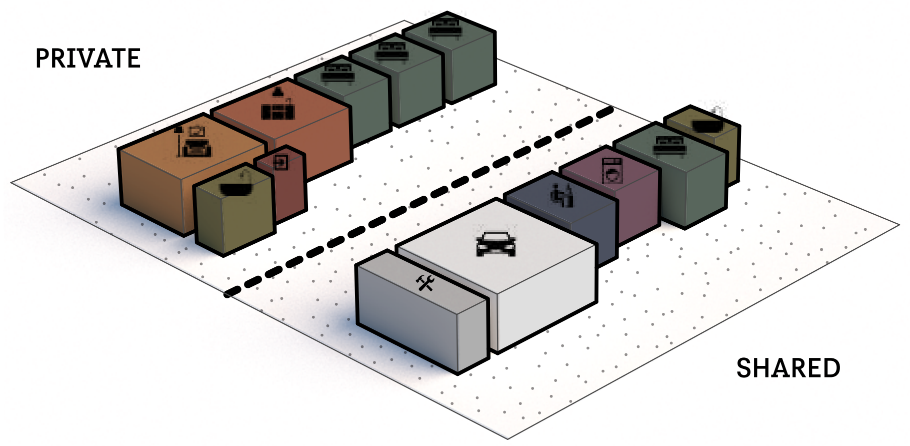
Today the average parcel house in Denmark is 140 m^2 with a plot of 800 m^2

02



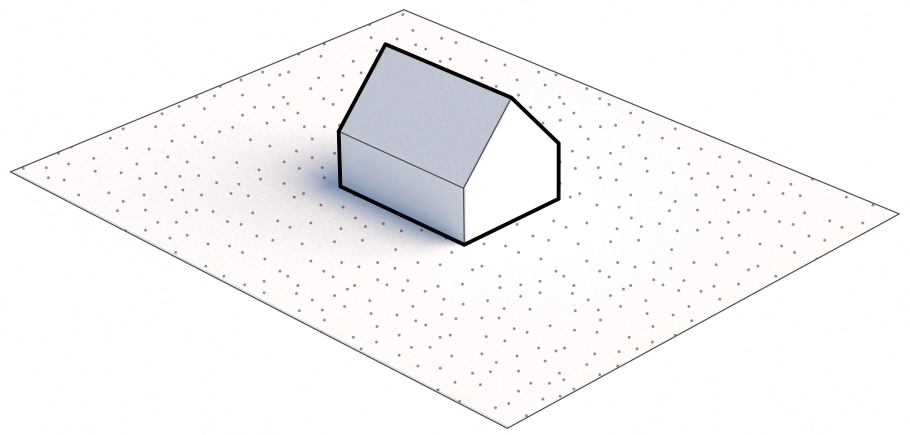
Spaces are of different sizes and purposes – the parcel house has grown for the last 60 years

03



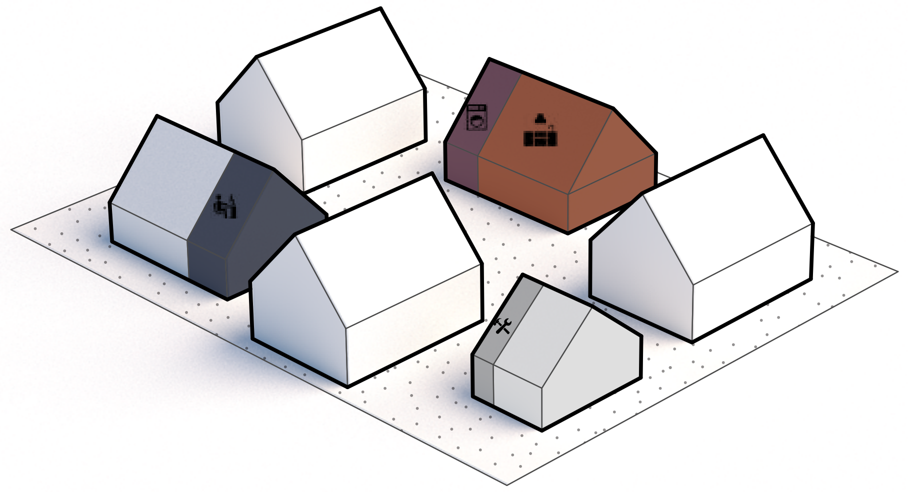
But what if we designed for affordability? To do this we have to divide the standard parcel house into what can be shared and what can't

04



This means that we can shrink the size of the home to just 100 m^2 instead of the original 140 m^2

05



This allows for densification of the site, creating a small village community that shares common spaces and outdoor areas

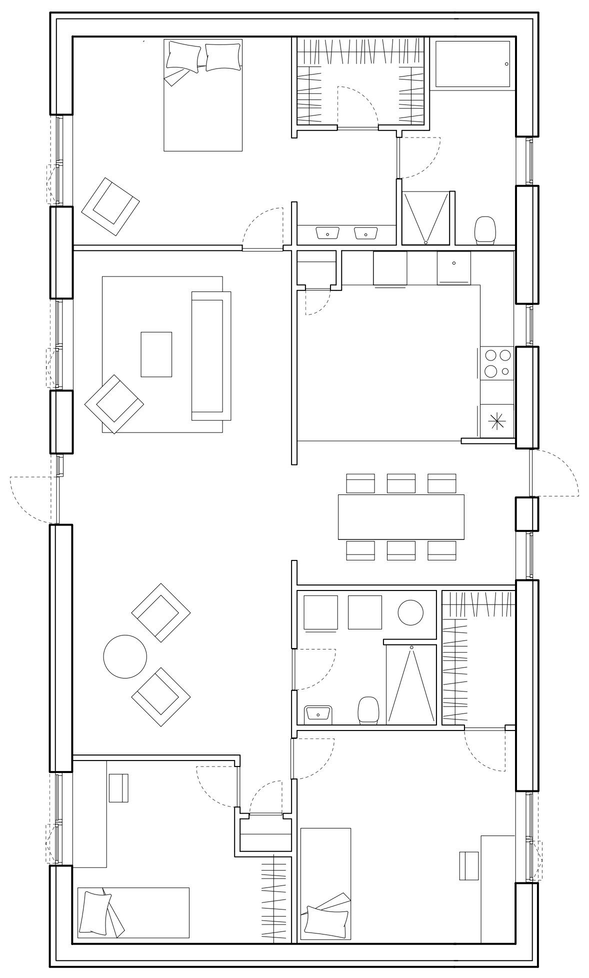
Source: EFFEKT based on Artelia's calculation and some asumptions, 2021.

Shared Living typology
Efficient area per person

REFERENCE HOUSE

52 m²

Ground Floor

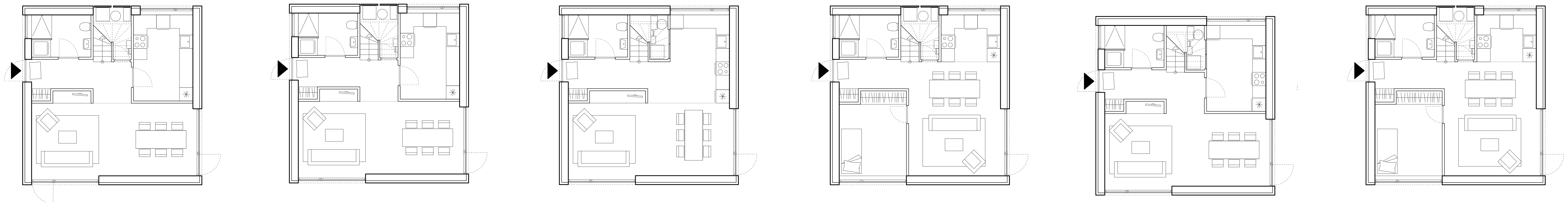


3 persons
3 bedrooms

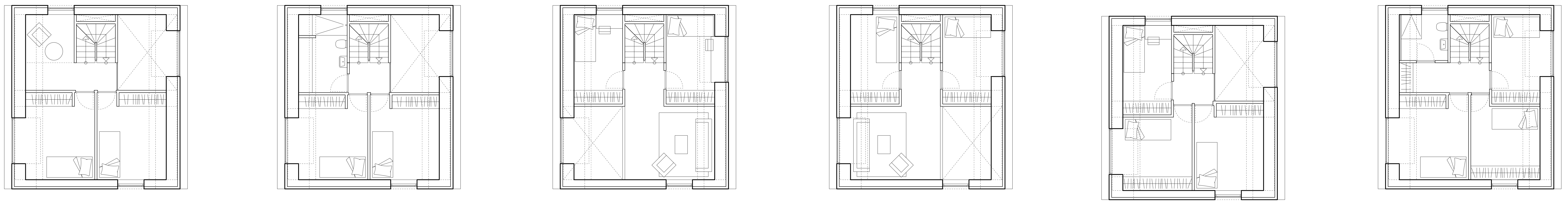
LIVING PLACES

35 m²	35 m²	35 m²	30 m²	30 m²	25 m²

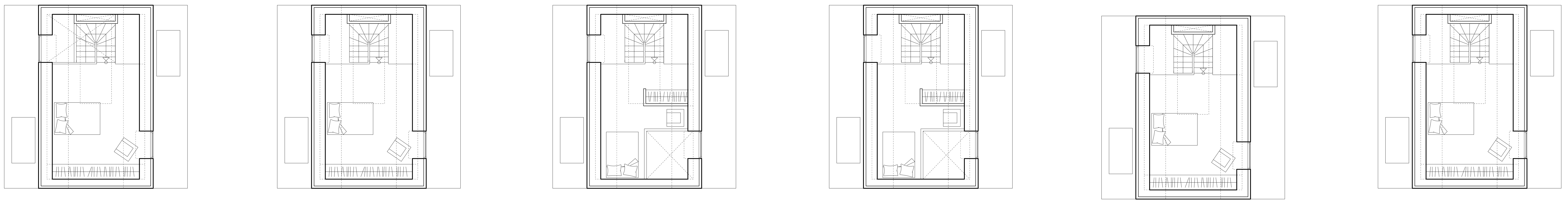
Ground Floor



First Floor



Second Floor



4 persons 3 bedrooms	4 persons 3 bedrooms	4 persons 3 bedrooms	5 persons 4 bedrooms	5 persons 4 bedrooms	6 persons 5 bedrooms

Reference house area according to DI Byggeri

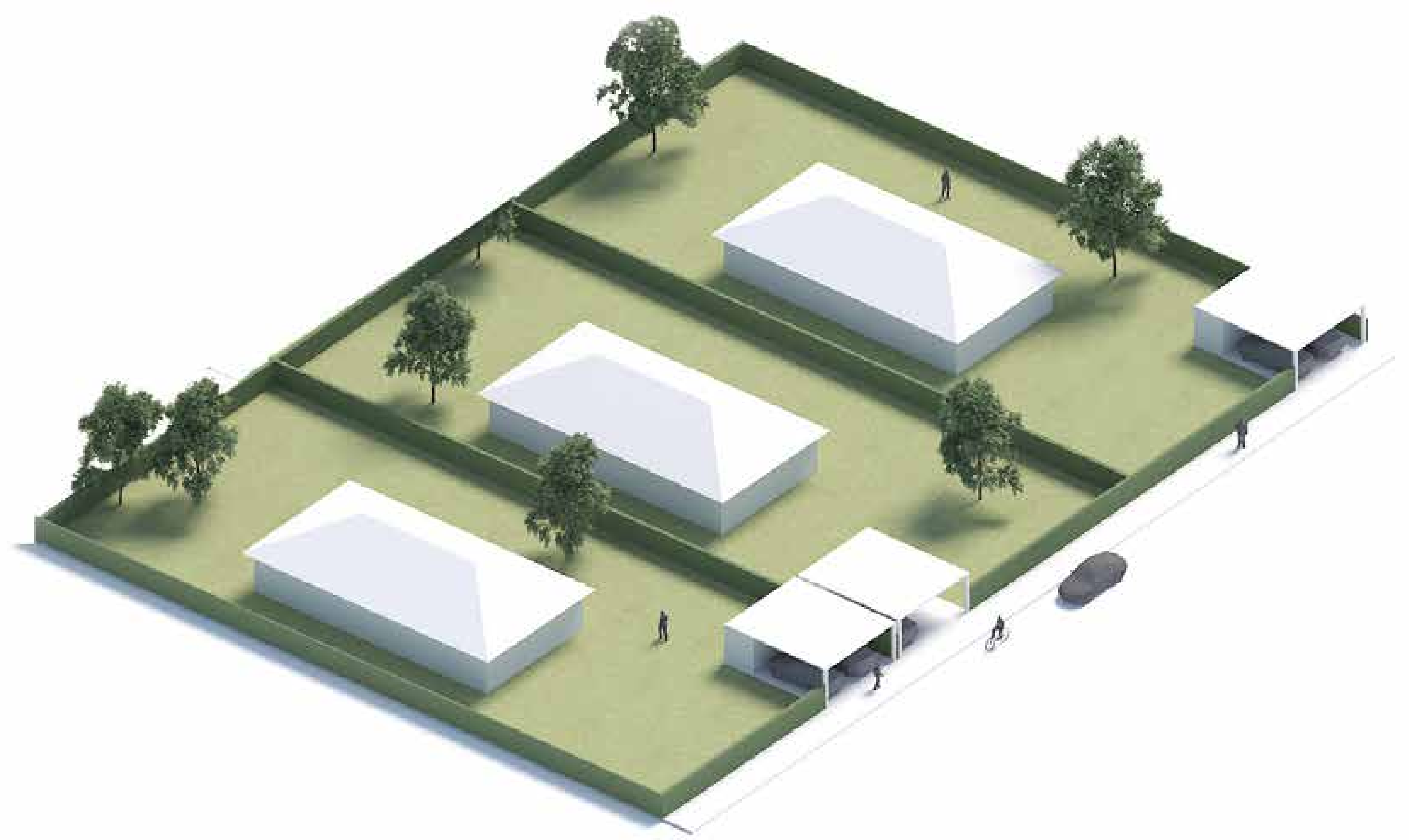
Designing from solitude to community

As humans, we crave community and fundamentally seek a sense of belonging. We want people with whom we can share – our responsibilities, yes, but also the experiences we enjoy that form the glue in our relationships. So, when designing Living Places, we must aim to redefine what our home aspirations look like to better serve our human needs.

By combining principles of access over ownership with dense living we allow people to meet their neighbours and proactively engage in shaping their community. Transforming our disconnected homes to active communities. By creating homes and communities centered around the idea of sharing we seek to create a new paradigm; a means to a more democratic society, that understands that sharing is not a new fad but an age-old practice, that creates better living environments for both people and the planet.

Shared living showcases how we can live closer while enhancing our way of life by creating active communities that significantly reduce our environmental impact and creating better living environments for the many. Shared living enables us to significantly reduce environmental impact per person, and reduce land-use while at the same time creating healthy homes for the many.

From separated private homes...

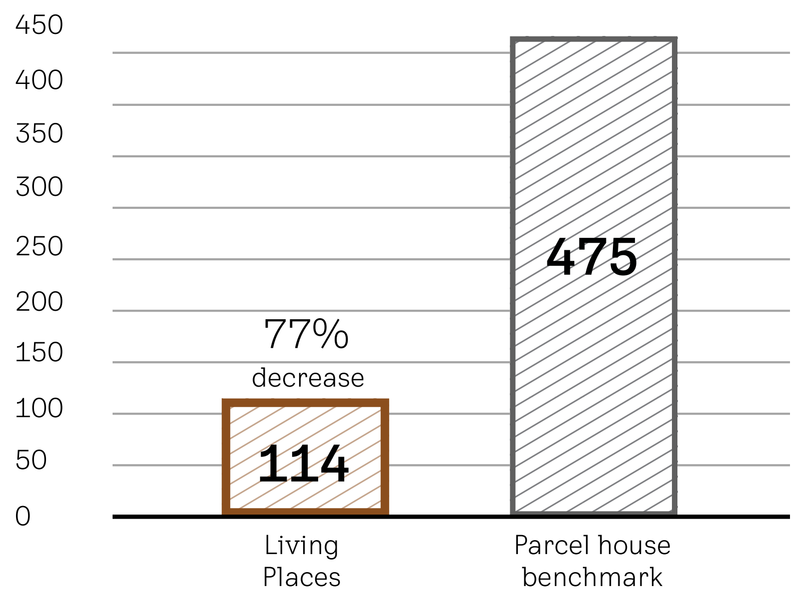


...to active communities

Impact of the design

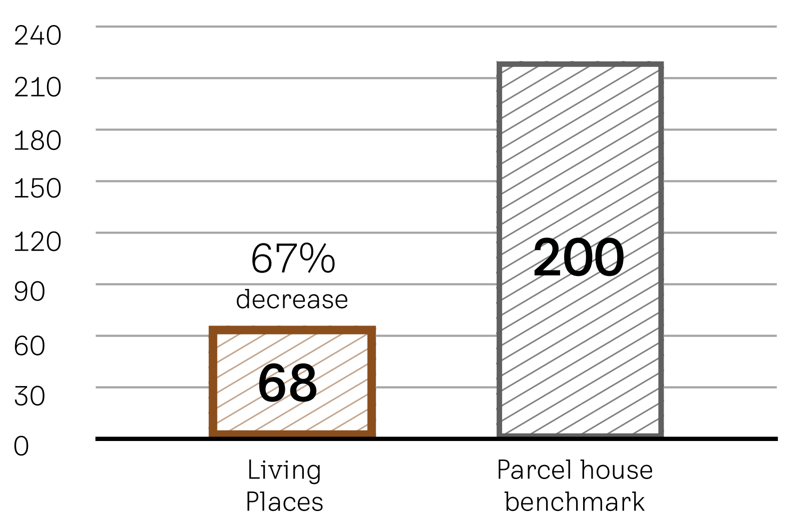
Environmental impact:

kg CO_2 / person a year



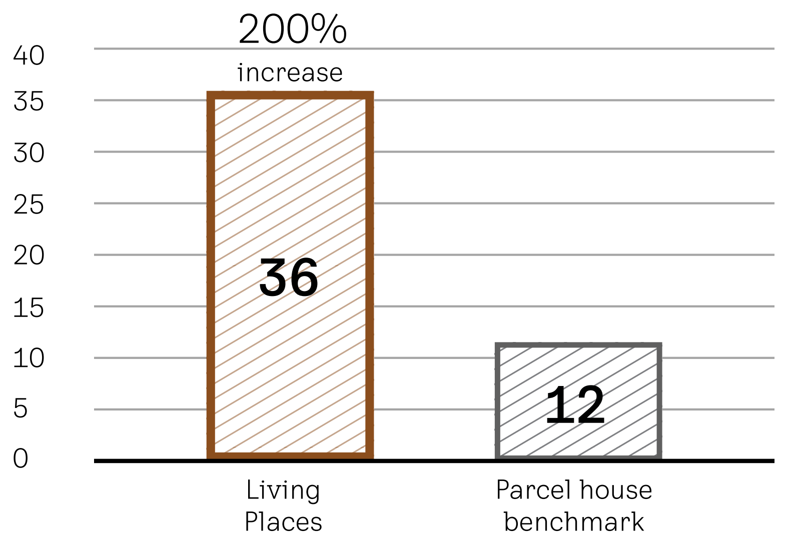
Land-use:

m² / person



Density:

People / 2400 m² (site)



Estimation for 7 Units with 5 persons per unit

Source: Study by EFFEKT Architects , 2020

Benefits of shared living

There are many studies showing how shared living is beneficial for the inhabitants. Below we have summarized some of the most important points from these studies.

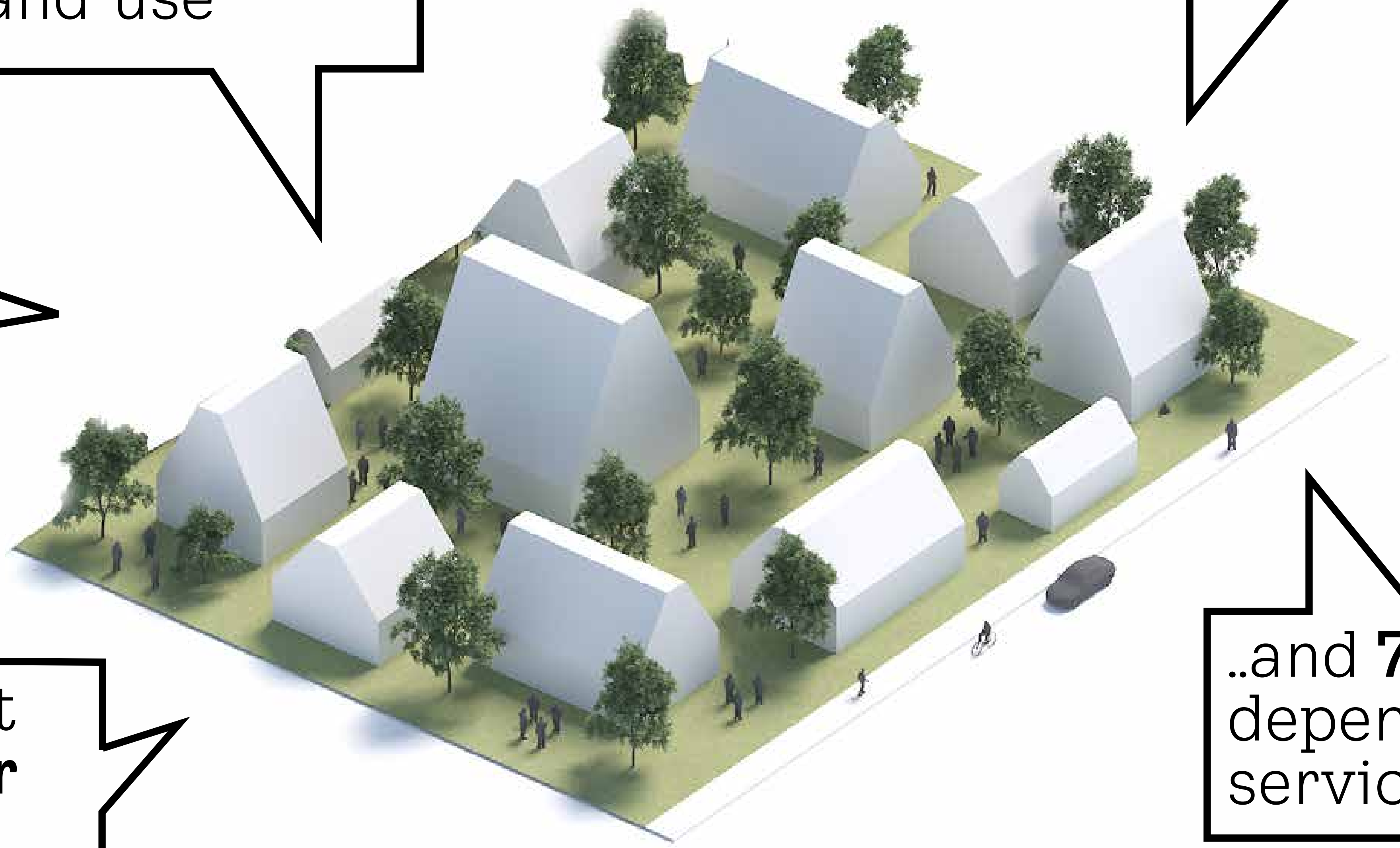
77% reduction of the environmental impact

200% increase in density

67% reduction of land-use

People living in green communities are **75% less likely to be lonely**

Community living reduces **food waste with 60%**



..and **7 times** less dependent on social services

Survey show that **91% feel happier** when living in a community

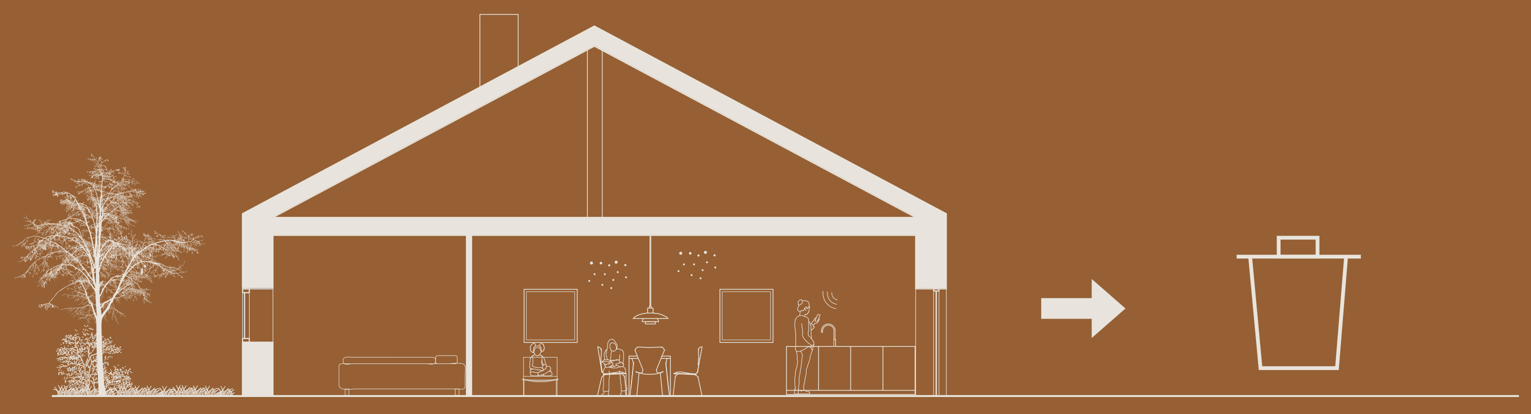
Source: Study by EFFEKT Architects , 2020

Simple Principle

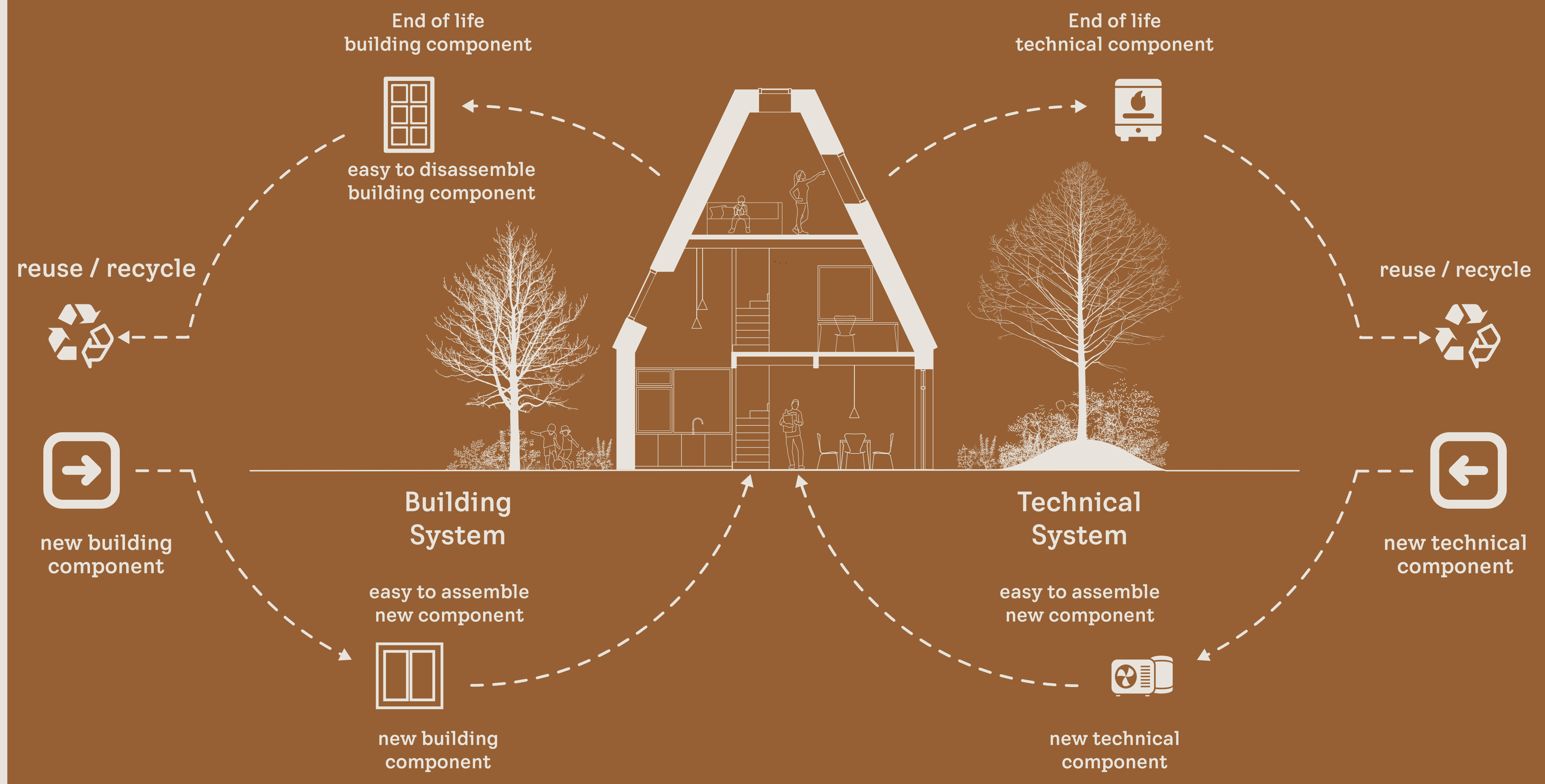
Can a new way of building enable easy upgrades, repairs and a longer lifespan?

Offering a simple modular building system that requires little to no maintenance and can easily be upgraded, repaired and fitted with smart appliances

Take ⟶ Make ⟶ Waste ⟶ Repeat



Our linear model, with its oversimplified approach, often produces inefficient and inadequate outcomes, reflecting a 'take-make-waste' methodology.



Design-for-disassembly extends product lifetimes and minimizes waste, promoting reusability and sustainability

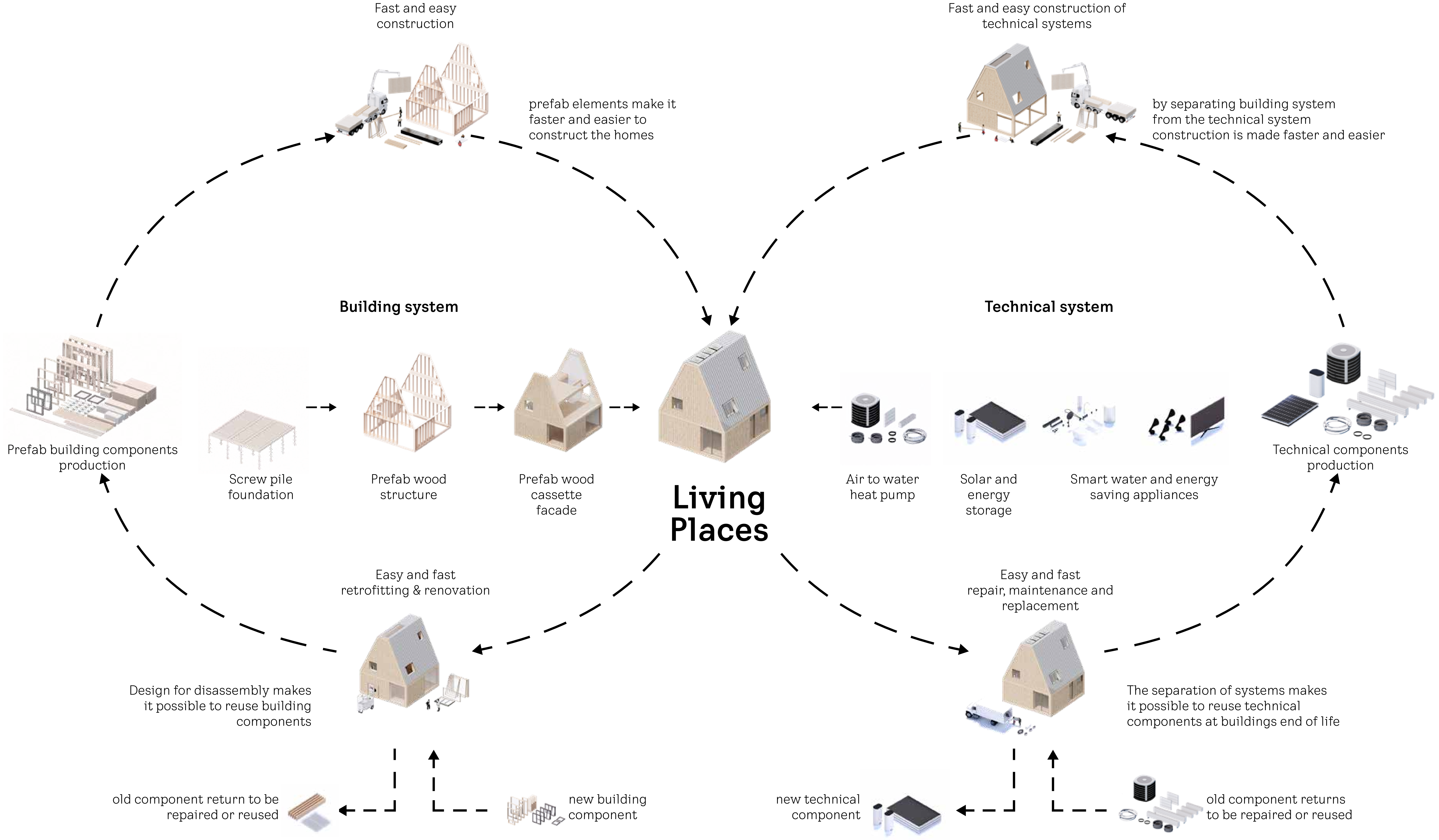
Simple building system and Technical system

By separating the technical systems and building systems we are able to create a system that enables a circular economy, reduced cost, labour, and waste production.

A vital part of the concept is bringing our built environment back to the basics. By carefully considering how the different components of a building come together, our homes will offer innovative, simple solutions for how the homes for the future should be built. This is achieved thanks to a modular building system that requires little to no maintenance.

Today we merge these two by building cables into the walls, casting the pipes in the foundation. This makes it hard to repair and maintain our technical systems, and this makes the way we build expensive and inefficient.

By separating the building systems from the technical system and designing the homes so that these are easy to access and maintain, repair, and replace we create homes that can accommodate new technical systems efficiently and at a reduced cost.



Design for disassembly
Lifespan of building parts

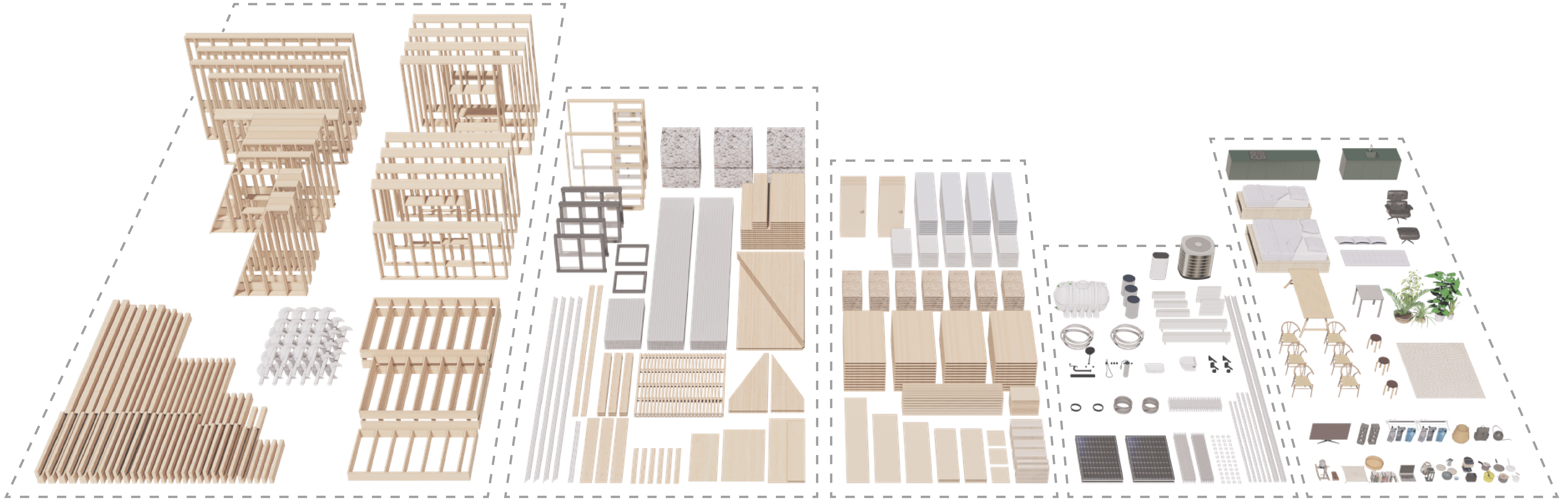
The design-for-disassembly method, by facilitating easy repairs, upgrades, and recycling, extends product lifetimes and curbs waste. This approach, which emphasizes reusability and resource efficiency for sustainability, also ensures that the easiest components to replace have the shortest lifetimes, aligning maintenance with product longevity.

Building

Living Places

Simple home
Smart appliances

Components

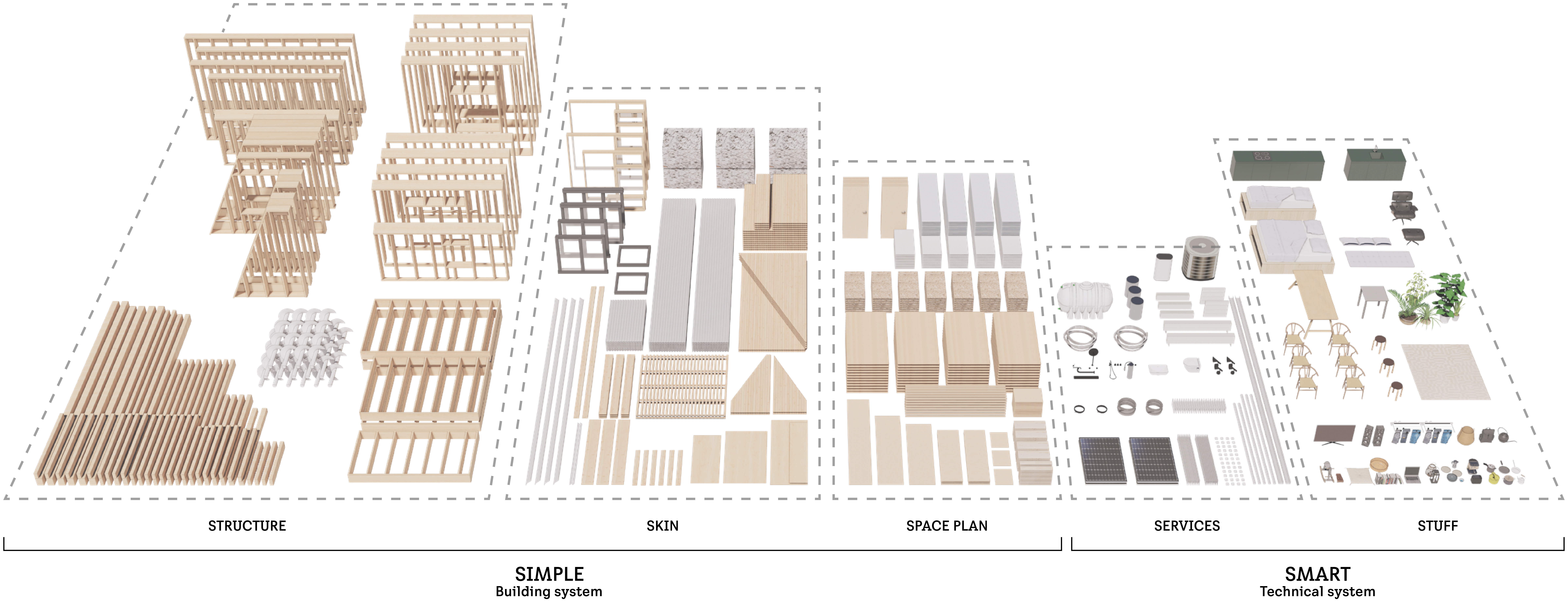


STRUCTURE | SKIN | SPACE PLAN | SERVICES | STUFF

Building system | Technical system

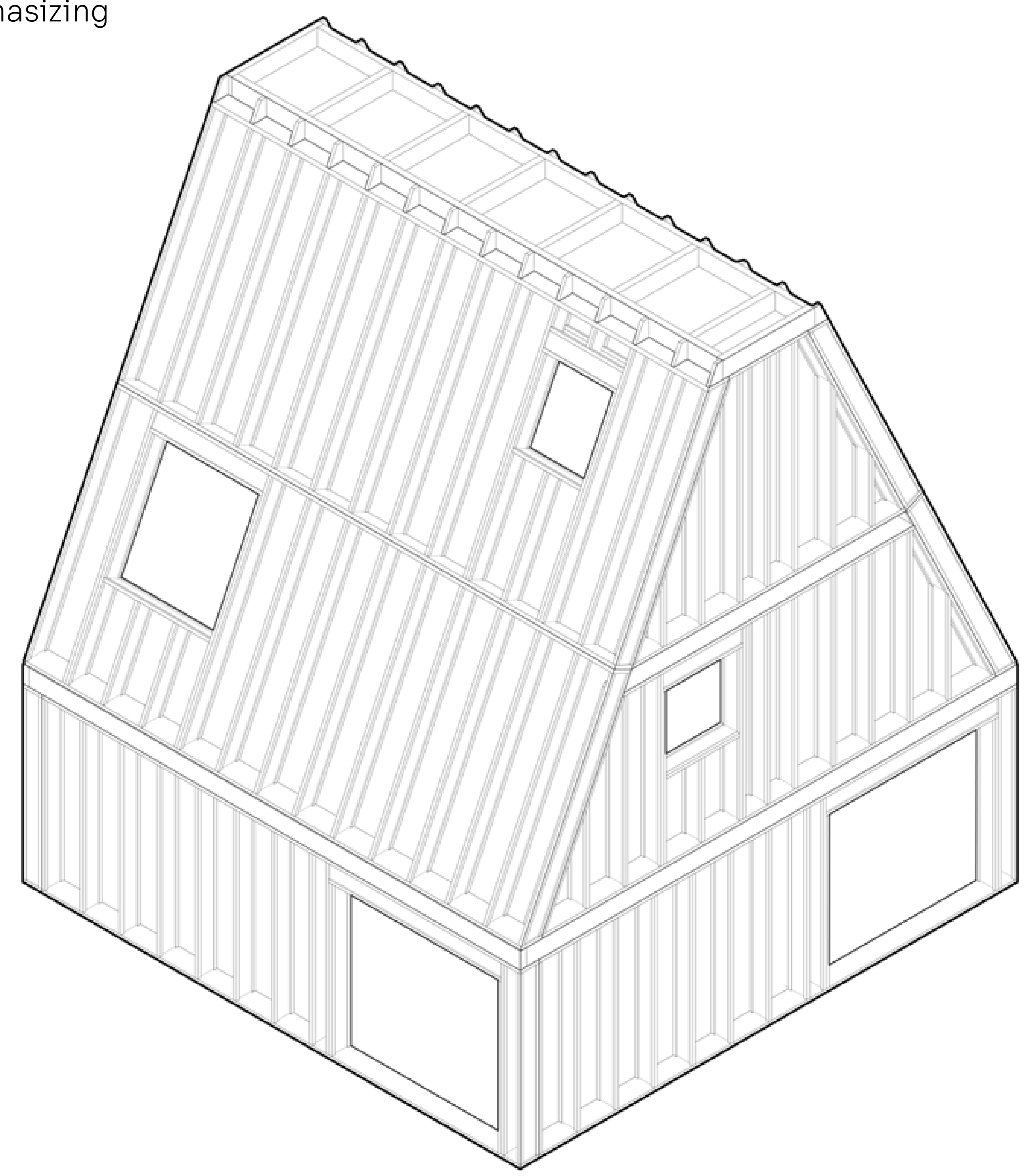
50 - 300 years | 20 - 50 years | 3 - 30 years | 7 - 15 years | months / years

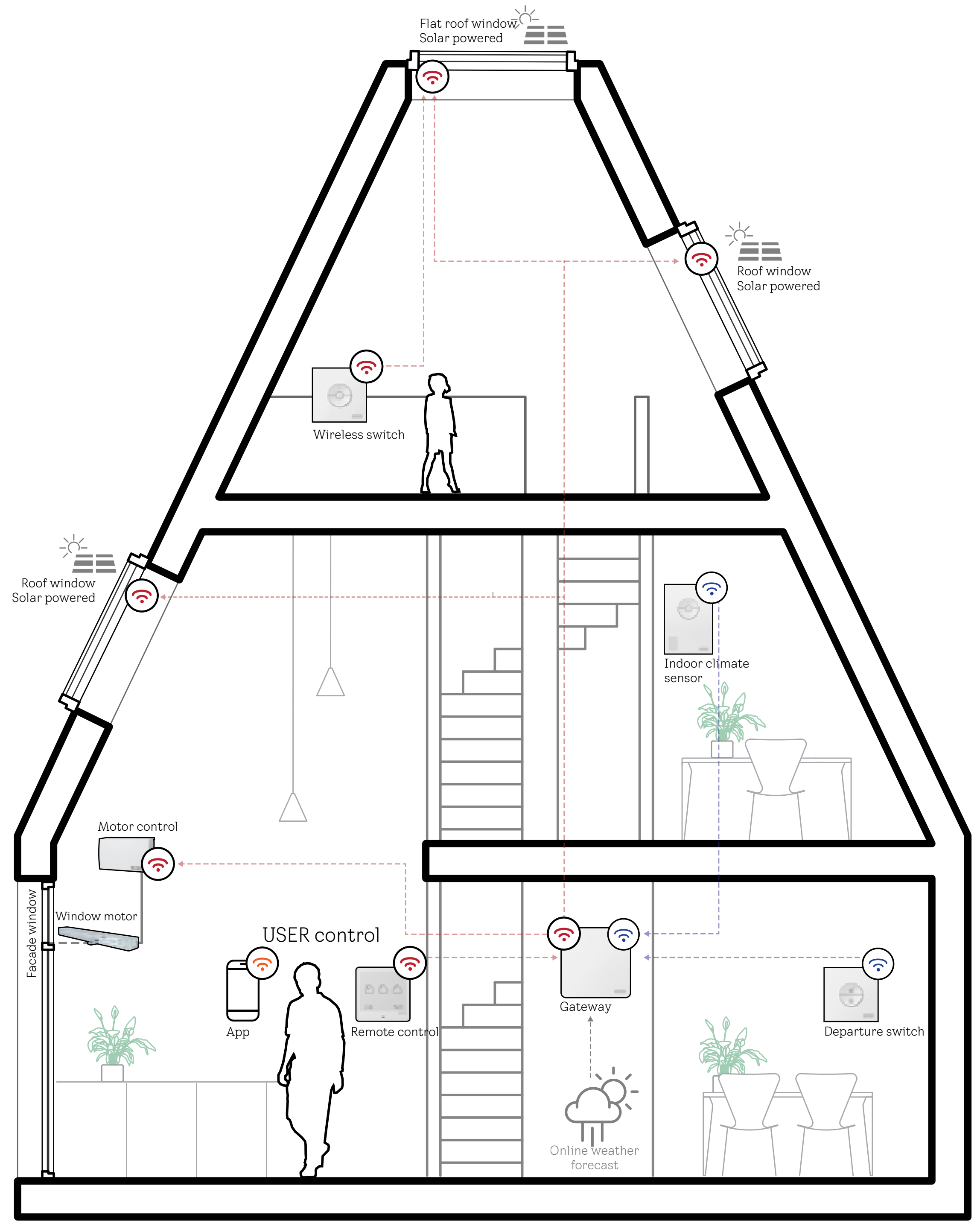
Simple house & Smart appliances



Simple home
Smart appliances

Our construction system innovates through subtraction, merging simple design with smart technology for a highly efficient, yet user-friendly solution. This approach exemplifies innovation by streamlining complexity and emphasizing practicality.





SIMPLE

SMART

Simple home
Building system

1. Foundation / Ground slab
- Floor treatment with Indoor climate certified oil
- Ask plank floor with click system, 15x185 mm
- Spruce battens, 50x70 mm
- Vapor barrier, 0,20 mm
- Pine structural timber C18, 45x295 mm
- Cellulose insulation, 375mm. Fire class: B-s2, d0
- Hard wind barrier, 8 mm

2. Facade
- Spruce facade cladding boards, 21x124 mm. Vertical
- Spruce roofing battens, 38x73 mm. Horizontal
- Spruce roofing battens, 25x50mm. Vertical
- Wind panel with open diffusion, 8mm
- Pine structural timber C18, 45x295 mm
- Cellulose insulation, 295 mm. Fire class: B-s2, d0
- OSB plate G3, 18 mm
- Pine wood framing, 45x70 mm
- Wood fiber insulation, 45mm. Fire class: B-s2, d0
- Fiber gypsum boards, 15mm. Visible connections
- Interior linoleum paint

3. Roof construction
- Steel sinus plate, 18 mm. Zink-Magnesium treatment
- Spruce roofing battens, 38x73 mm. Horizontal
- Spruce roofing battens, 25x50mm. Vertical
- Wood fiber roofing plate, 25 mm
- Pine structural timber C18, 45x295 mm
- Pine interior battens, 45x45 mm
- Cellulose insulation, 340 mm. Fire class: B-s2, d0
- OSB plate G3, 18 mm
- Pine wood framing, 45x70 mm
- Wood fiber insulation, 45mm. Fire class: B-s2, d0
- Fiber gypsum boards, 15mm. Visible connections
- Interior linoleum paint

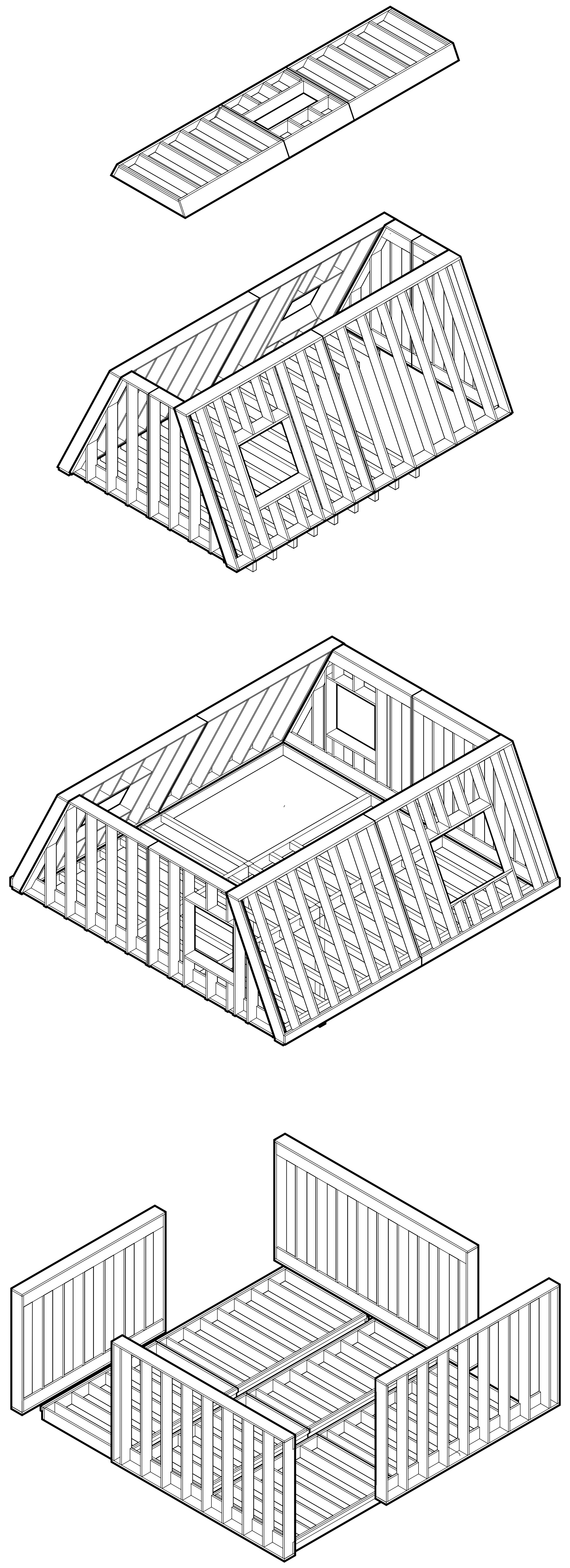
4. Slab
- Floor treatment with Indoor climate certified oil
- Ask plank floor with click system, 15x185 mm
- Fiber gypsum floor boards, 13 mm
- Pine floor plywood, 18mm
- Pine roofing plywood, 25mm
- Pine structural timber K18, 270x120 mm

5. Interior wall
- Interior linoleum paint
- Fiber gypsum boards, 15mm. Visible connections
- Pine wood framing, 45x70 mm
- Fiber gypsum boards, 15mm. Visible connections
- Interior linoleum paint

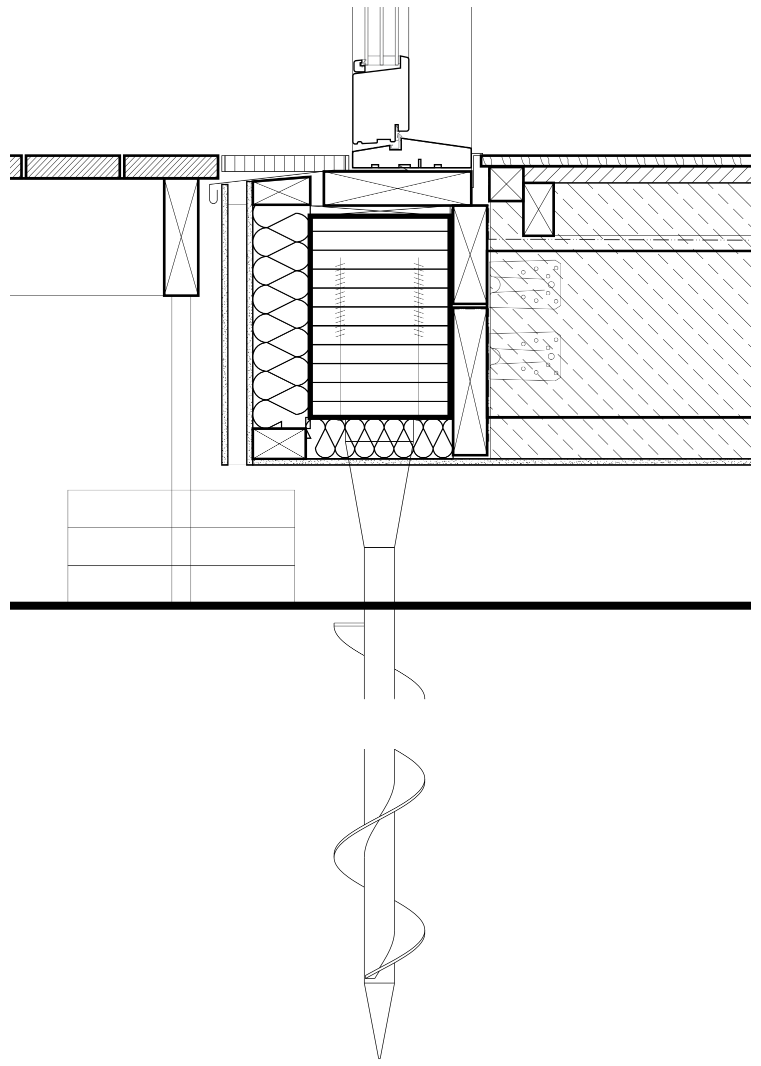
6. Windows
- Oiled oak frame
- Glass. Triple layer 6+14+4+14+6

7. Roof windows
- Remote controlled window. Solar powered
- Indoor blinds. Solar powered
- Outdoor black out curtains. Solar powered

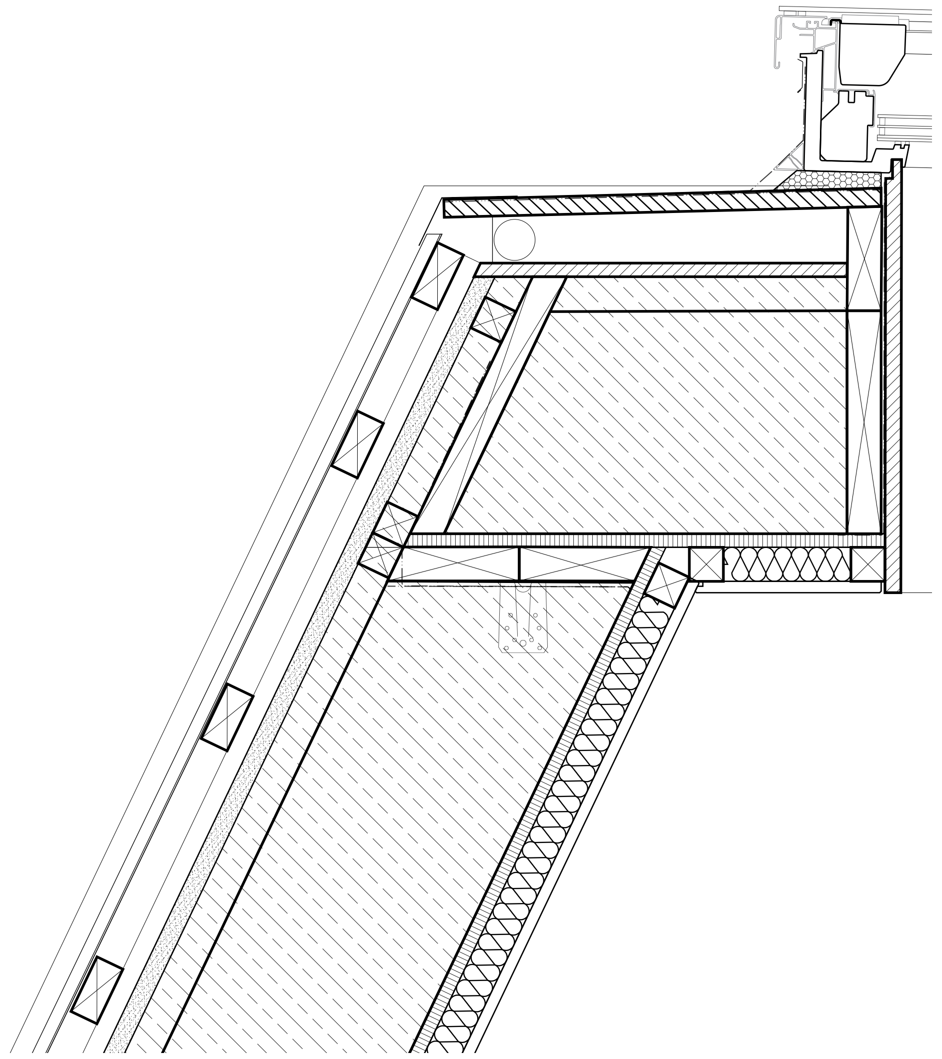
8. Flat roof windows
- Flat glass rooflight, 800x800 mm
- Black out curtains. Solar powered



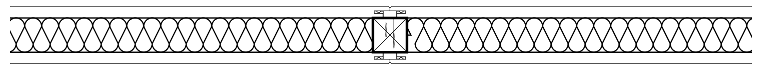
1. Foundation / Ground slab



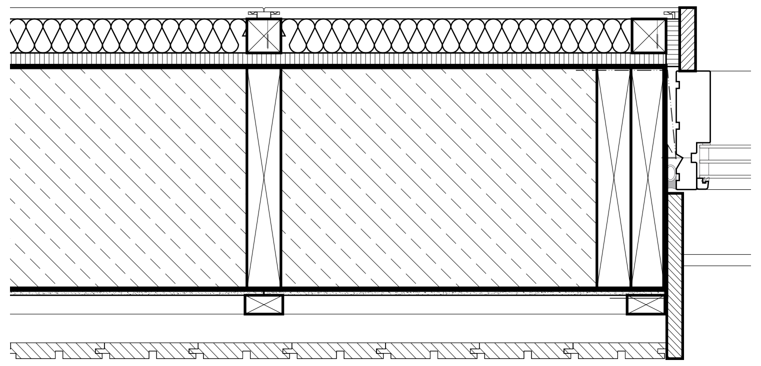
3. Roof construction



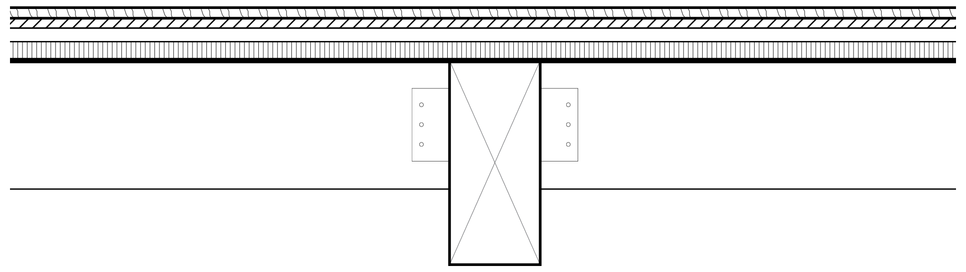
5. Interior wall



2. Facade

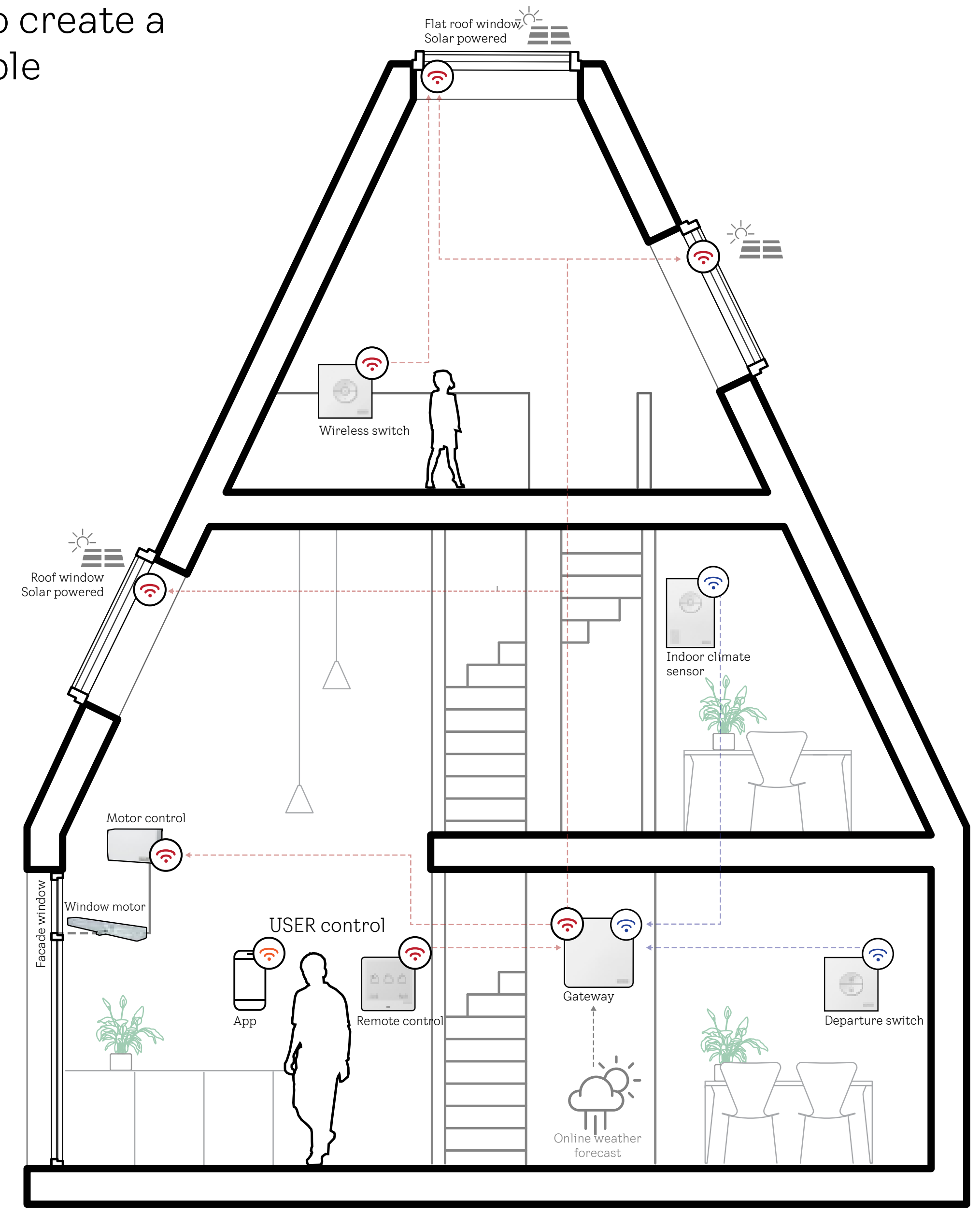


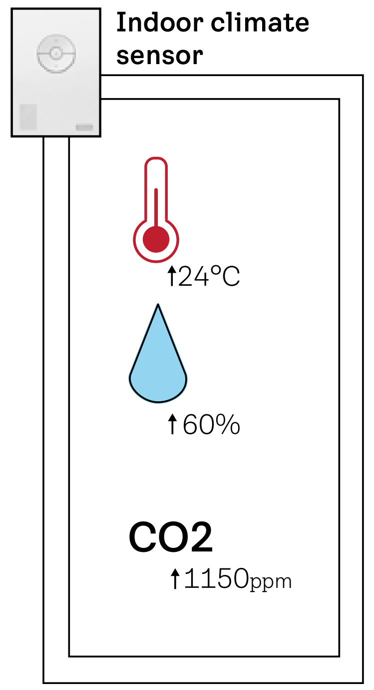
4. Slab

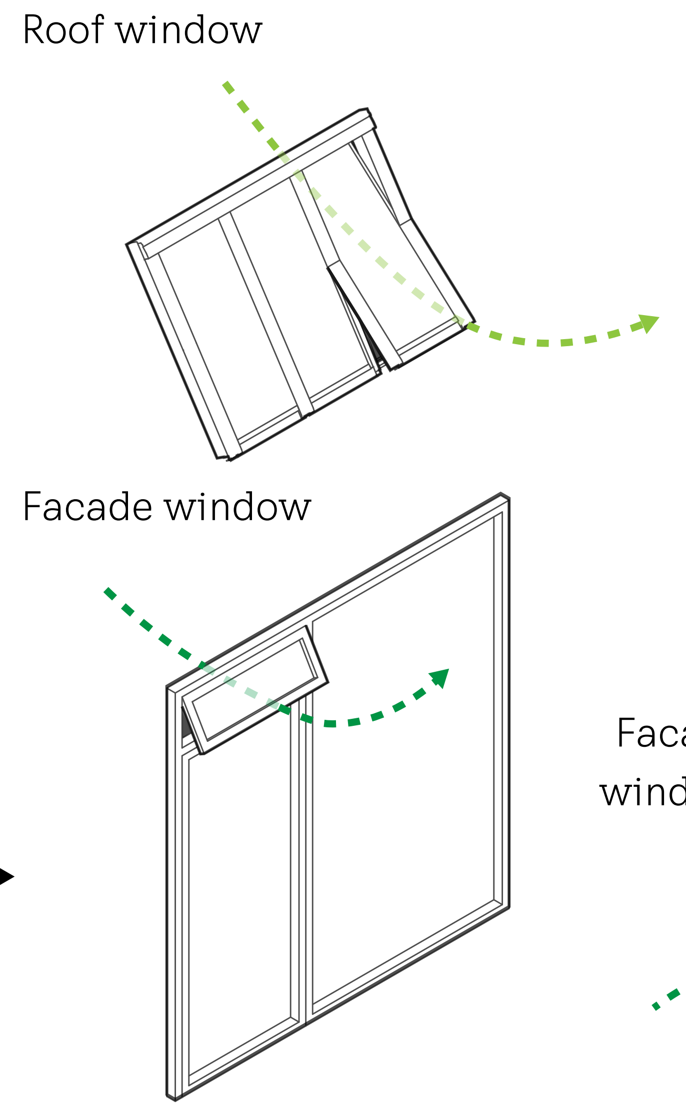


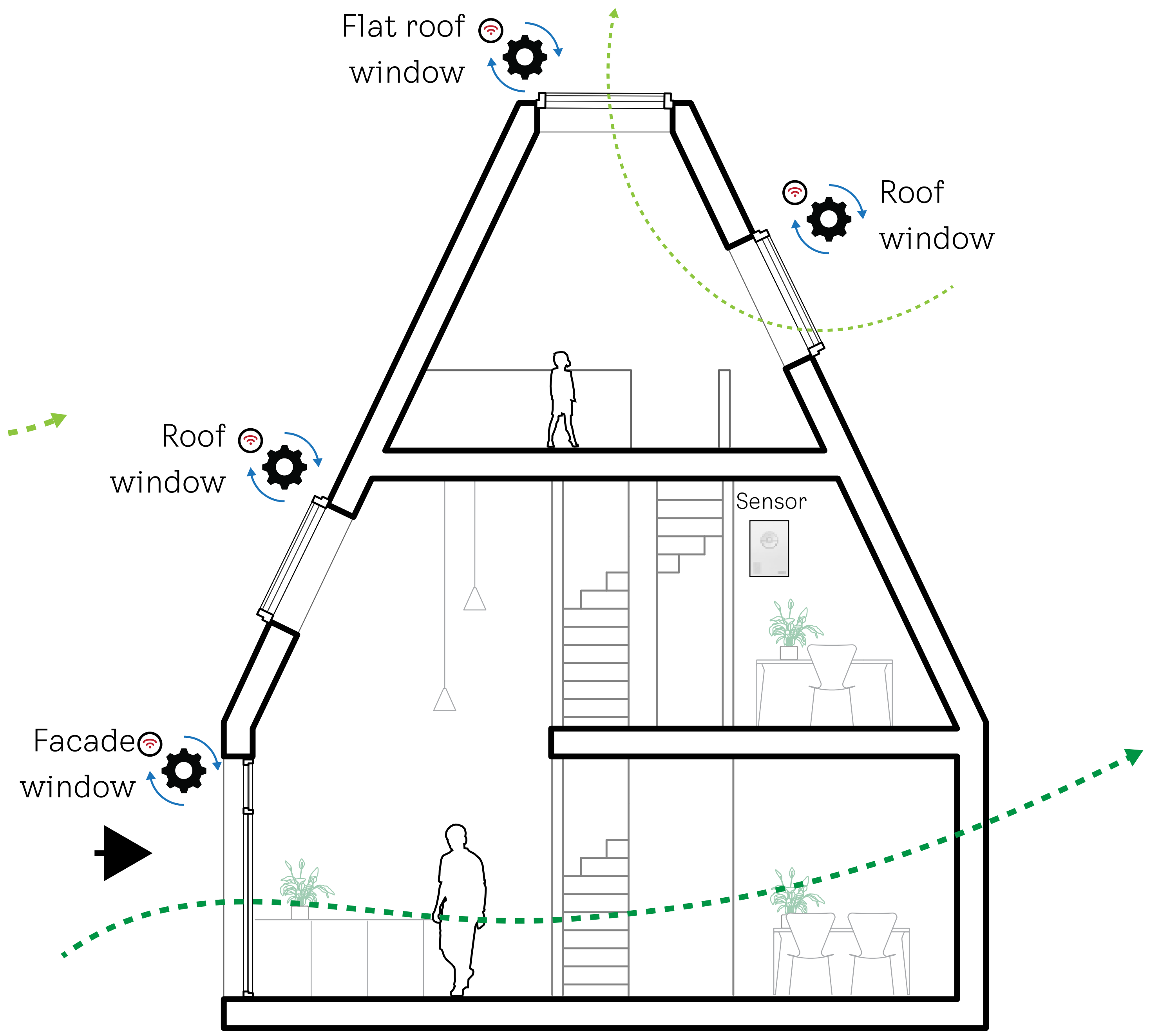
Smart appliances
Natural ventilation

Leverage natural ventilation, our smart system simplifies design while maintaining optimal indoor air quality and comfort. Its intuitive controls harmonize with nature to create a healthier, more sustainable environment.









NATURAL VENTILATION

The natural ventilation principle is created by natural driving forces, which are activated by opening the windows to create a satisfactory indoor climate when it is needed.

SENSOR

Set points

The motorized windows open when the below setpoints are overwritten to ensure a satisfactory indoor climate.

CO_2: 1150 ppm
Temperature: 24 C°
Humidity: 60 %

MOTORIZED WINDOWS

Control

In each living room and bathroom, a motorized window is established, which is controlled according to the set points, either the skylight or the sash window

CROSS AND STACK VENTILATION

When the windows open, the natural driving forces (thermal buoyancy and cross ventilation) ensure a satisfactory indoor climate.

Thermal buoyancy: Warm air will rise and be replaced by fresh outside air further down the building.

Cross ventilation: Pressure differences on the facades caused by the wind will move the air through the building.

A way of building ...with a big impact

By rethinking the way we build the concept we can potentially have a big impact on the construction industry. The diagrams show that if we were to build all houses in single-family houses and row-chain and double houses, like Living Places, we could save approximately 1 million tons of CO_2 each year.

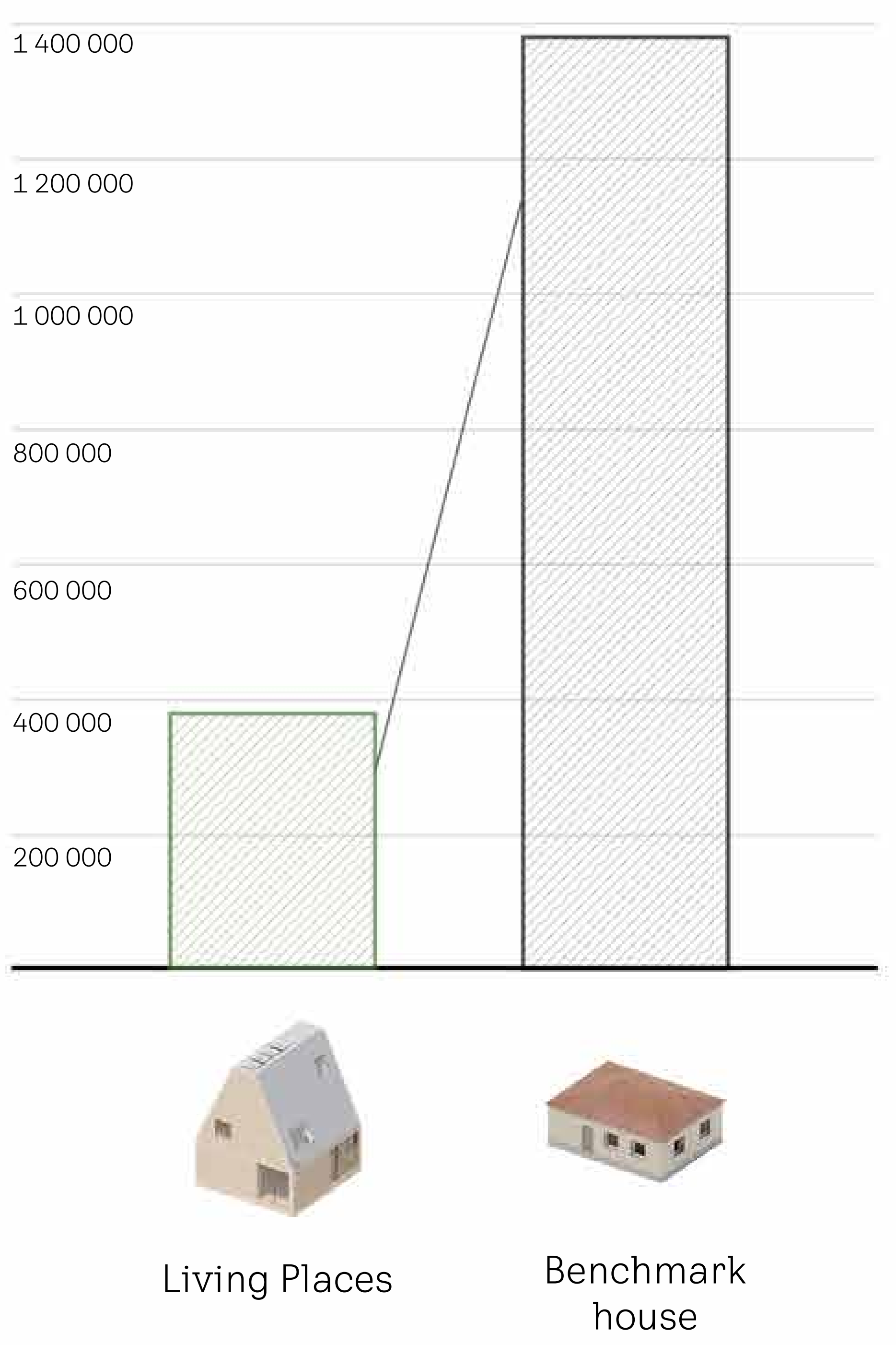
It would be a significant contribution to Denmark's climate goals that commit to cutting emissions by 70% by 2030[1].

To achieve this goal, the building sector needs to reduce CO_2 emissions by 5.8 million tons[2].

Living Places would reduce the emissions from the industry by 17%.

New homes in Denmark 2021

Environmental impact for new homes pr. year GWP 50 years



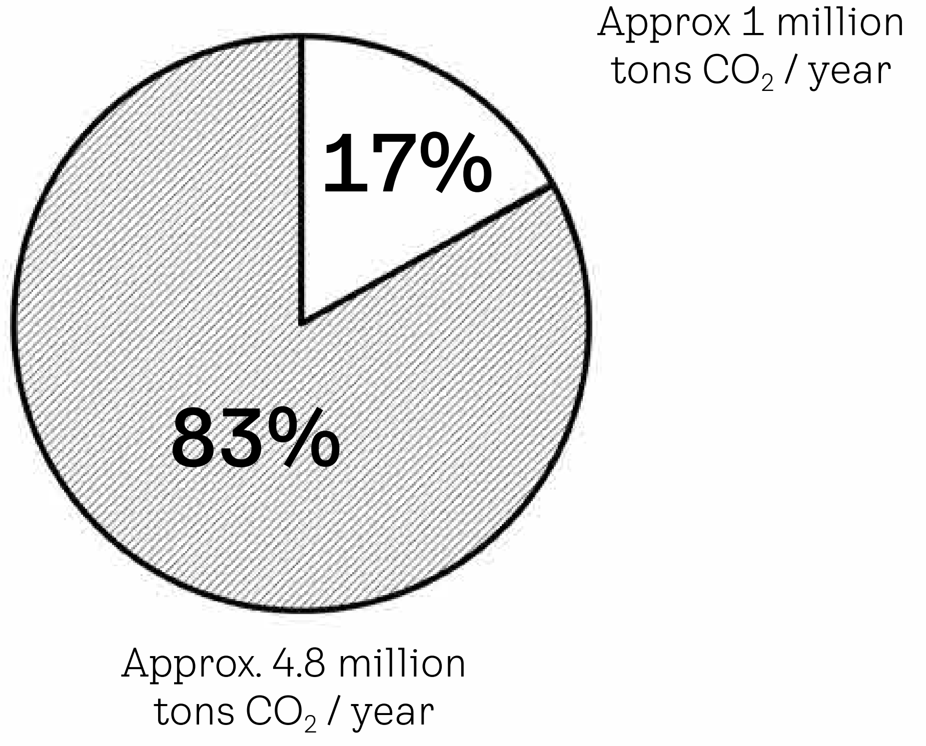
Yearly CO_2 reduction
If all new family homes were constructed like Living Places

Approximately

1 000 000

tons CO_2 / year

17% reduction of the targeted 5.8 million tons of CO_2, the construction industry has to reduce its emission by 2030 in order to comply with the Danish Climate Act.

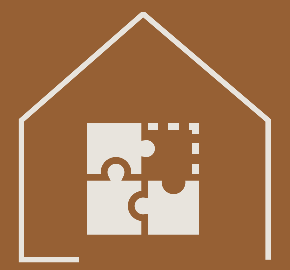


[1] Danish Climate Act (Danish Council on climate Change, 2020)
[2] Klimapartnerskaberne, 2020

Adaptive Principle

Can we create homes that respond to more ways of living?

The principle is scalable and adaptable, meeting the diverse needs of modern lifestyles. Flexible, customizable living spaces that can evolve with changing family sizes, work requirements, and personal preferences, providing a dynamic and versatile environment for a wide range of users.



From one size fits all

Most housing offers adopt a 'one-size-fits-all' approach, typically providing standardized living spaces that lack flexibility to cater to individual needs and preferences.

To an adaptable living system, that responds to the need for more ways of living

The principle emphasizes personalization, providing adaptable spaces that cater to the unique needs and lifestyles, offering a versatile solution for diverse ways of living.

Typologies for the many

Throughout our lives, what we want and need from our homes changes. When we feel trapped by our living environments, we suffer. But when our homes are flexible enough to account for the unforeseen, we thrive – which is precisely what Living Places offers.

To solve this challenge Living Places is created in a range of typologies. As a result, our prototype is context-responsive – yet always retains a focus on the sloped roof, health, context, and sustainability.

A catalogue of typologies designed to adapt to the constant needs for new ways of living.

"… 80-85% of all new built square meters are between 1 and 5 storeys"[1]

Tiny
2 floors / 1 home

Tiny House, Guest house, granny flat, Tool Shed, Workshop.

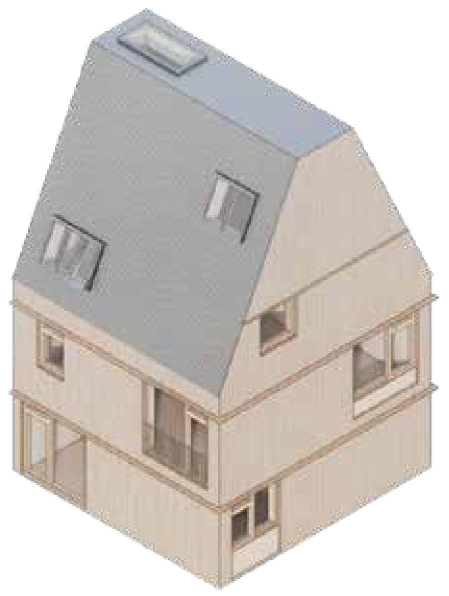
X-small
3 floors / 1 home

Family House, Student apartment, Young Professionals, Co-living

Small
3 floors / 1 homes

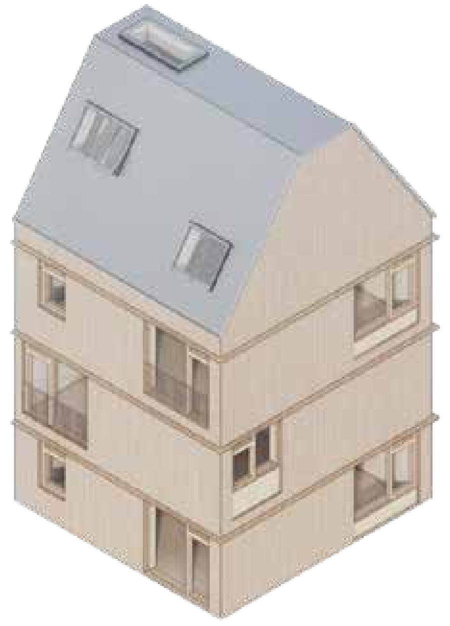
Family House, Generation Home, Shared House, Rowhouse

Medium
4 floors / 2 homes



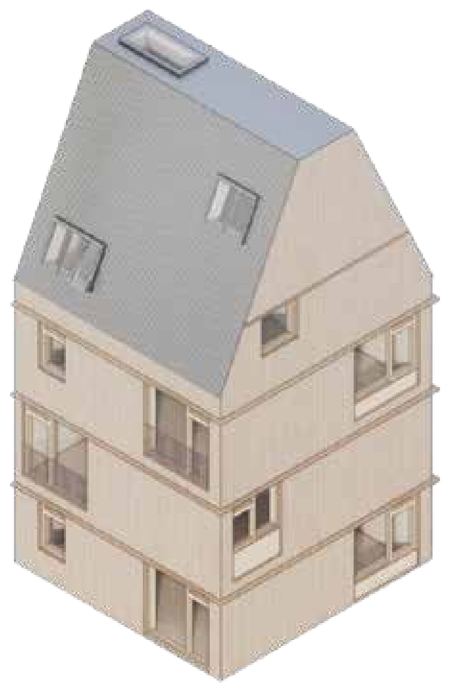
Town House, Generation Home, Shared House, Atelier

Big
4 floors / 3 homes



Town House, Generation Home, Live-work, Co-work Atelier

Large
5 floor / 3 homes



Community House, Apartment Block Multi-generational Home

[1] Build rapport 2020 - "Anvendelse af træ i byggeriet – Potentialer og barrierer"

Typologies for the many

The vision is to provide homes that adapt to the challenges that we cannot anticipate – homes that we can rely on for life. By embracing smart systems and simple design solutions, we enable people to actively shape their everyday lives and connect them to innovative community services and opportunities. Thanks to the modular building typologies, the homes are designed for disassembly – ensuring maximum flexibility and adaptability as well as a circular approach to the management and life cycle of our buildings.

Adaptability is ensured through a series of technical solutions that allow for the easy installation of services that don't burden the homeowner. For example, an adaptable interior floor plan means that the homeowner can switch up their space multiple times throughout different life stages.

The typologies are designed so they allow for maximum flexibility. They can be planned or retrofitted to change with the needs of their inhabitants. By creating a flexible envelope we abandon the notion of homes that are one size fits all, and enable homes that respond to the need for more ways of living.

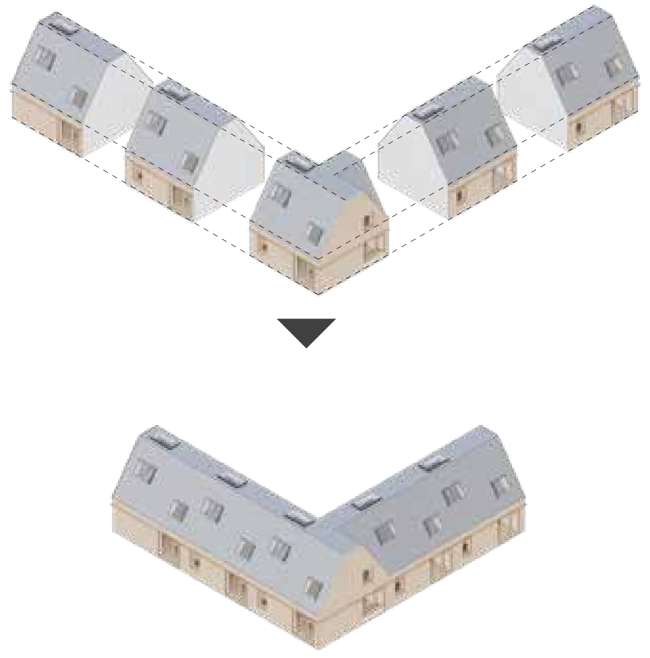
Modularity thinking in systems

Our approach centers on modularity, allowing for versatile building configurations in rows or courtyards with scalable heights. This modular design, adaptable for structures from 2 to 5 floors, focuses on optimizing Life Cycle Assessment (LCA) and cost-effectiveness.

The choice to limit buildings to a maximum of 5 floors is strategic, adhering to simpler fire regulations to achieve a balance between low environmental impact and affordability. This modular system exemplifies efficient, adaptable urban development.

Tiny	X-small	Small	Medium	Big	Large
2 floors / 1 home	3 floors / 1 home	3 floors / 1 homes	4 floors / 2 homes	4 floors / 3 homes	5 floor / 3 homes

Configuration



From module to various typologies

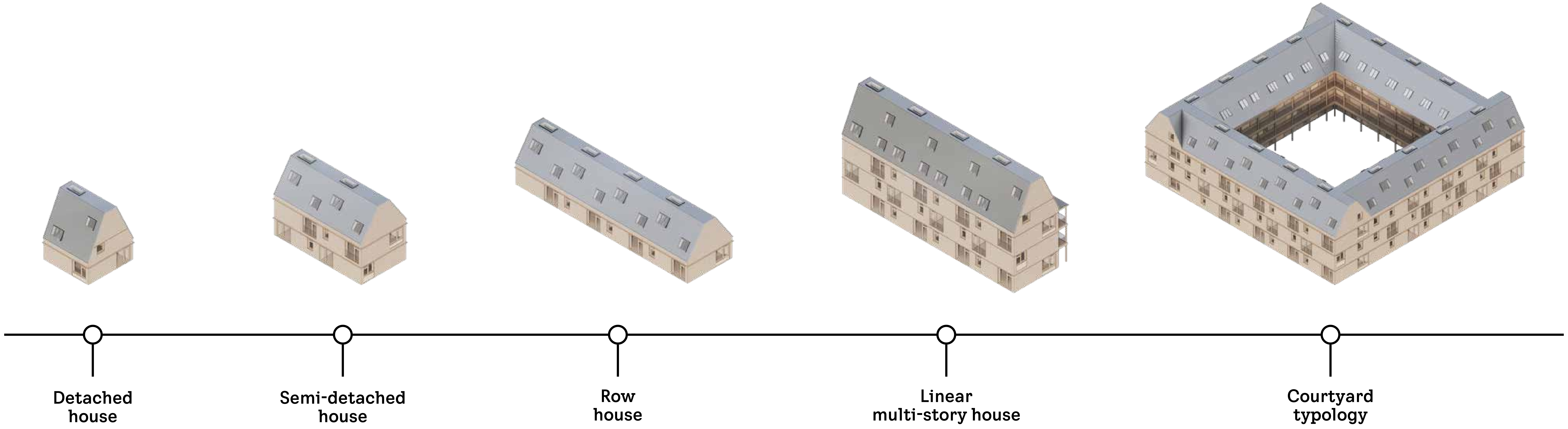
Our modular approach is designed to deliver a wide range of housing typologies, from single detached homes to multi-story residential complexes. At its core, the system is built on a foundation of interchangeable components that can be combined and reconfigured to suit various architectural styles and needs.

This modular flexibility allows for the seamless creation of diverse housing forms, including single detached houses, semi-detached houses, row houses, and courtyard structures.

Each module within the system can be customized, ensuring that every building, whether it’s a compact single-family unit or a larger communal residence, is optimized for its specific use and inhabitants. The scalability of the design is a key feature, allowing for easy adjustment in size and complexity.

This means that the system can easily adapt from creating intimate, personalized spaces in single or semi-detached homes to forming more complex, interconnected structures in row houses or courtyard arrangements.

VARIOUS TYPOLOGIES



A scalable solution...

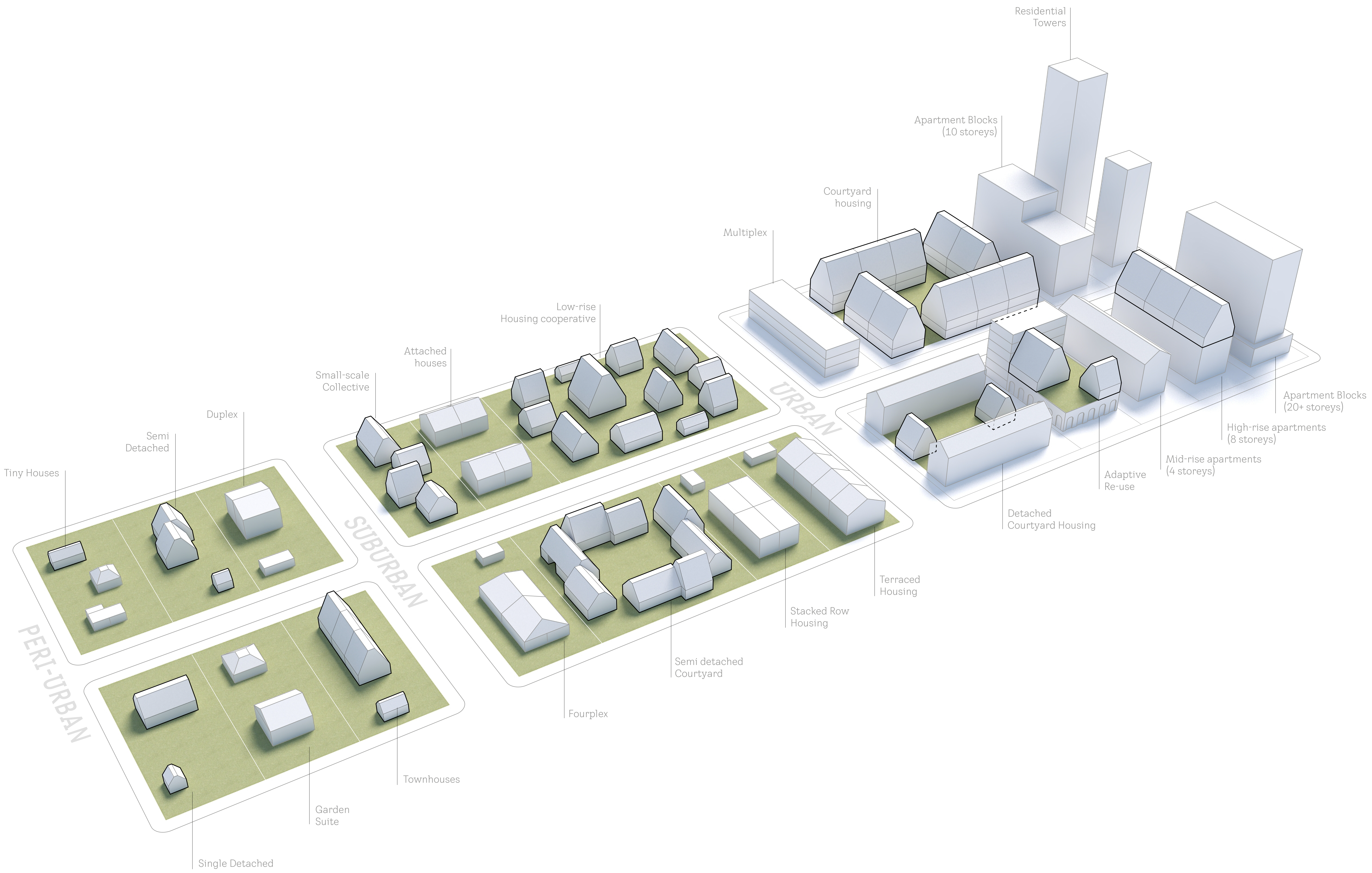
For Living Places to be truly impactful, it needs to be scalable. Every Living Places we create will unfold our building principles – yet simultaneously account for contextual needs, like site specifics or resident family constellations.

Think of it as a system which can expand, shrink, multiply or diminish – all without compromising our vision and integrity. This flexible approach makes it easy to scale, enabling a building system that spans from suburban to urban environments, from new built to adaptive reuse.

To prove the adaptability of the Living Places concept, we have continuously tested the project on multiple locations spanning from greenfield development to urban development.

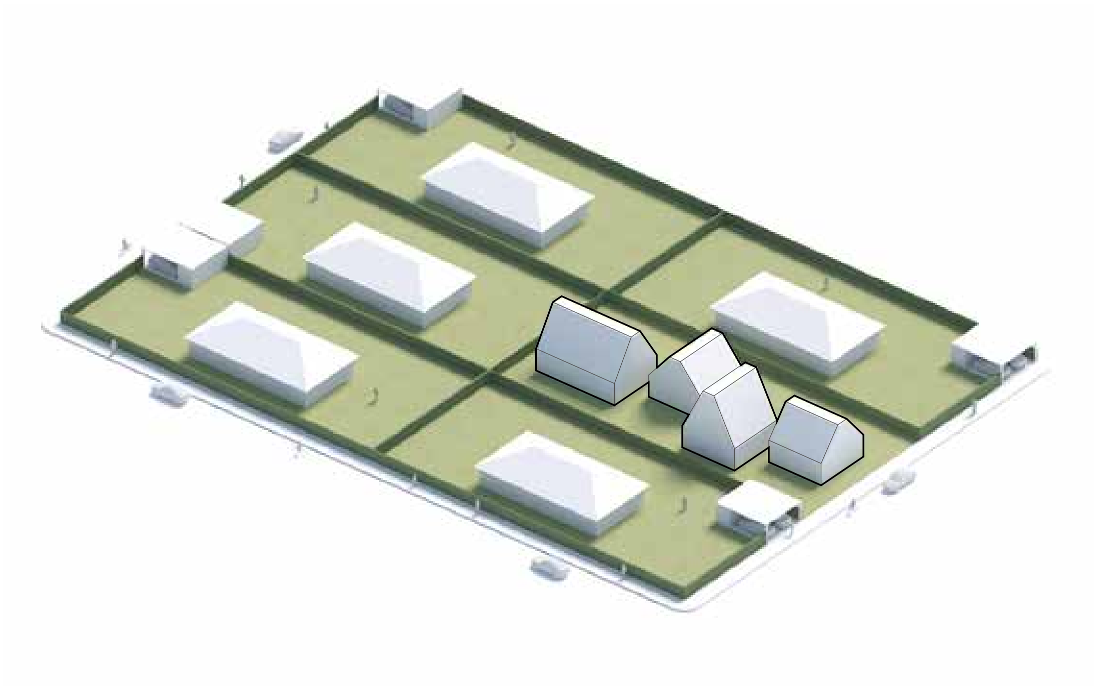
The test has proven that the concept can adapt to multiple locations and has the flexibility to withstand the challenges that each site poses.

The results give us a strong indication that the concept can adapt and scale to various locations both nationally and internationally.

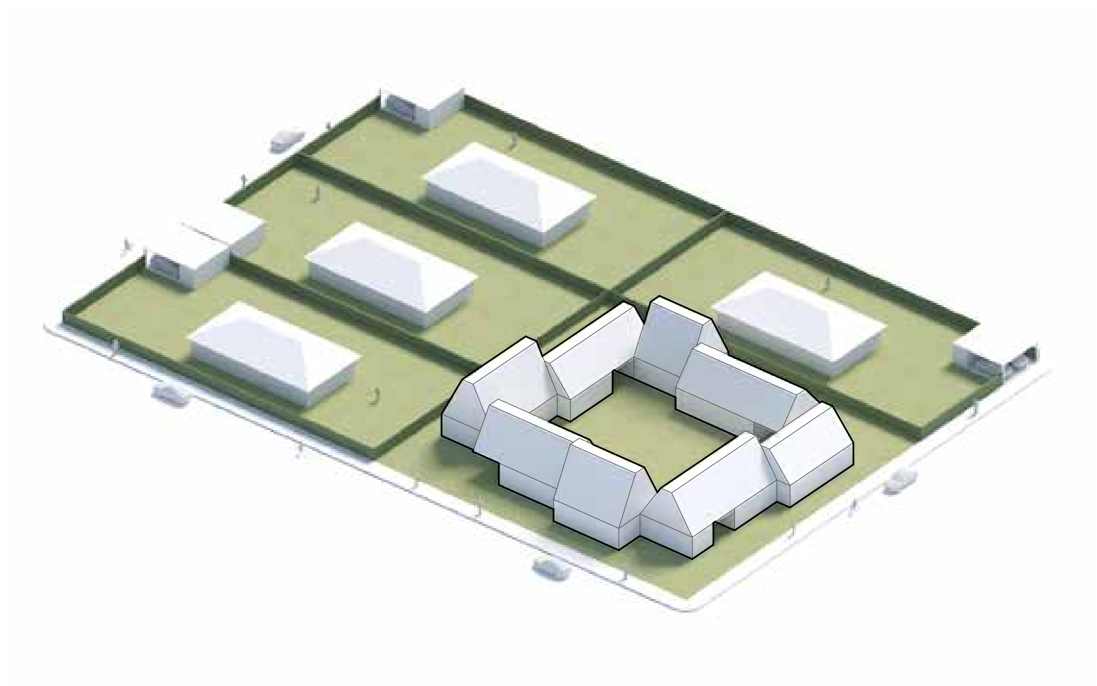


Suburban integration

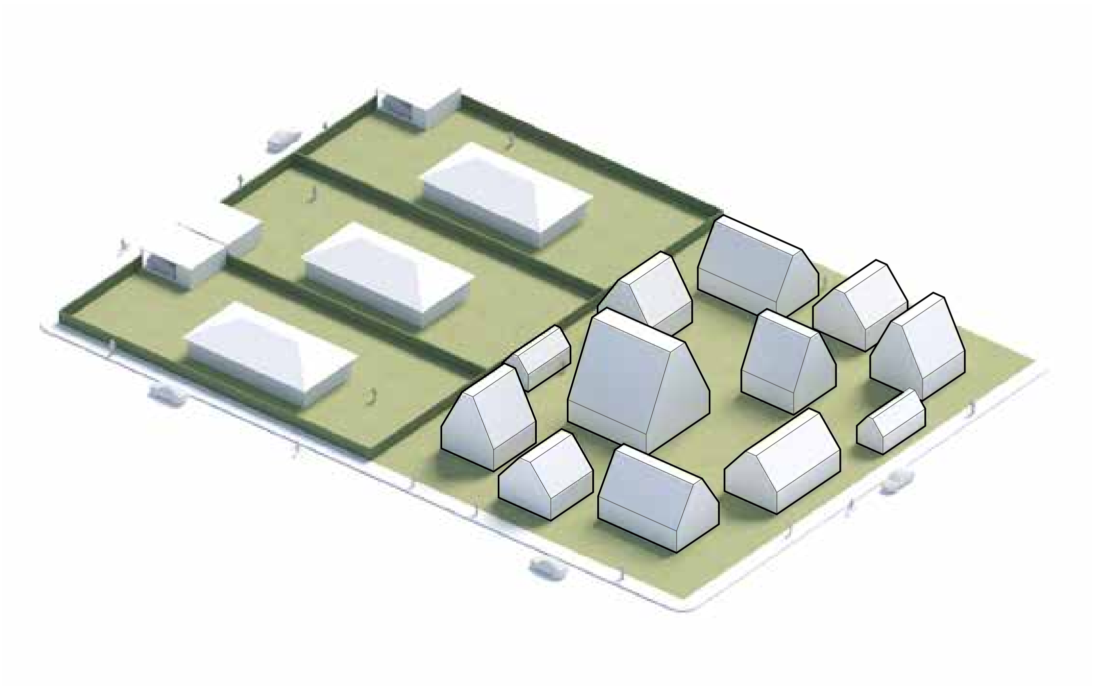
Diagrams showing how the project can integrate into a rural and suburban context.



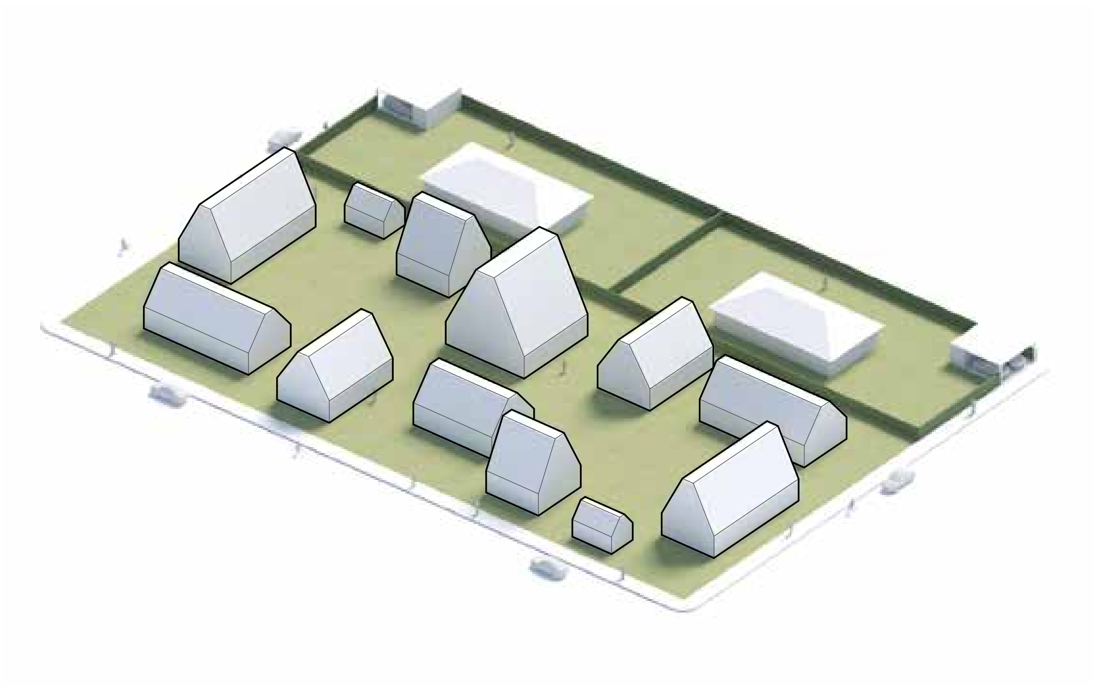
1 Plot Development



2 Plot Development



3 Plot Development

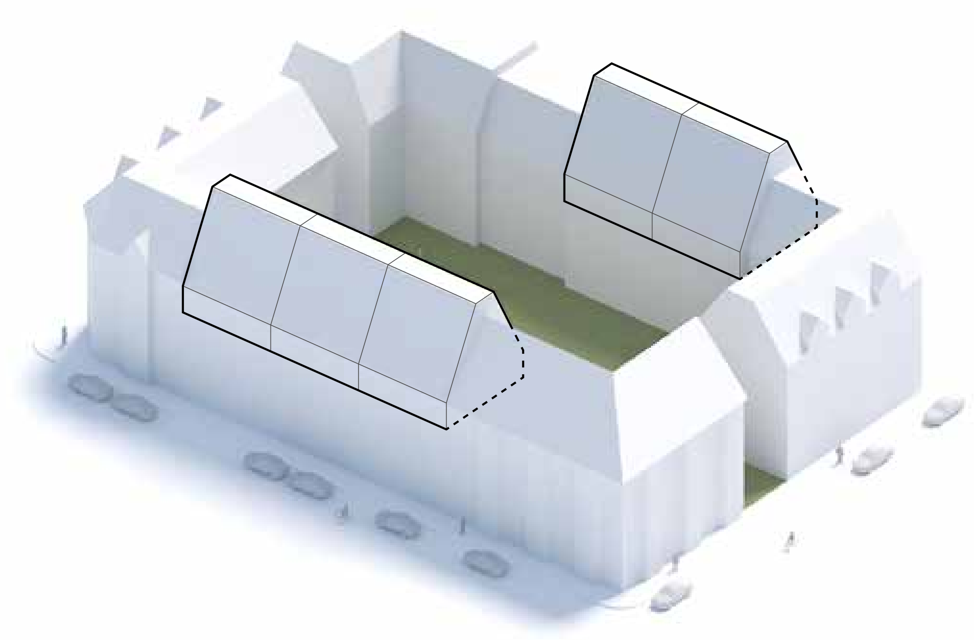


4 Plot Development

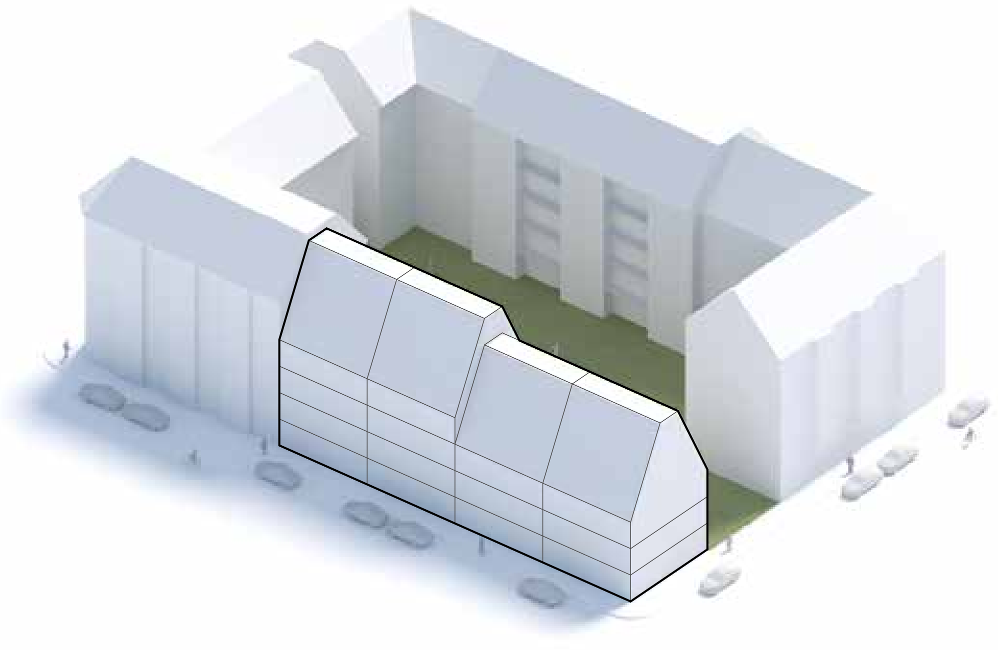

@ EFFEKT

Urban integration

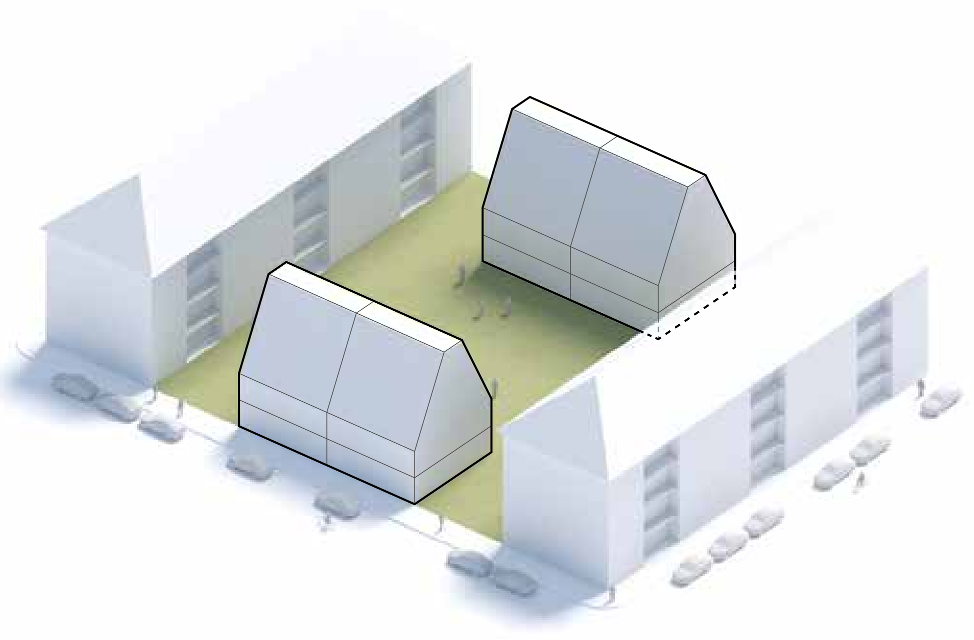
Diagrams showing how the project can integrate into an urban context.



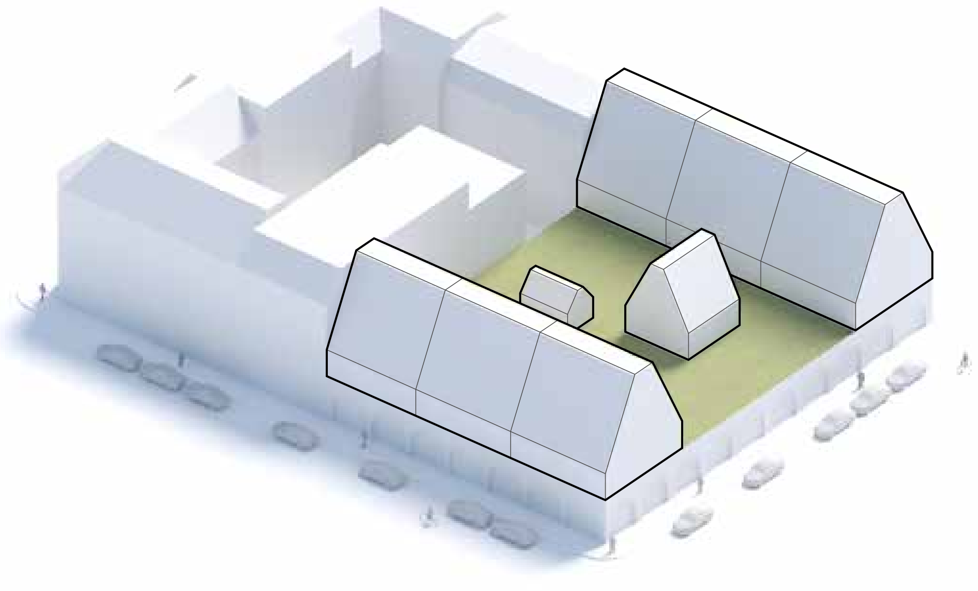
5 Raise the Roof



6 Perimeter Block Extension



7 Courtyard Densification



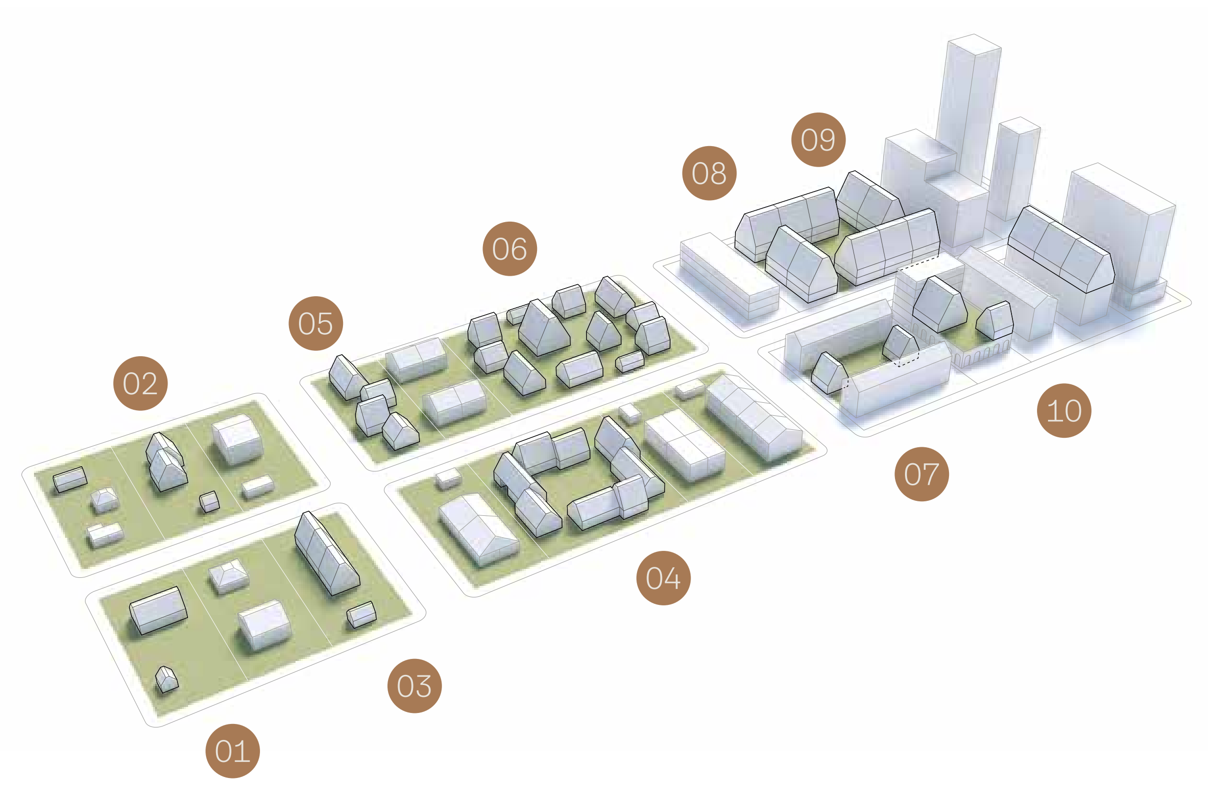
8 Adaptive Reuse


@ EFFEKT

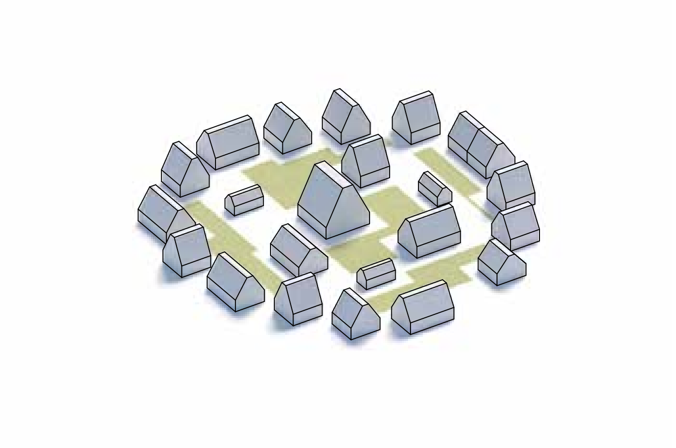
Tested cases

The Velux Living Places have been extensively tested in various locations to verify their adaptability and scalability. Our findings show that the concept is versatile and effective in any environment, though minor adjustments may be needed for complex sites with unique climates or urban densities. These adjustments ensure each installation is both functional and culturally relevant.

Feedback from these tests has refined our approach, leading to the use of innovative, sustainable materials and design elements adaptable to different conditions. We're also developing customizable modules for easier site-specific modifications, streamlining the adaptation process for diverse settings.

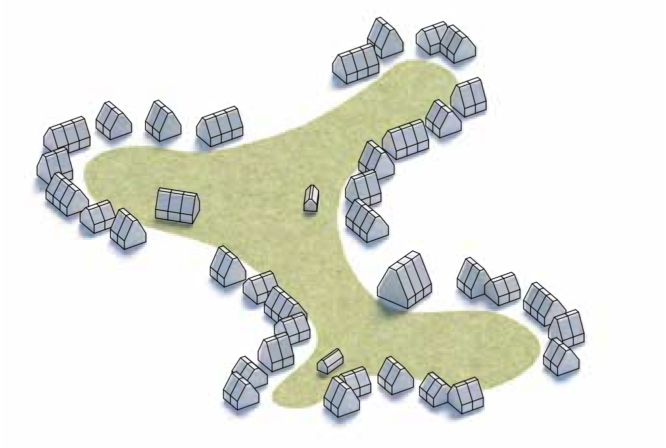


Rural



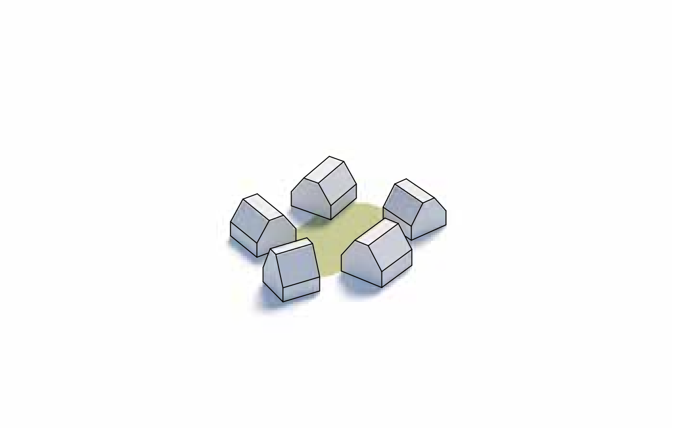
Rural - Single family house

01



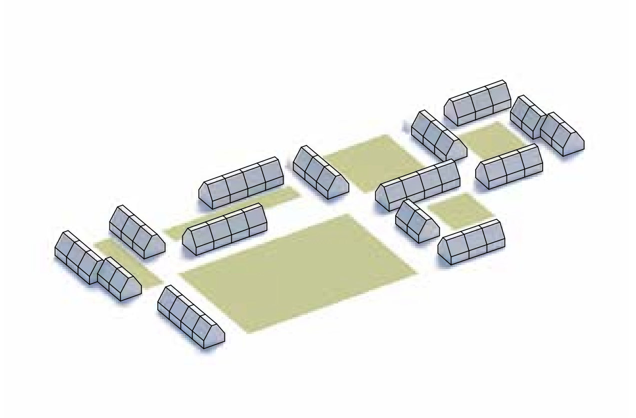
Rural - Row houses, semi-detached

02



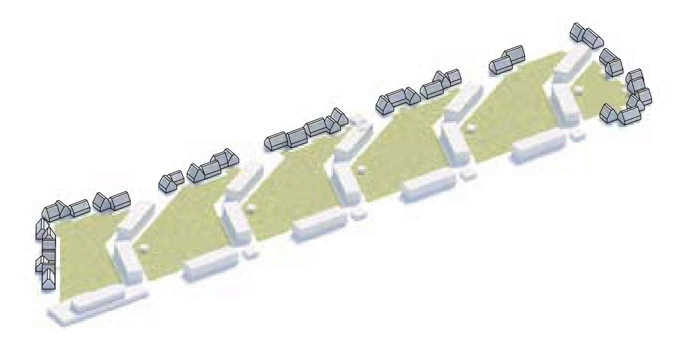
Peri urban - Co-living houses

03



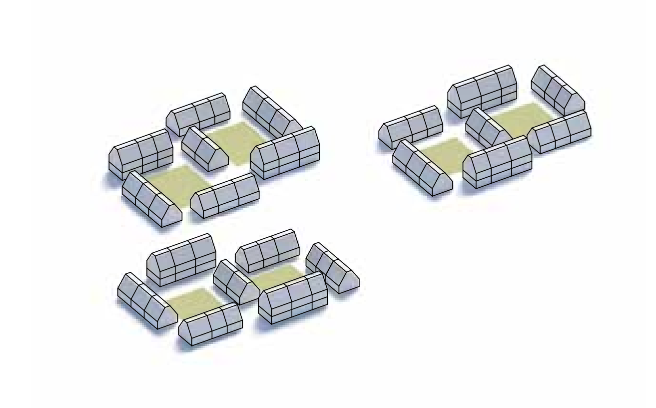
Peri urban - Row houses

04



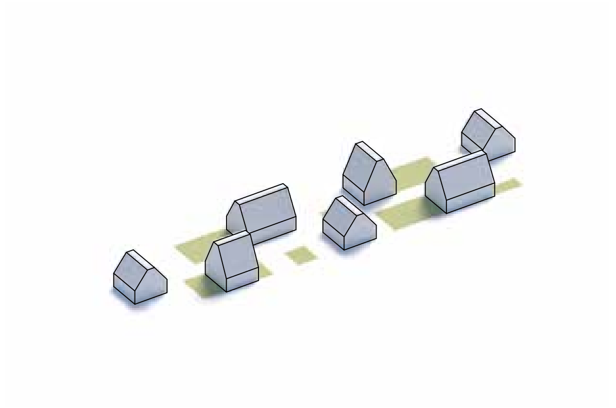
Suburban - Densification

05



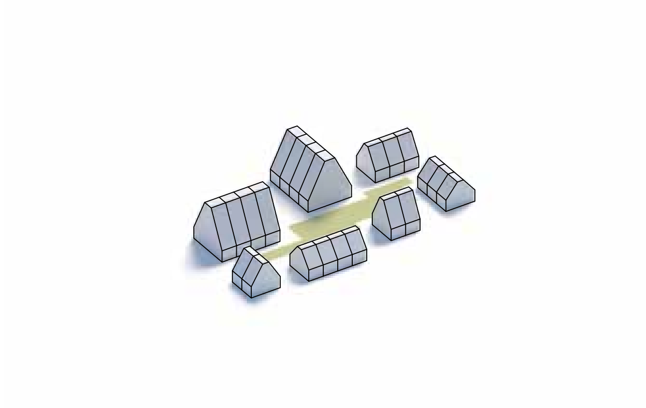
Suburban - Row houses

06



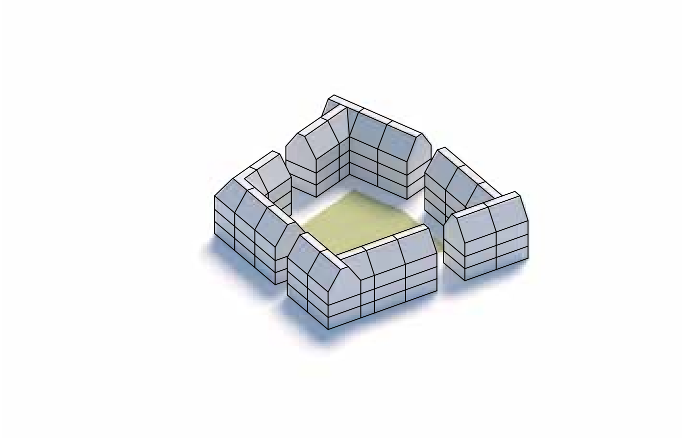
Suburban - Single family houses

07



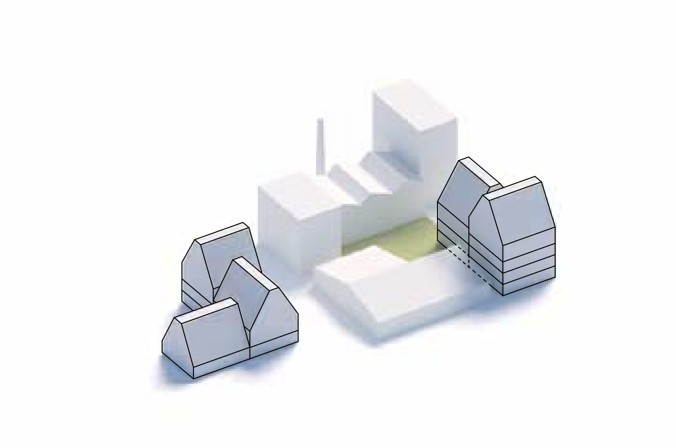
Urban - Row houses & Co-living

08



Urban - Block

09



Urban - Densification

10

Urban

Scalable Principle

What if by rethinking the way we design, plan, and finance homes we could unlock housing for the many?

By creating homes that challenge the way we design, plan, and think homes we can unlock housing for the many.

Source: EFFEKT Architects, 2023

Unlocking housing for the many

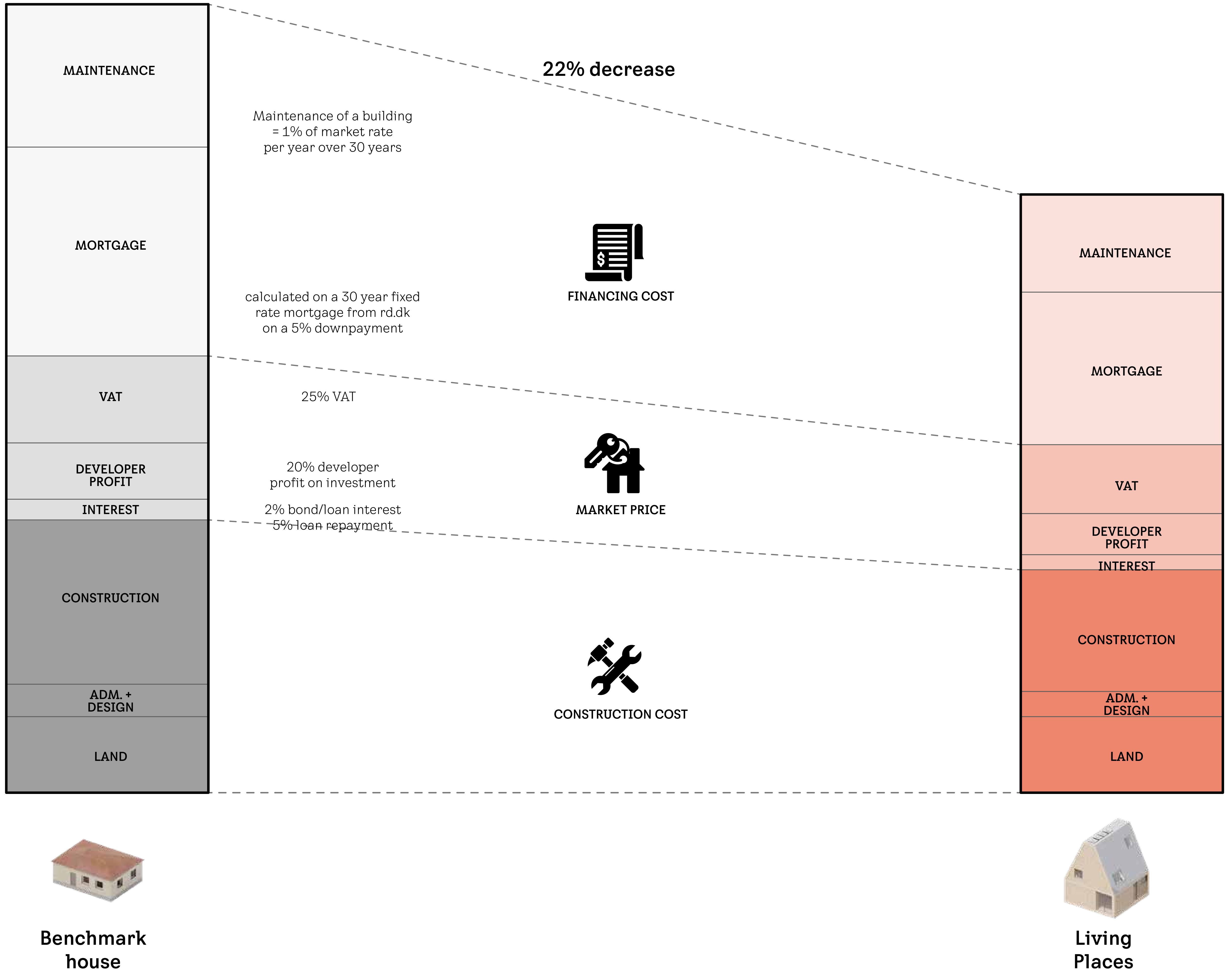
It is economically feasible for the average European citizen to live in a home that is healthy, sustainable, safe, and cost-effective without negatively impacting life on this planet.

The problem is that we think the cost is a barrier, and rightly so: rapid urbanization, outdated home ownership models, and precarious working conditions have continuously decreased our possibilities of living in a quality home, let alone buying one.

How can we flip this dynamic upside down and begin to reverse the affordable housing crisis? By creating affordable homes that challenge the one-size-fits-all logic, and by creating an adaptable and healthy home which enables diverse ways of living at an affordable price.

By combing affordability by design, circular resource loops, and new financial models for homeowners, we can lower people's entry points into the housing market.

note: Speculative developer model calculations are based on m² prices for Copenhagen, Denmark over a 30 year period



VAT
remains 25%

Developer profit
remains 20% of investment

Interest
is reduced because of the reduced construction cost

Construction
is reduced through the use of prefab modular solutions

Adm & Design
is reduced do to the scalable design

Land Prices
remains the same

Source: EFFEKT Architects, 2020

LCA and cost studies of build-ups

By using the process, we have investigated various build ups. We have developed LCA and detailed drawing for numerous versions. This catalogue can be expanded and serves as a knowledge bank for the team.

Foundation

Linear, elements

Terrain deck

Structure, insulation, flooring

Exterior walls

Structure, insulation, facade cladding

Floor deck

Structure, insulation, flooring

Interior walls

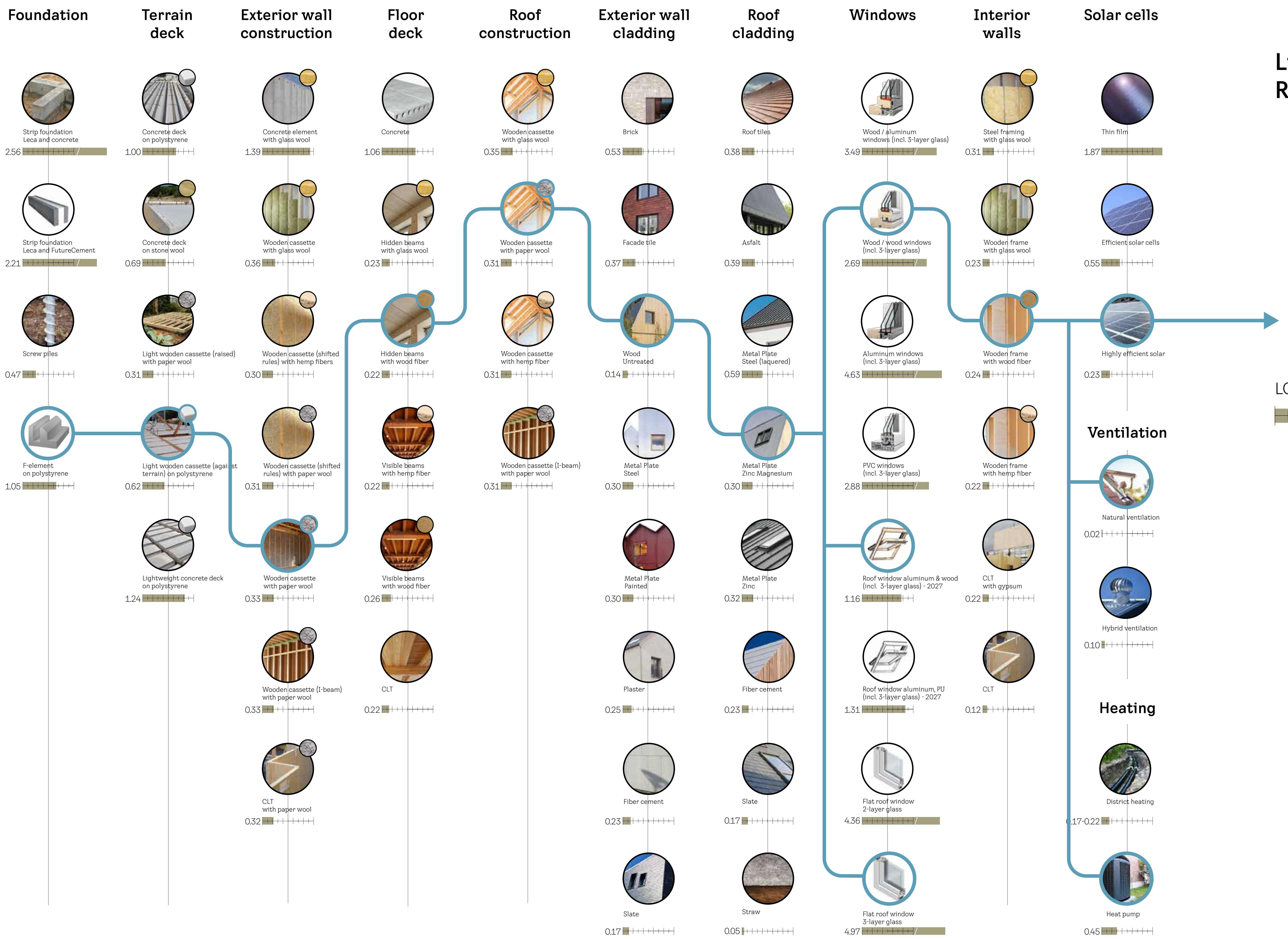
Structure, insulation, finishes

Roof construction

Structure, insulation, roof cladding

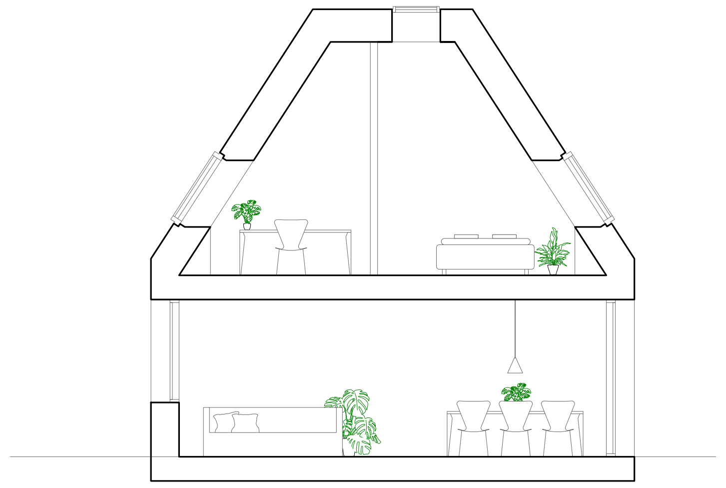
Optimization pathway - example

Initial version, single family houses in row configuration.

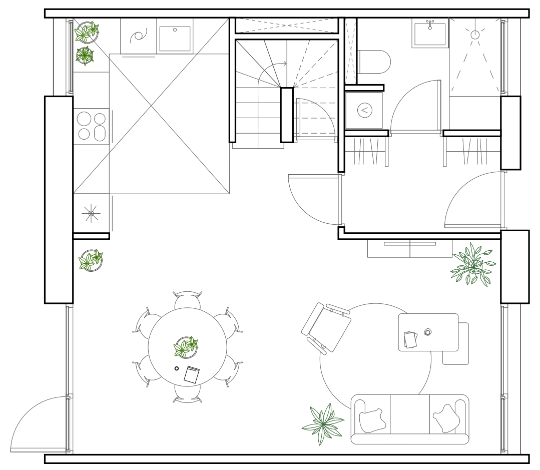


Living Places Row houses

LCA: 3,30 $kgCO_2eq/m^2/year$



Section - Row houses

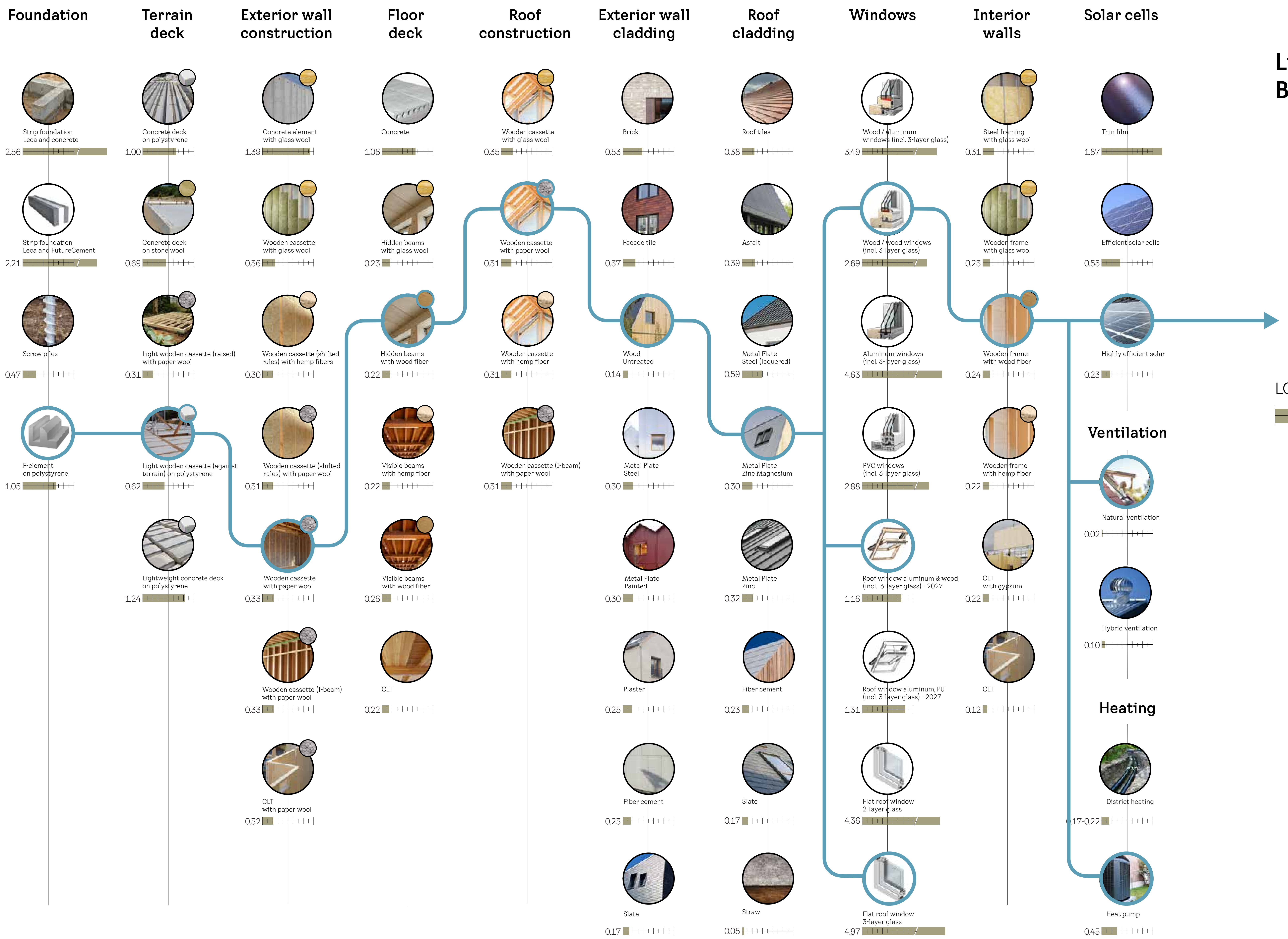


Ground floor - Row houses

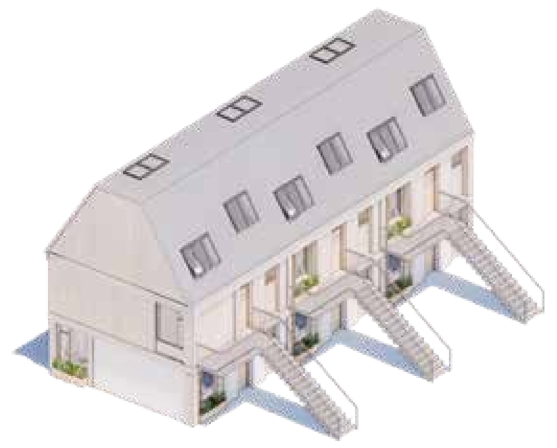
Source: LCA Calculation by Artelia, 2022.

Optimization pathway - example

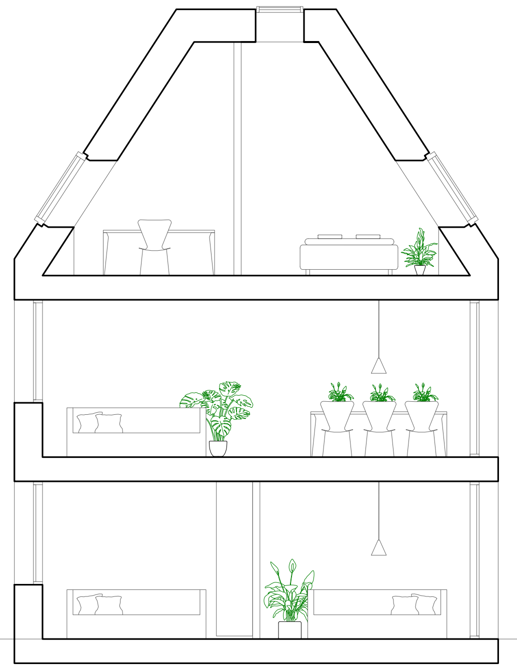
The Double House is made in 3 levels, and allows for the concept to have a small apartment in the bottom, that is useful for senior citizens or young professionals. This allows us to create a wider variety of housing options.



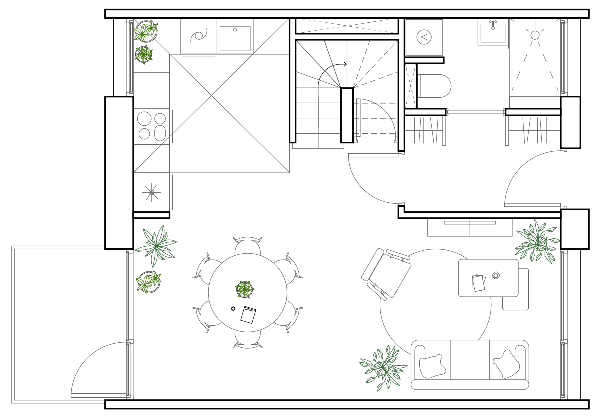
Living Places Block - 3 floors



LCA: 3,80 kgCO_2eq/m^2/year



Section - Block

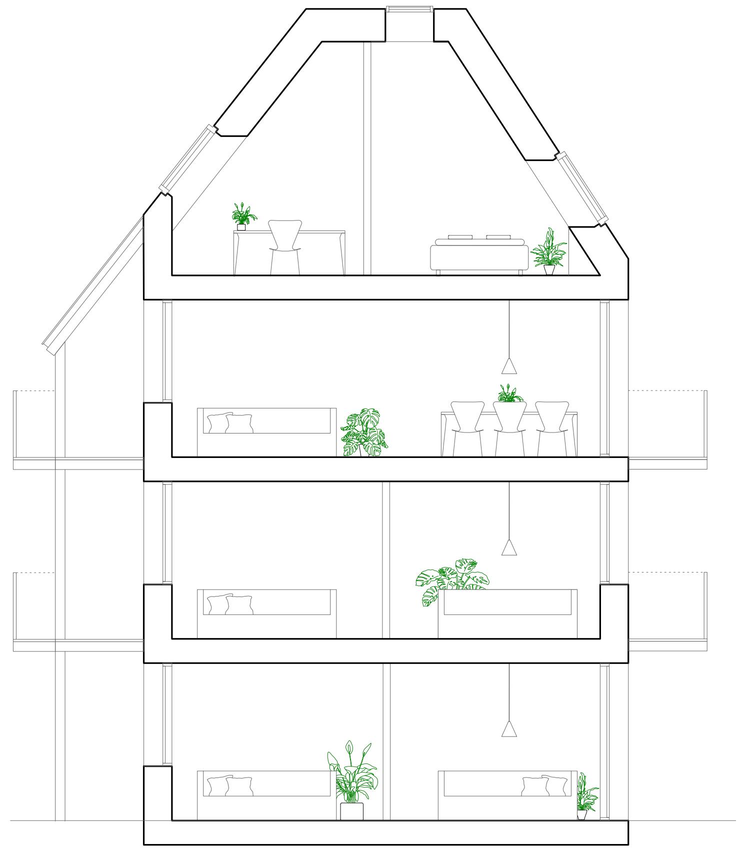


Ground floor - Duplex

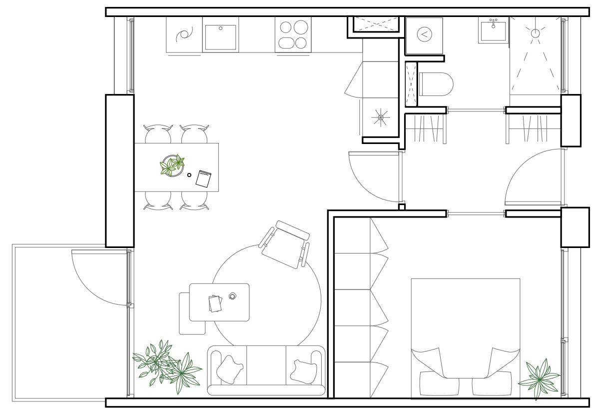
Source: LCA Calculation by Artelia, 2022.

Optimization pathway - example

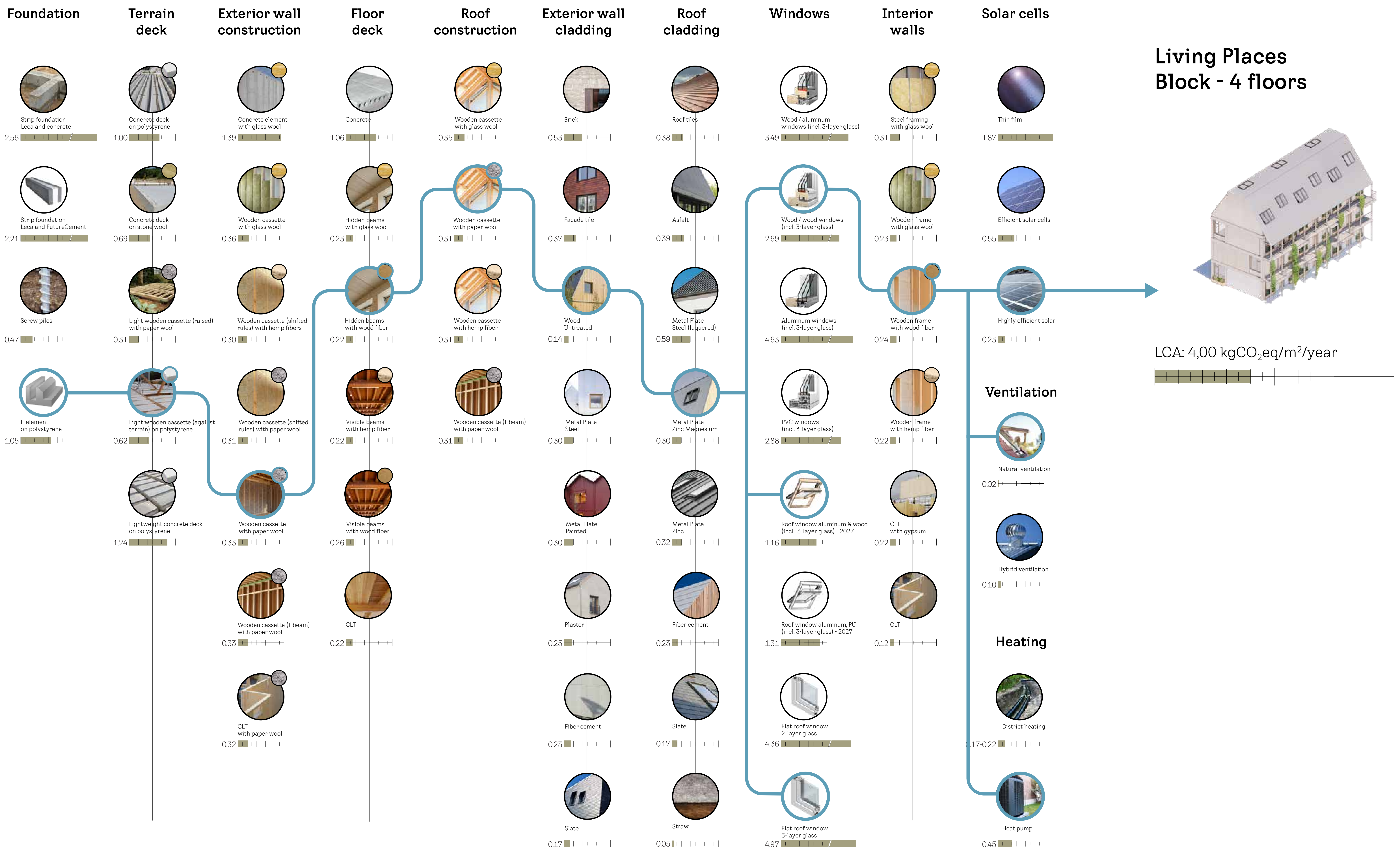
The short linear block is made in 5 storeys, is only approx 35 meters long and would be ideal as a fill in project in urban contexts. It consists of 2 layers of smaller apartments and a 3 storey typology for co-housing or penthouse.



Section - Block



Ground floor - Apartment



05

Prototype proof of concept

Living Places Copenhagen
a living lab for the world

A living lab for the world -

The project was successfully completed by the VELUX Group, showcasing their commitment to sustainable practices in the building industry. In collaboration with EFFEKT Architects, Artelia engineers, and Enemærke & Petersen contractors, this pioneering venture demonstrated the feasibility of constructing low-carbon, healthy housing using existing technologies without incurring extra costs or compromising on quality, architecture, and indoor climate.

This initiative, a temporary landmark for the UIA2023, not only elevated the partners involved but also significantly benefited the city. Our vision of creating a better living environment that serves both people and the planet was realized, contributing to a thriving future for humanity.

The site served as a living lab for VELUX and its partners, fostering the investigation and exploration of innovative solutions for future construction and living. These efforts provided valuable insights for the industry.

Additionally, the project intends to validate the concept of design for disassembly. After a successful 2-5 year period, the village will be deconstructed and relocated, extending the lifespan of the buildings and enabling placemaking in a new location. This approach exemplifies sustainable development and adaptability in modern construction.

Living Places Copenhagen Results

Living Places Concept has Denmark's lowest CO_2 footprint and a first-class indoor climate. It has been built using existing technologies and materials, demonstrating that we do not have to wait for future technology to build far more sustainable homes that are healthy, affordable and beautiful to live in.

Starting from the ground up - each building component has been optimized for the best constellation of price, indoor climate and carbon footprint, with a special focus given to the envelope of the building where significant CO_2 savings can be achieved.

As a result, Living Places Concept has received third-party verification from AAU BUILD to have almost 3x lower CO_2 footprint than an average Danish single-family house at 3.85 kg CO_2 eq per m^2/year compared to 11.10 kg CO_2 eq per m^2/year for an average new build, Danish single-family house.

Furthermore, Living Places is designed with a strong focus on creating a healthy indoor climate using daylight and fresh air and has been awarded a best-in-class indoor climate.

Environmental impact

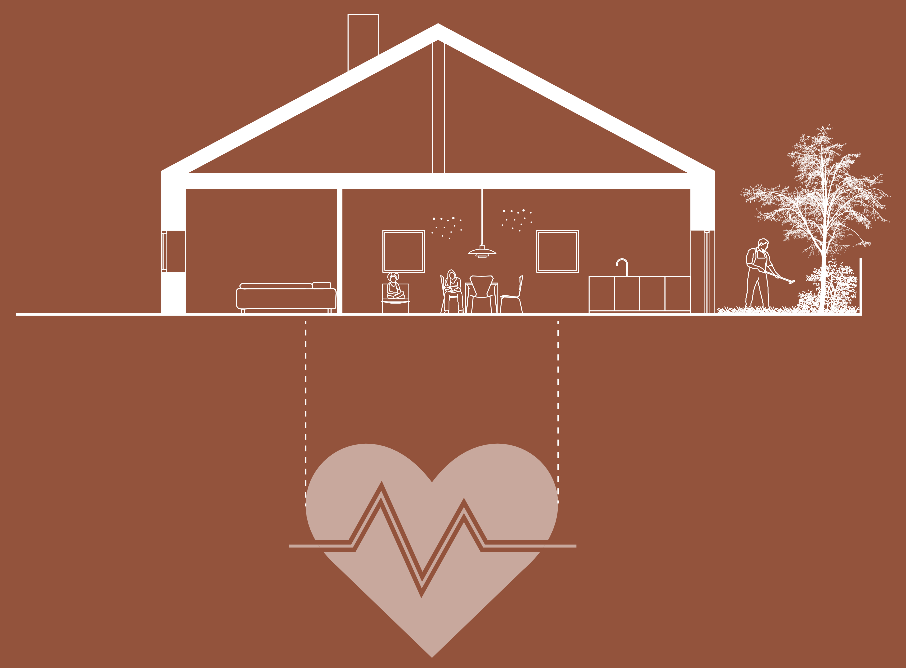
3x lower LCA

11.10 kg CO_2/m^2/year

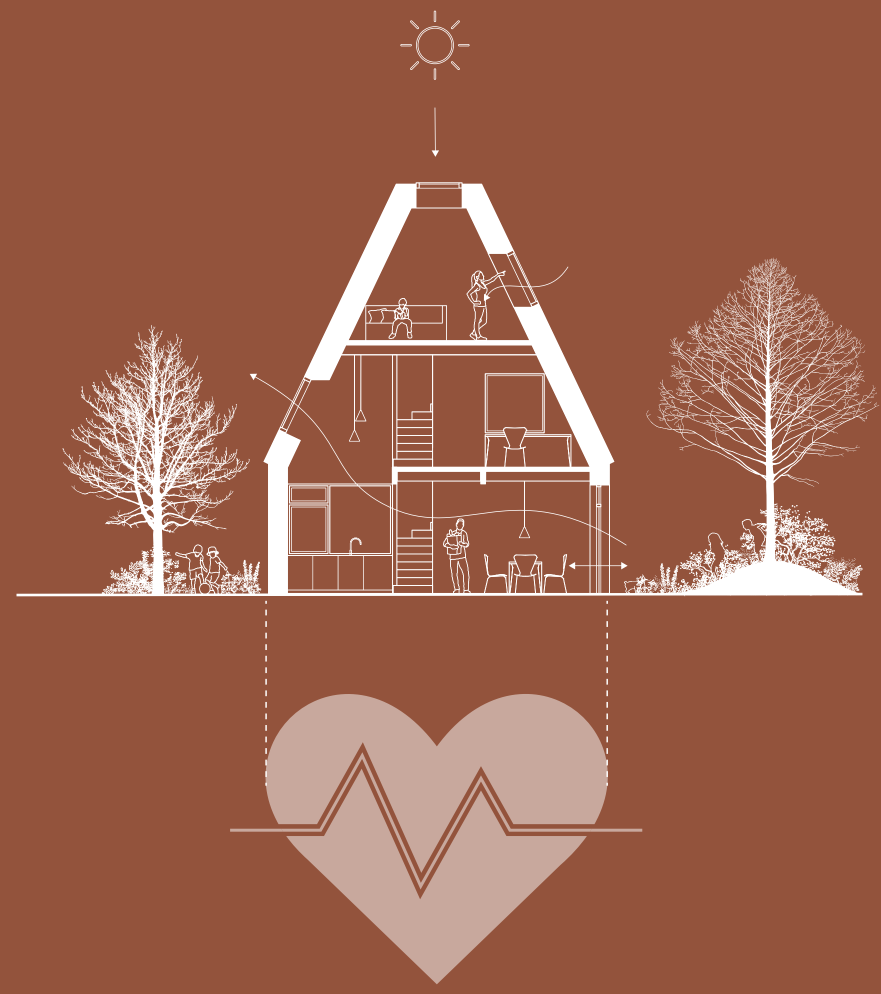
3,85 kg CO_2/m^2/year

Health impact

3x better indoor climate class



Indoor climate class 3



Indoor climate class 1

Source: EFFEKT Architects, 2023

[1]:Boligbyggeri fra 4 til 1 planet - 24 best practice cases, Aalborg Universitet, 2024

Context

Jernbanebyen a new
development in the city

Location & Context

Living Places, now established in Copenhagen's Jernbanebyen, was selected for its prime showcasing opportunity at UIA 2023.

This location has proven ideal for demonstrating Living Places, capitalizing on the event's prominence and Copenhagen's innovative urban character. It has been transformed into a vibrant showroom, making Jernbanebyen a destination that exemplifies sustainable, harmonious urban living as envisioned by the Living Places initiative


Copenhagen V
Jernbanebyen

Identity & context

Industrial area

Jernbanebyen in Copenhagen, formerly a busy industrial area for railway activities, is undergoing a transformation. After the industry subsided, the area is now in the process of being transformed into a modern district with preservation of its historical character

Cultural heritage

The buildings in Jernbanebyen, Copenhagen, embody the area's industrial history. With their distinctive architecture from the railway era, they serve as a tangible connection to the past, blending historical significance with contemporary urban life.

Event & creative offices

The former industrial buildings in Jernbanebyen, Copenhagen, are now repurposed as event spaces and creative offices. Their spacious and unique architecture offers an ideal setting for artistic and corporate events, and provides inspiring work environments for creative professionals and startups.

Experimental housing

Jernbanebyen in Copenhagen is experimenting with new housing typologies, including experimental student housing. This initiative blends modern design with the area's industrial heritage, focusing on sustainable, diverse living spaces that cater to various needs and lifestyles, particularly for students.

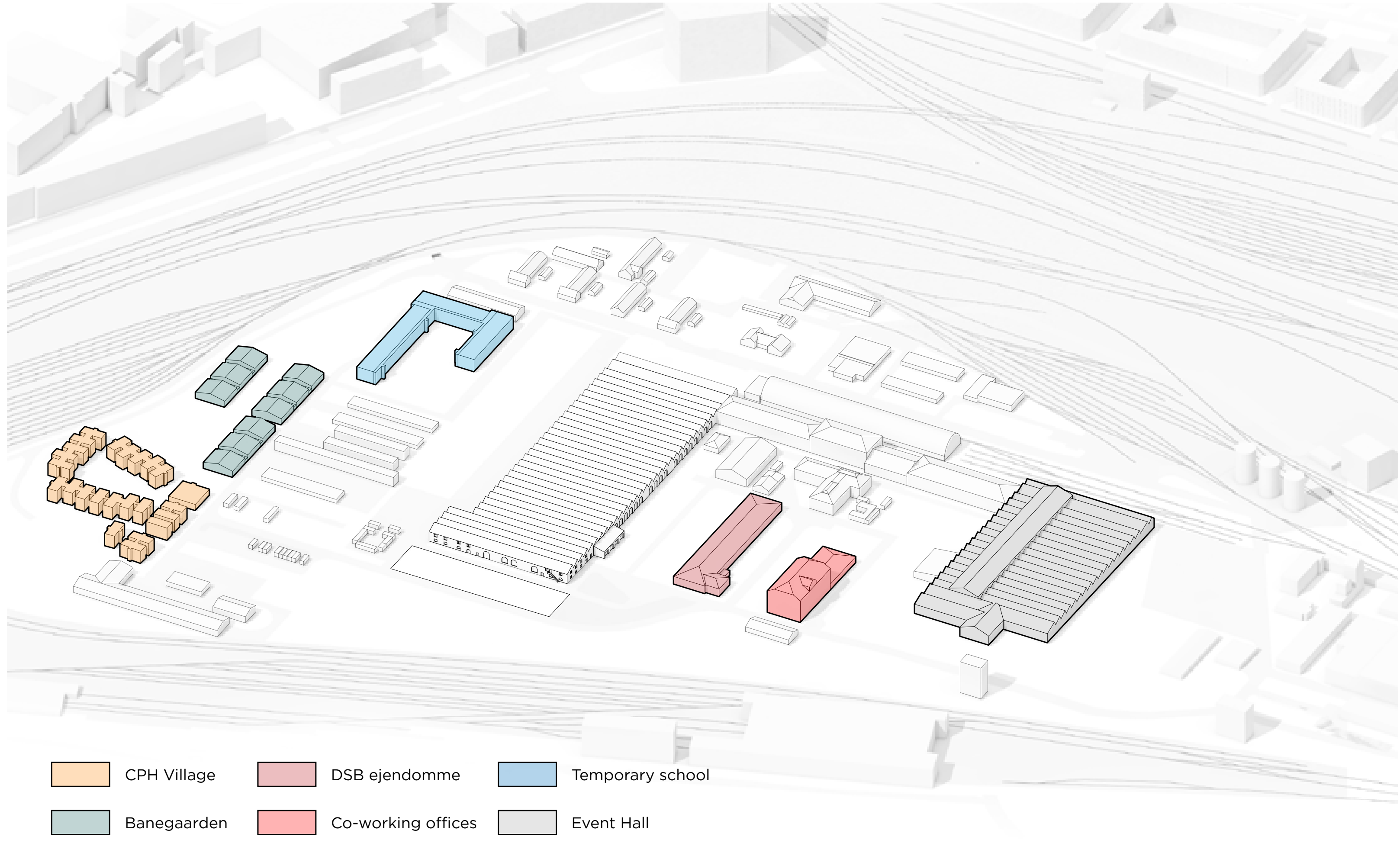
Food & culture

Jernbanebyen in Copenhagen features a lively food and cultural scene, anchored by Banegaarden, a converted old railway dock. This spot has evolved into a hub for diverse culinary and cultural activities, leveraging its industrial heritage to create a unique, vibrant community space.

Local community

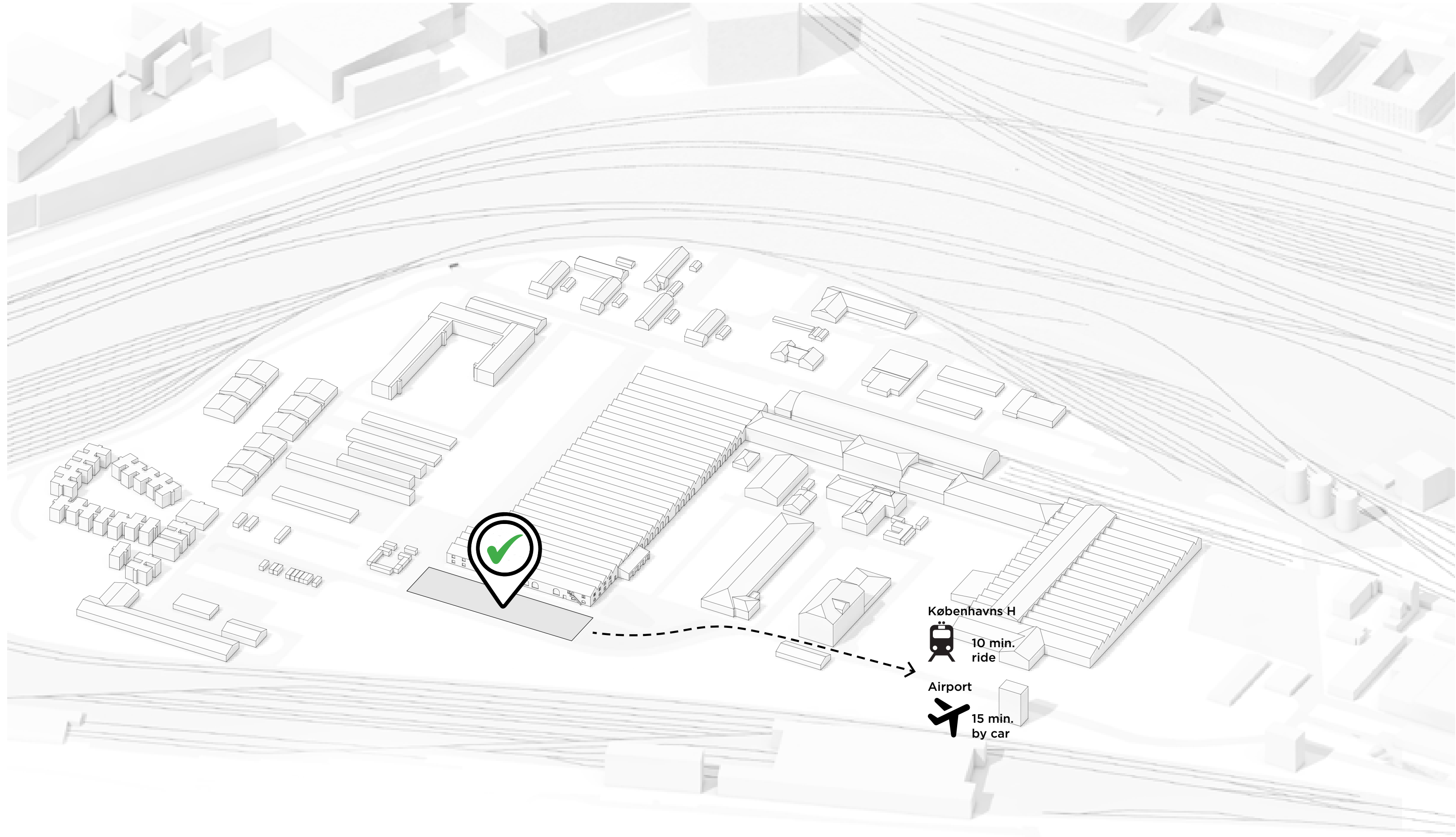
Jernbanebyen in Copenhagen is unique due to its engaged local community of residents, artists, and entrepreneurs. Their collective efforts and initiatives infuse the area with a distinct culture and vibrant atmosphere, creating a strong sense of identity and community spirit.

Context Potential



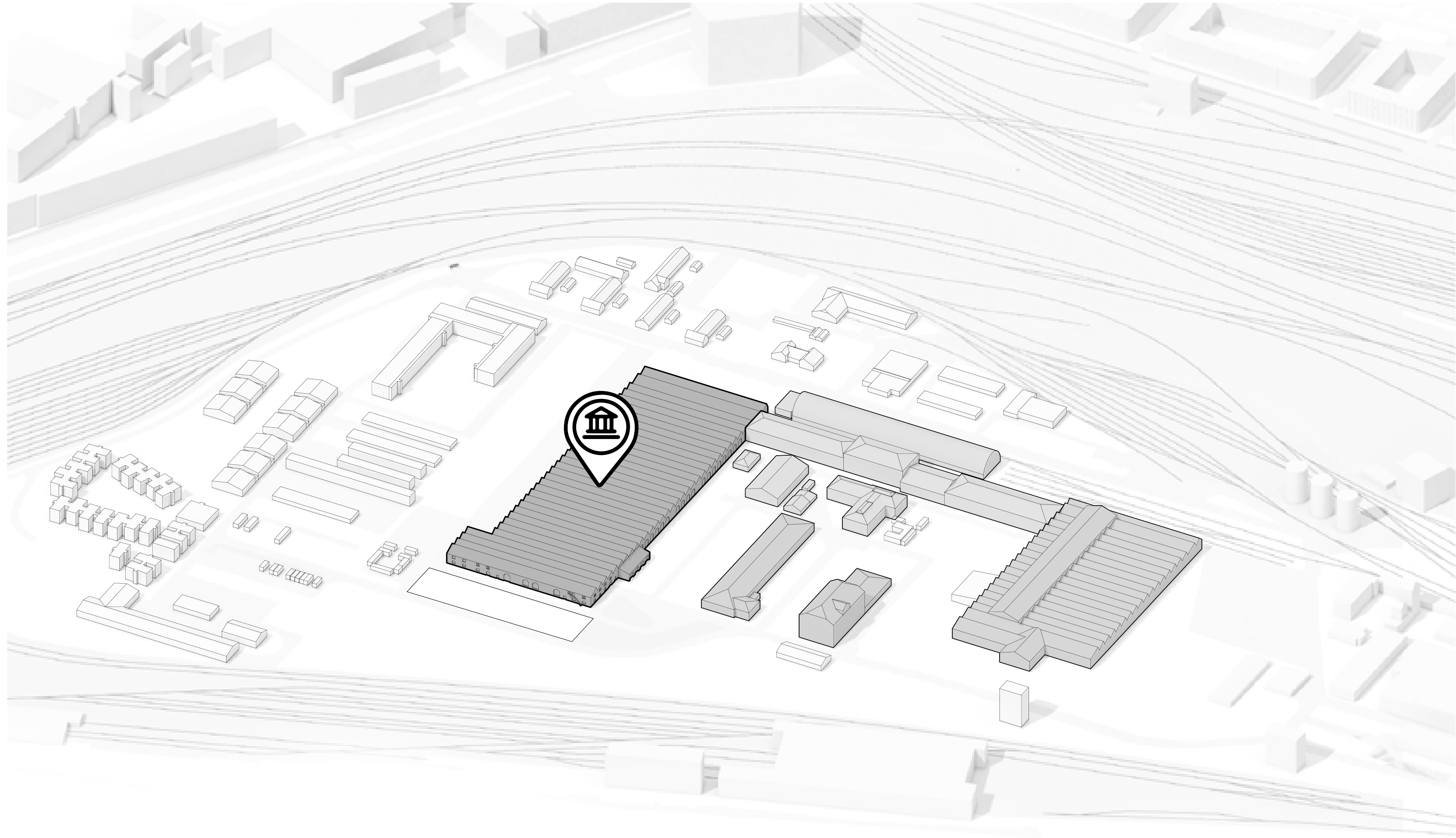
Existing program

Located near the site is many existing programs that enhance the sites potential, and enables a possible synergy between these.



Well-located

The site is located in the heart of Copenhagen, and is accessible from all major neighborhoods. This location poses a huge potential to become a new favored hotspot for Copenhagen.



Existing cultural heritage

The site is located next to the old train maintenance site, these buildings are of important cultural heritage and provide an amazing context for a project like this.


@ Adam Mork

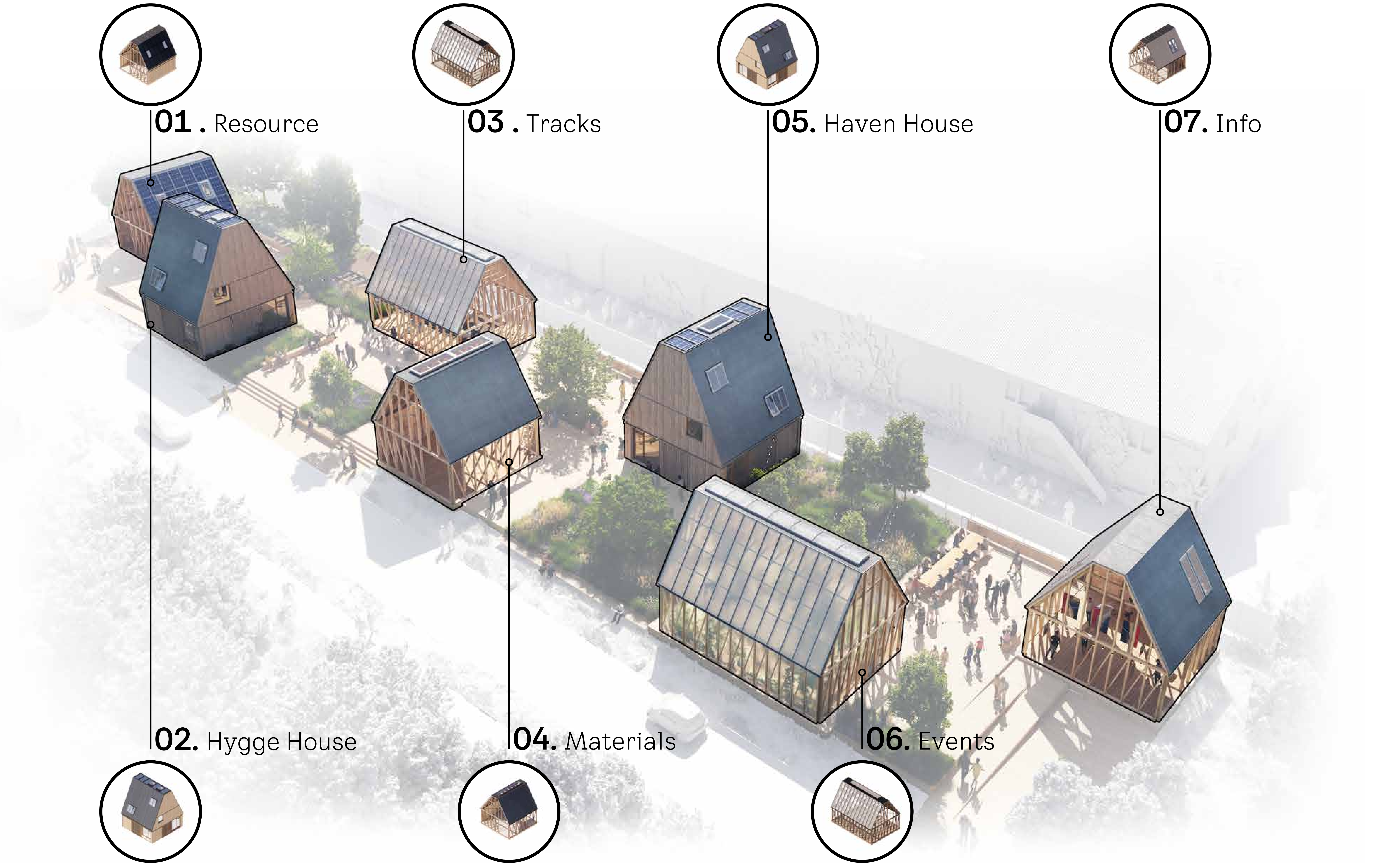
Concept

A new venue for all
of Copenhagen

Programming on site

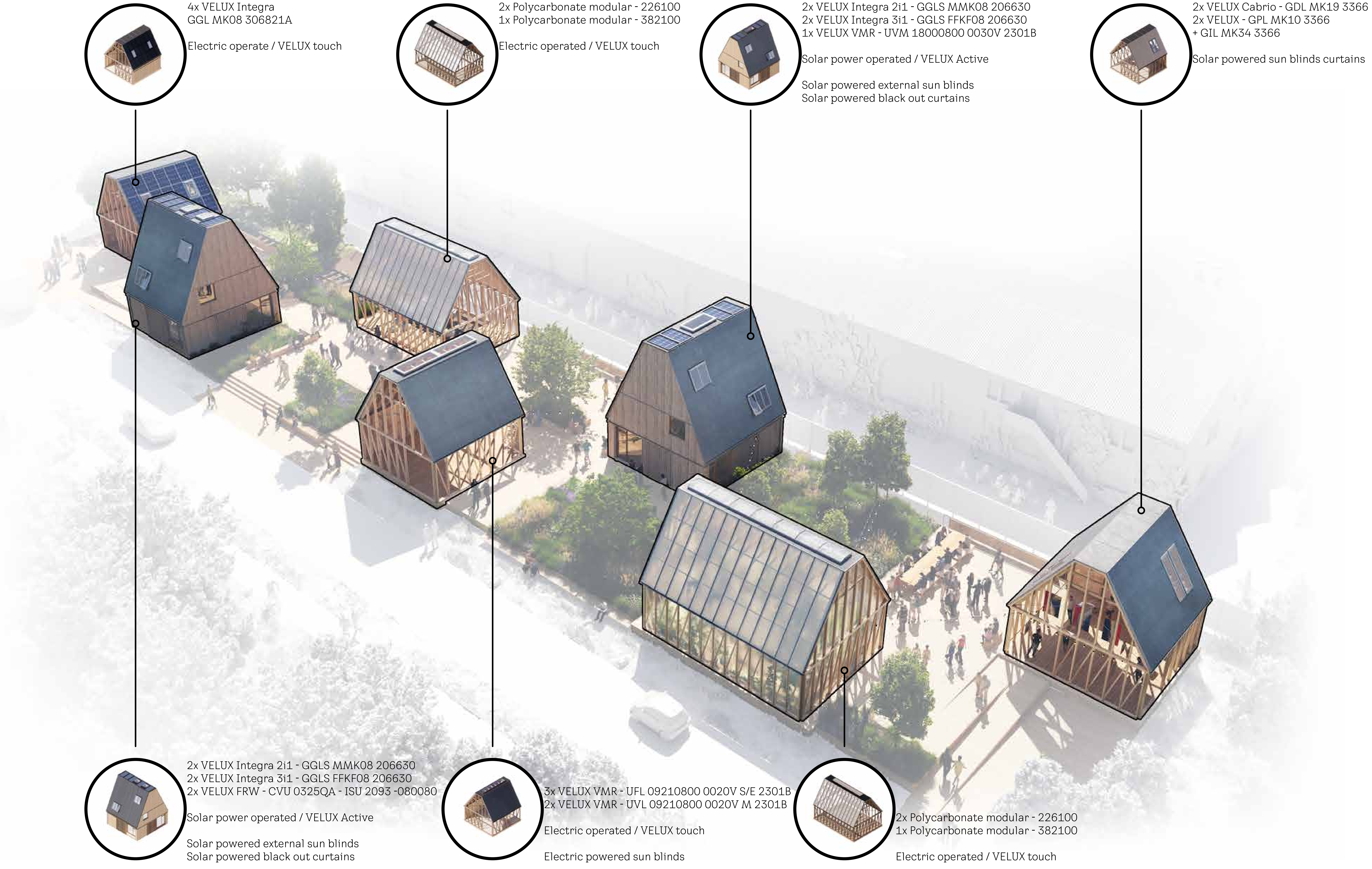
On the 30th August 2022, the construction process of Living Places Copenhagen began. This experimental project aims to show how low carbon housing can be built using existing technologies – and in a way that does not incur any additional costs in construction and without compromising on quality, architecture and indoor climate.

Living Places Copenhagen includes seven full-scale prototypes – five open pavilions and two completed houses. Each prototype is curated to show the synergy between how we live in homes and communities. The prototypes are built using everyday techniques and materials to gain valuable insights and learnings for developing new solutions for construction and living. Furthermore, the location will test desirability and the design for disassembly principle by deconstructing the village after 3-5 years and placing it somewhere else afterwards.

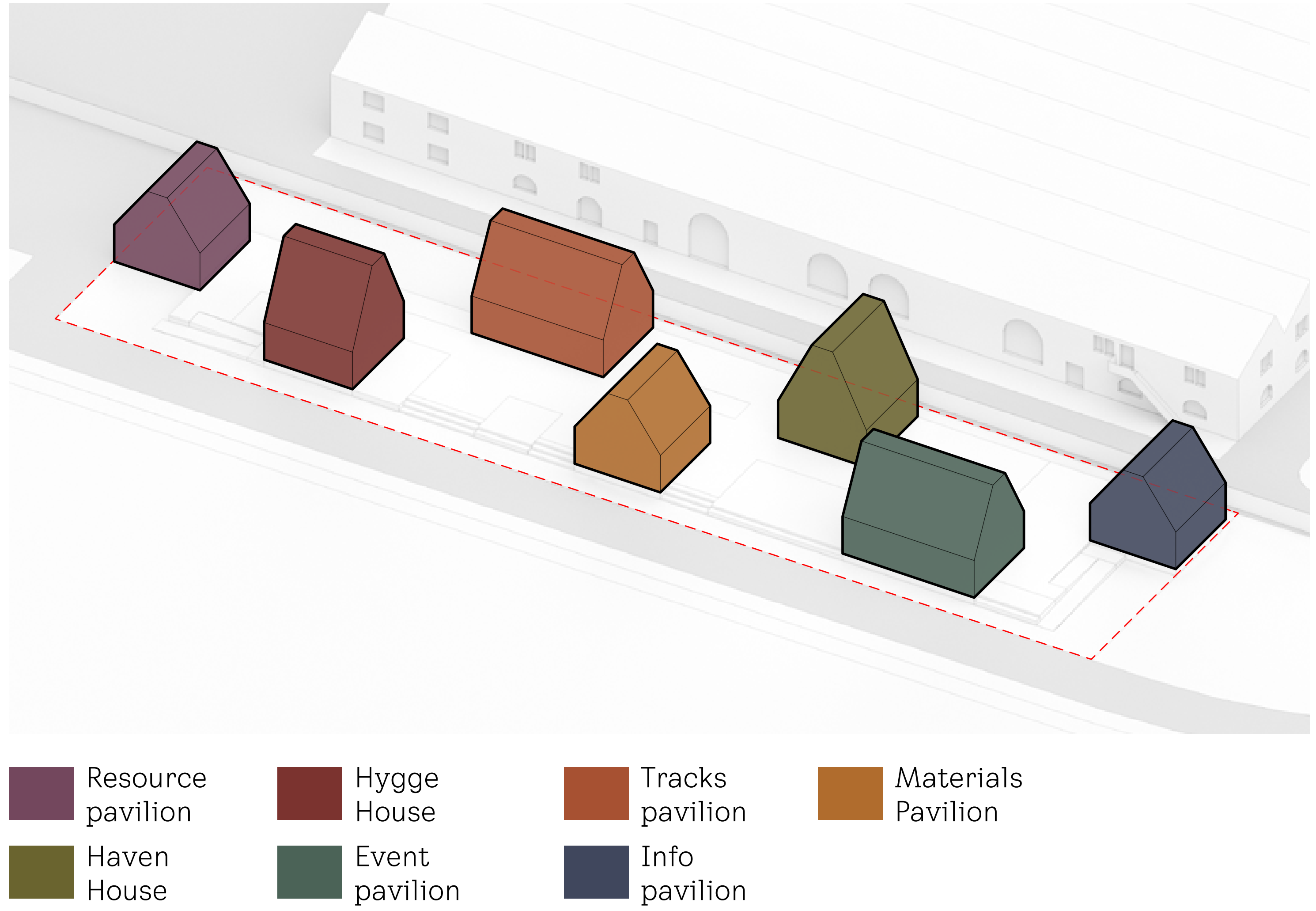


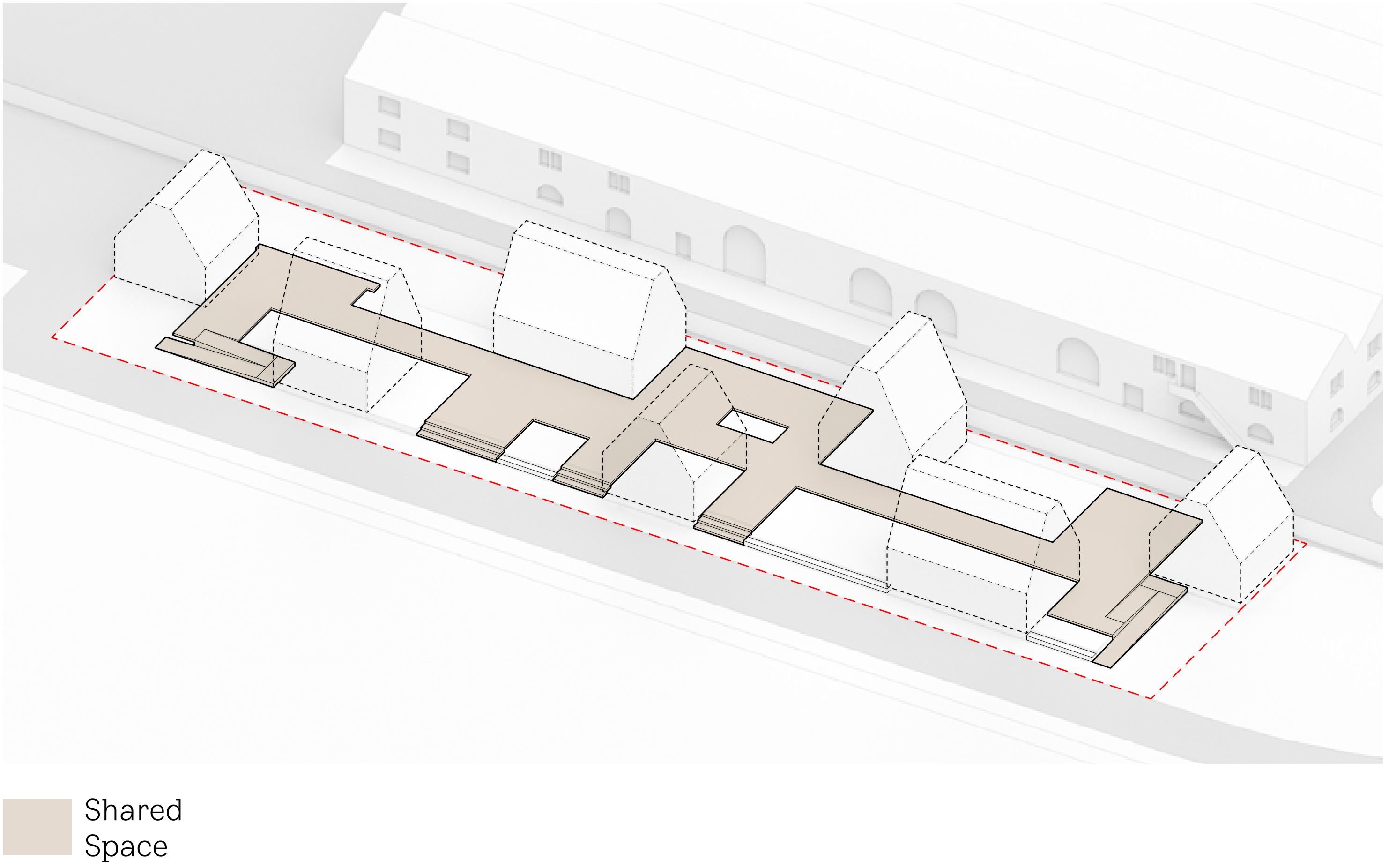
VELUX integration

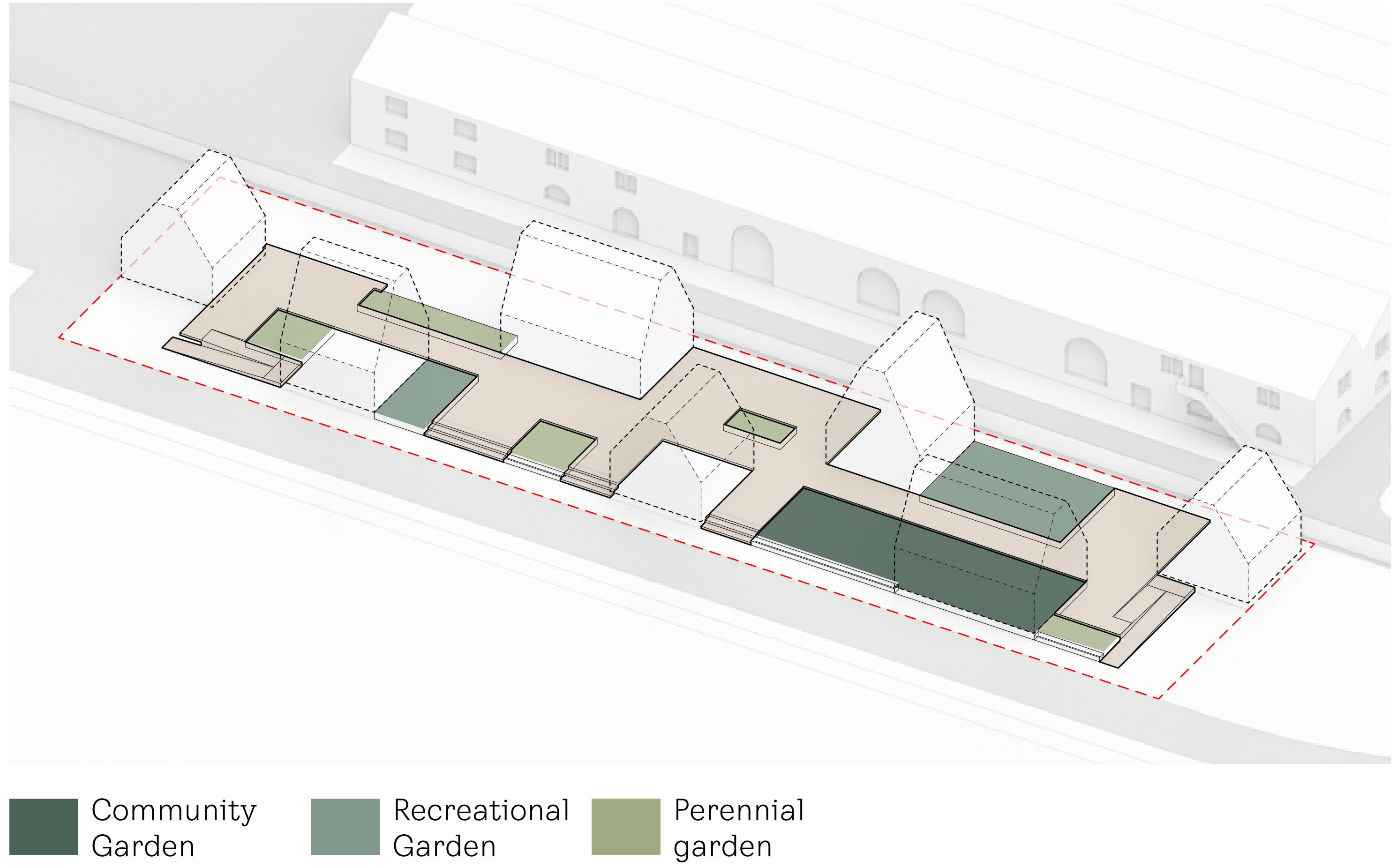
VELUX roof windows have been bringing daylight and fresh air into homes around the world for more than 80 years.
Our wide range of roof windows and accessories can positively transform your home in many ways, while also improving your indoor environment.



Concept Diagram







Buildings

The seven buildings, each unique, together create a close-knit community atmosphere. Their shared spaces, encourage interaction and connection. This architectural ensemble turns the area into a vibrant, communal living space.

Public space

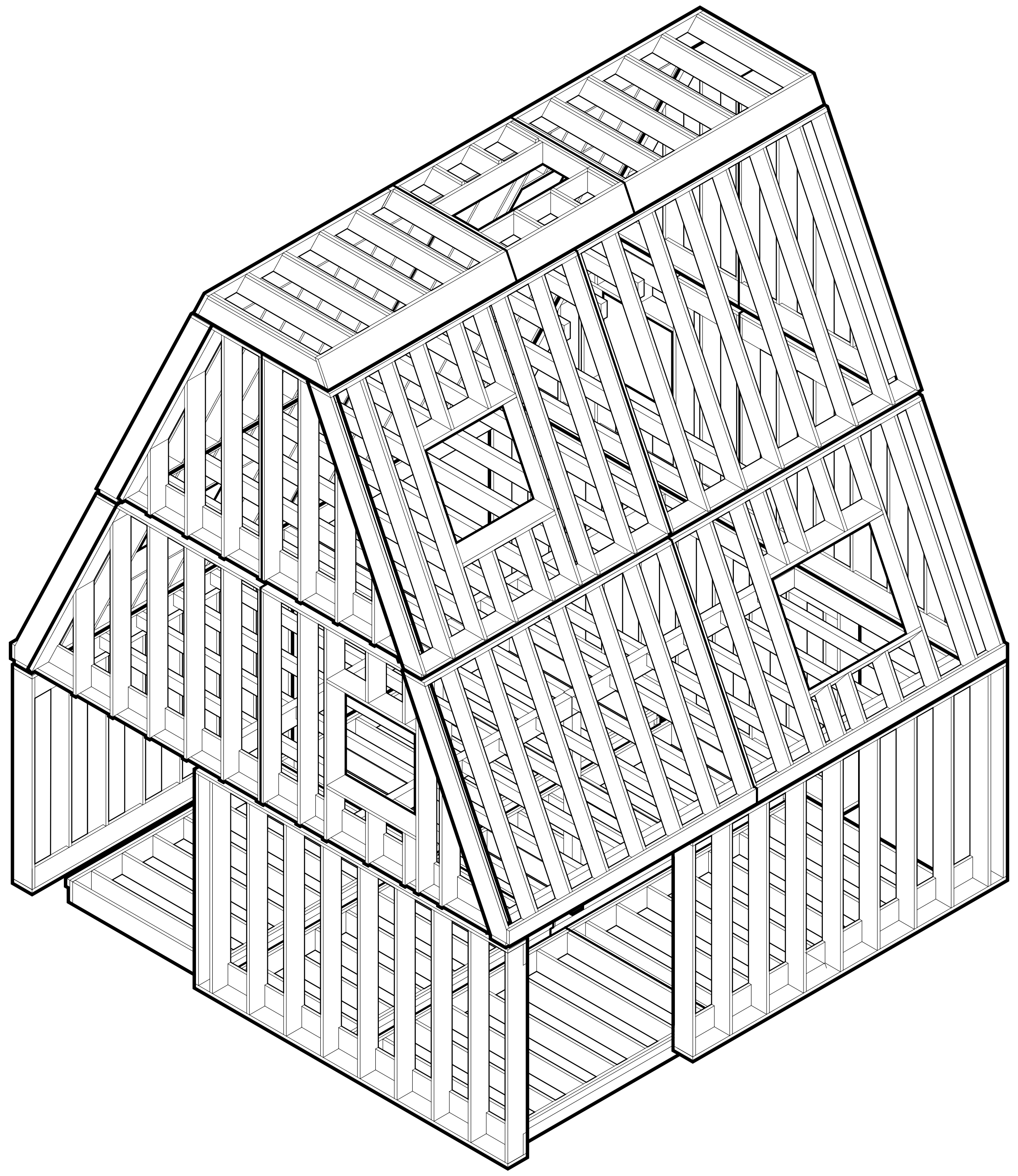
The raised wooden deck between the seven buildings is a serene oasis, offering a natural gathering point that enhances the community feel in an urban setting.

Green space

The community garden cultivates togetherness, the recreational garden offers leisure and play, and the perennial garden brings year-round natural beauty, together enhancing community bonds and a connection to nature..

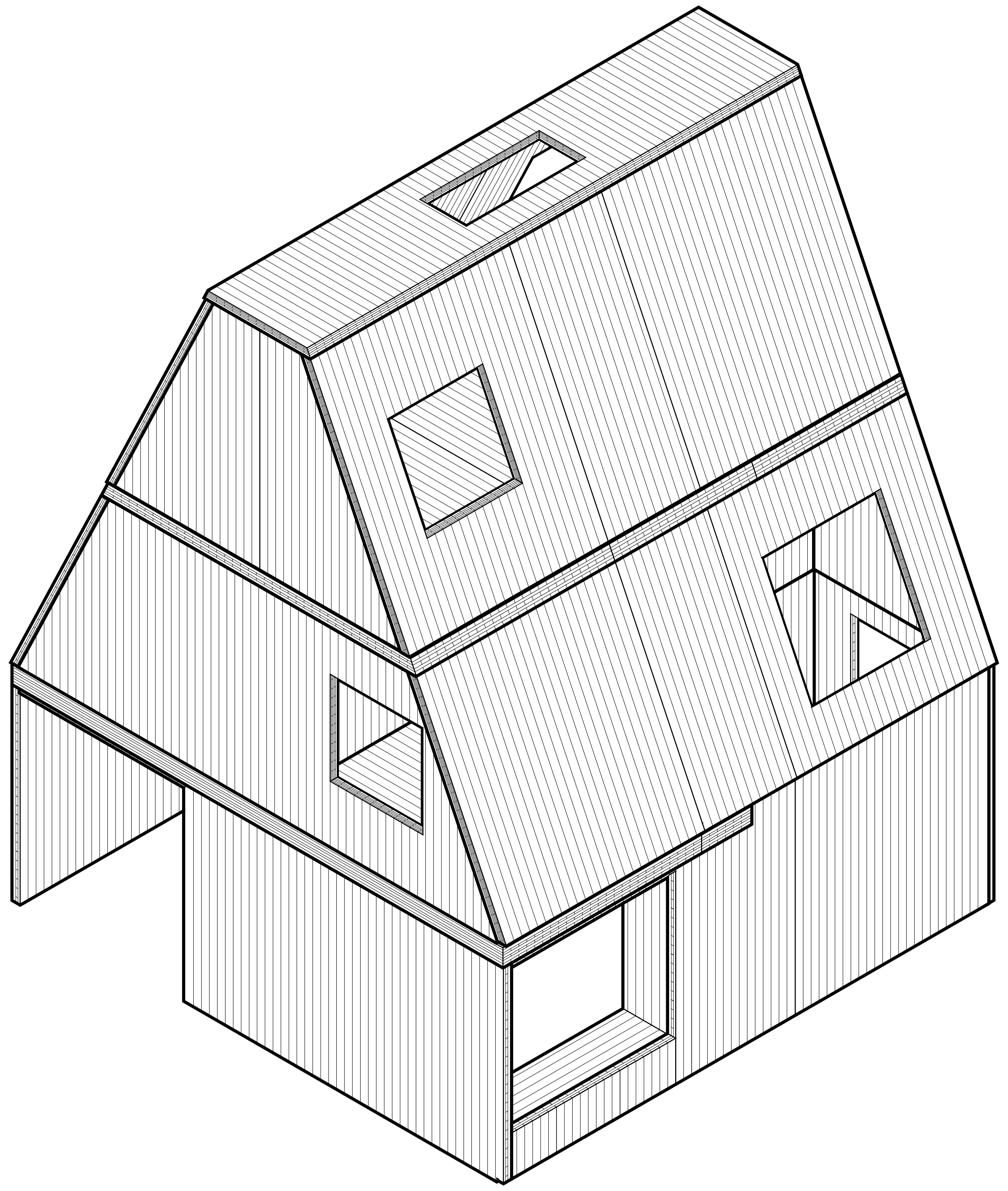
Building systems concepts

At the Living Places Copenhagen site, we have conducted a practical experiment with three building typologies: a Timber Frame house, a CLT house, and a Timber Frame structure pavilion. This project was aimed at exploring the effectiveness and sustainability of each construction method, providing valuable insights for advancing sustainable architecture practices.



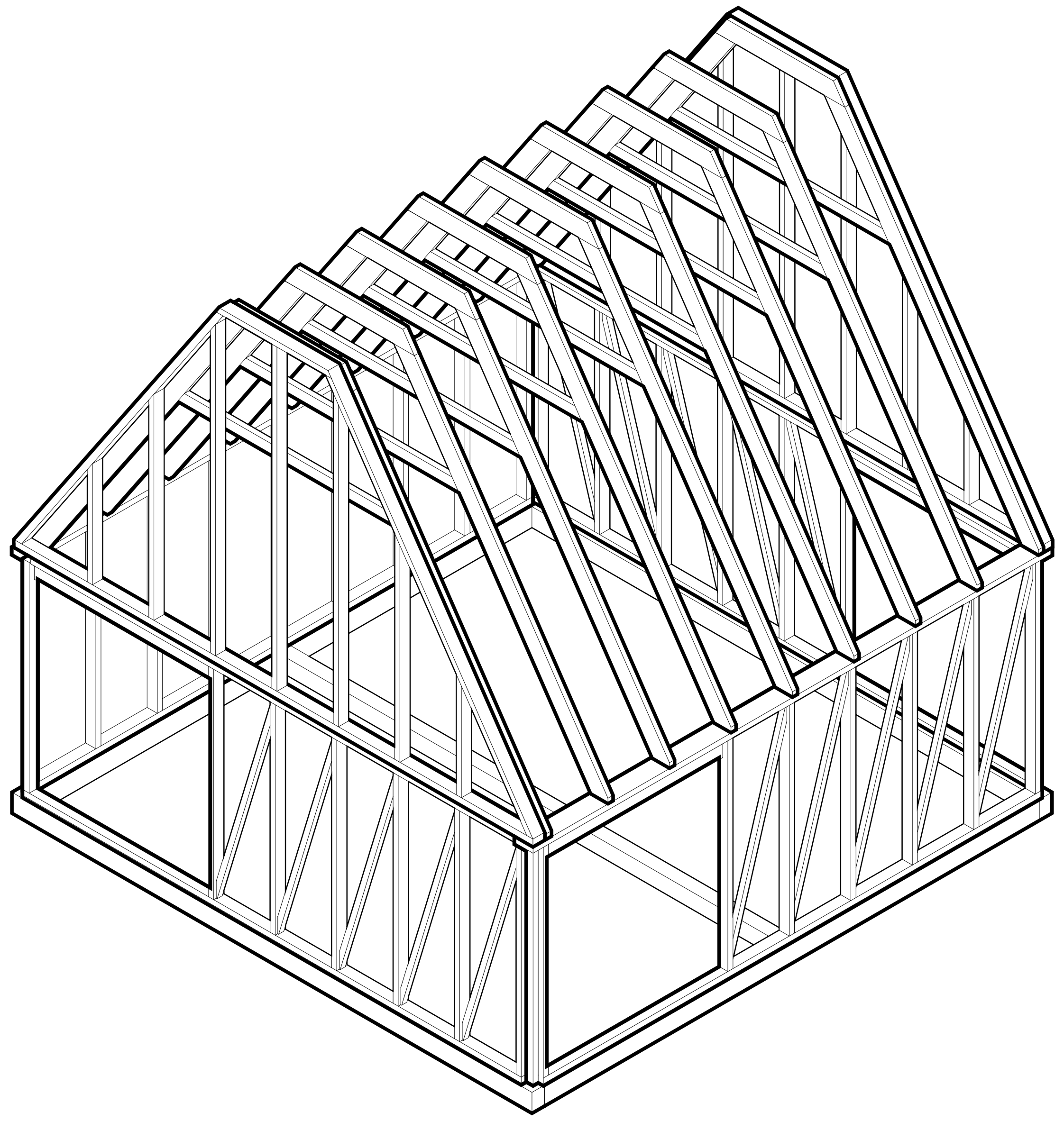
Timber frame structure

(house)



CLT structure

(house)



Timber structure

(Pavilion)

Prefab construction Factory

@ Andreas Bro

Construction on site

@ Andreas Bro

Ultra fast construction


August


September


November


December


January


February


@ Adam Mork

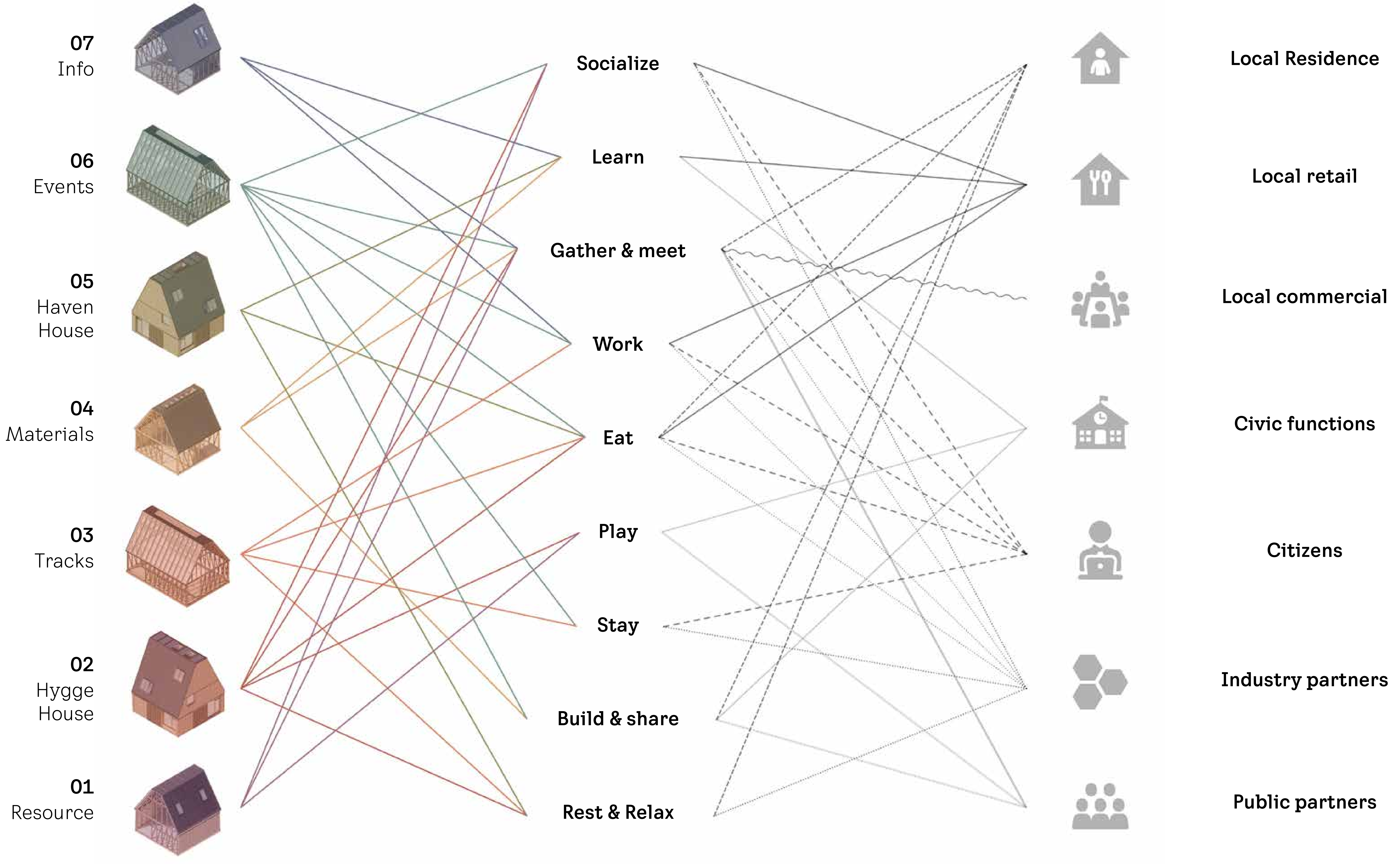
Neighborhood integration

The project successfully integrated event, information, resource, living pavilions, and housing with the local community, creating spaces that have greatly enhanced the interaction between local residents, retail, civic functions, citizens, and partners. Event pavilions have become vibrant centers for community gatherings and local markets, fostering a lively social atmosphere.

Information and resource centers, now key community hubs, facilitate learning and collaboration, strengthening connections among residents and partners. The living pavilions and houses, with their innovative design, have seamlessly blended residential living with public spaces, encouraging a fluid interaction between private and communal life.

Local retail and civic functions have been revitalized by these integrations, becoming more inviting and integral to daily life. This has resulted in a dynamic, inclusive community, where each element enriches the collective urban experience, showcasing the project's success in creating a cohesive and vibrant living environment.

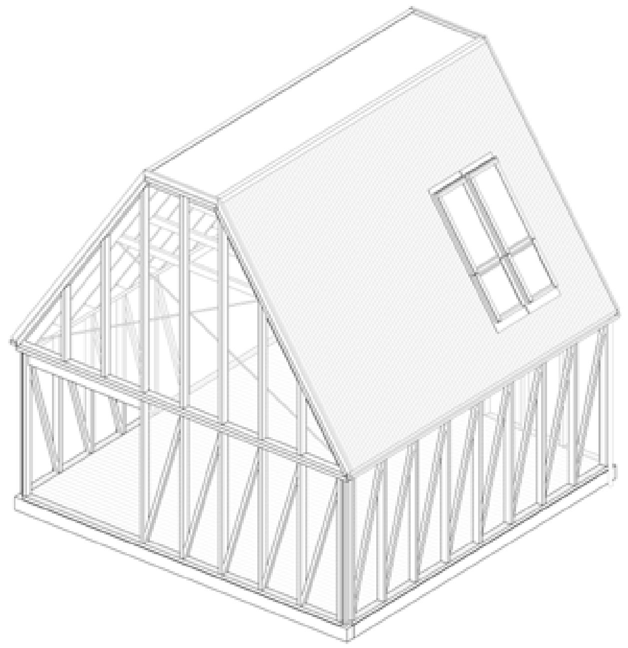
The project has been a huge success, attracting over 5000 visitors and hosting various activities. Its blend of event pavilions, resource centers, and communal living spaces has enlivened the area, making it a vibrant hub for the community and a model for urban development.



Info pavilion

The Info Pavilion, as the first structure visitors see, plays a pivotal role in introducing the area and the project. This pavilion is designed to educate and orient visitors through interactive displays and multimedia presentations, offering a clear overview of the project's vision and features.

It effectively sets the stage for the visitor experience, providing essential information, maps, and guides for navigating the area. As the initial touchpoint, the Information Pavilion is key to enhancing visitors' understanding and engagement with the entire project.

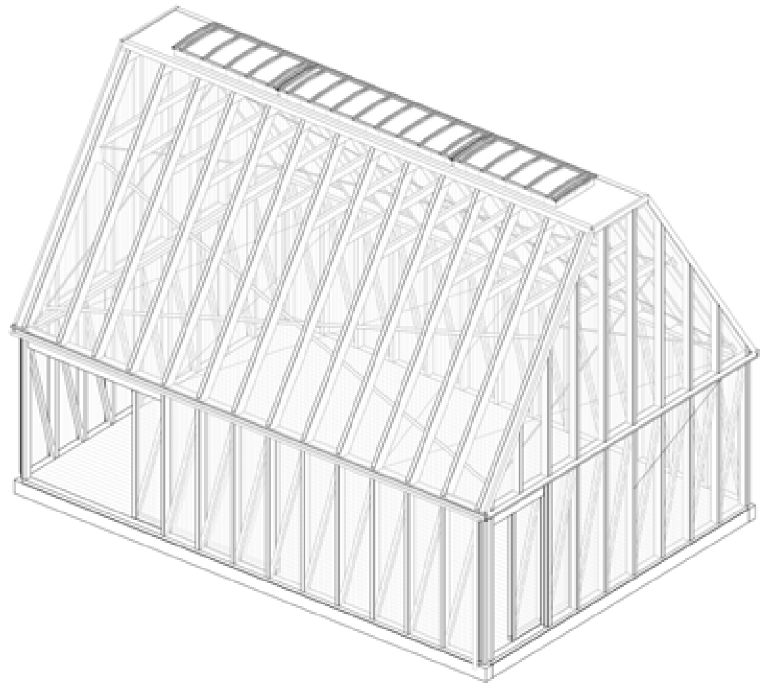


@ Mads Eneqvist

Event pavilion

The Event Pavilion, a versatile and multifunctional space, is ideal for hosting a variety of events, from small gatherings to large-scale functions. Its use of polycarbonate materials bathes the interior in soft, diffuse light, creating a welcoming atmosphere for all types of occasions.

This adaptability allows the pavilion to seamlessly transition between different events, such as workshops, cultural performances, and corporate meetings. The combination of its flexible design and inviting ambiance makes the Event Pavilion a favoured venue for diverse community and cultural engagements.

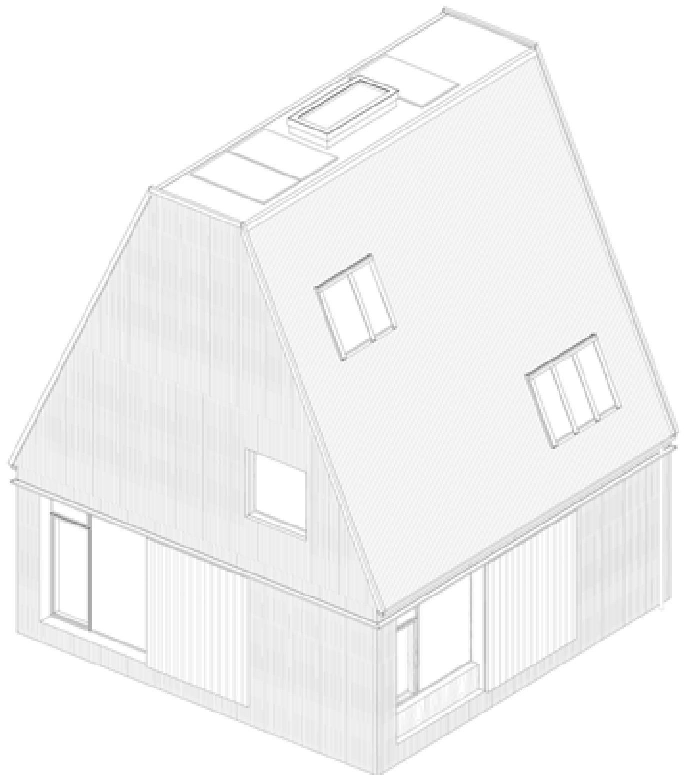


@ Mads Eneqvist

Haven House

The Haven House demonstrates the benefits and challenges of using Cross-Laminated Timber (CLT) in modern architecture. Emphasizing sustainable construction, it integrates functional and environmental aspects, showcasing how building techniques can align with eco-friendly principles. The house's natural aesthetic, featuring exposed raw wood surfaces, connects inhabitants with nature, enhancing its visual appeal.

This project serves as a practical example of CLT's potential in sustainable architecture, educating on eco-friendly building practices and promoting a deeper appreciation for environmentally conscious living.

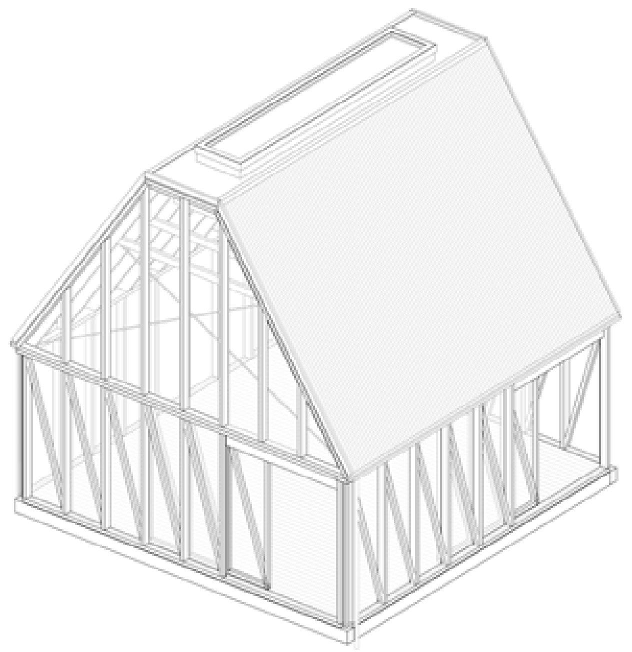


@ Adam Mork

Materials Pavilion

The Materials Pavilion is a dynamic exhibition space dedicated to exploring the future of living through innovative and sustainable concepts. Open all day, it offers interactive exhibitions on modern residential design, urban living, and low emission housing.

These displays provide a hands-on look into future living possibilities, inspiring visitors to consider new, environmentally harmonious living methods. As a hub for innovative ideas in living spaces, the pavilion stands as a key destination for those interested in the convergence of design, technology, and sustainability.

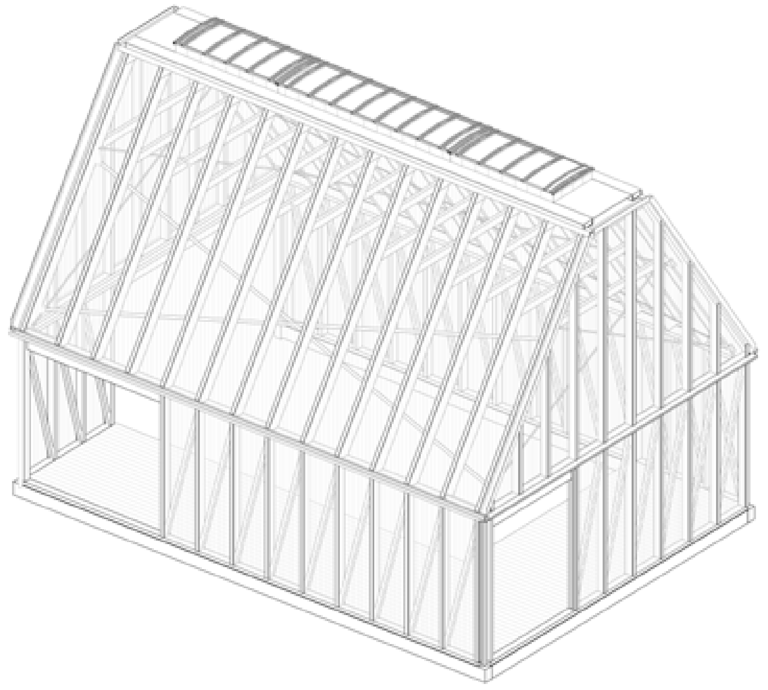


@ Adam Mørk

Track pavilion

The Tracks Pavilion, atop culturally significant train tracks, is a multifunctional space within Living Places Copenhagen. It blends event hosting with educational purposes, offering deep insights into sustainable living and design. Throughout the year, it hosts educational talks, becoming a learning hub for various audiences. The pavilion's location over existing train tracks is prominently featured in its design, serving as a constant reminder of the 'design for disassembly' approach.

This aspect not only preserves the site's cultural value but also exemplifies sustainable architectural practices, integrating history with modern innovation.

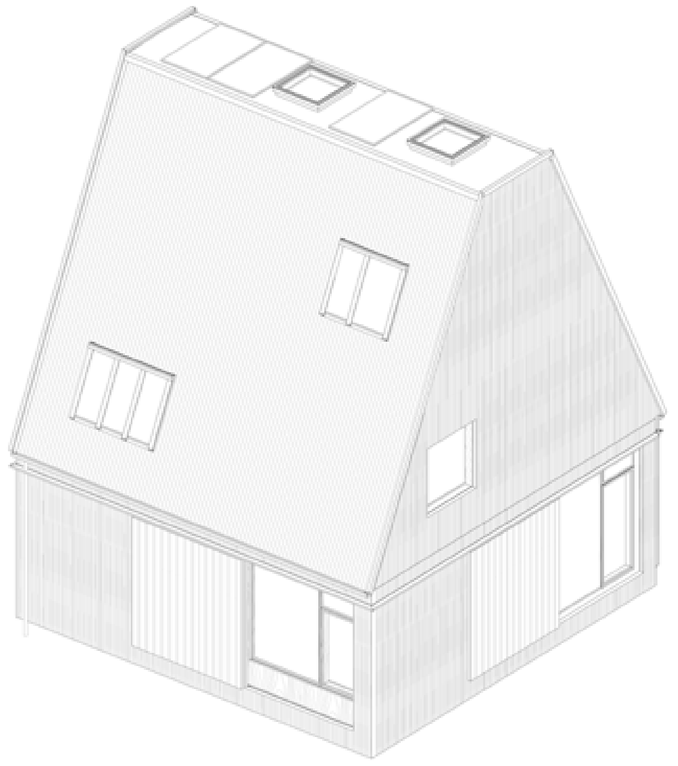


@ Adam Mork

Hygge House

The Hygge House exemplifies the balance between traditional building methods and modern low-emission practices, showcasing the pros and cons of timber frame construction. Its design integrates seamlessly with both environmental and community needs, demonstrating that low-emission, wood-based buildings can achieve both familiarity and enhanced quality.

The house's detailed craftsmanship highlights a high level of quality, offering a modernized approach to timber framing. This project serves as an educational example, showing how traditional building techniques can be adapted for a low-emissions, optimized way of living.

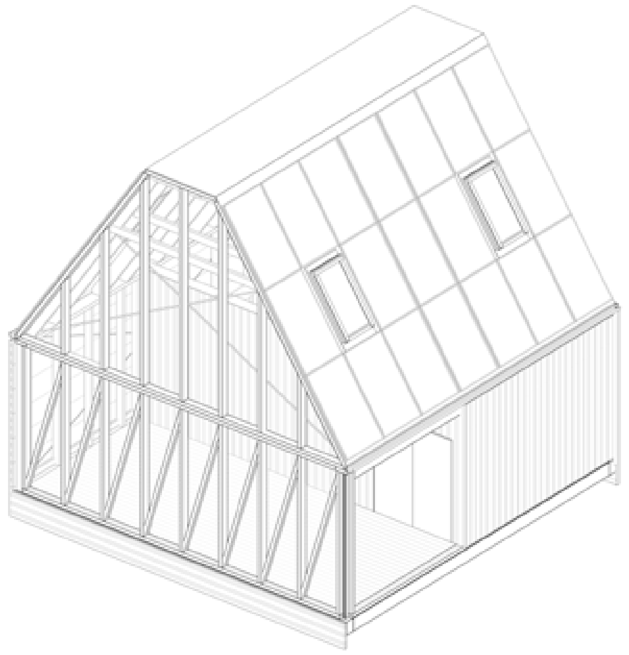


@ Adam Mork

Resource pavilion

The Resource Pavilion serves as a vital back-of-house support for a network of pavilions, adeptly managing parking, trash collection, and energy production. This key pavilion ensures smooth operation by providing organized bike parking, thus maintaining the other pavilions' aesthetics and functionality.

Its role in waste management emphasizes environmental responsibility through advanced recycling and waste reduction practices. Additionally, the pavilion's focus on renewable energy production, possibly through solar panels, not only powers itself but also supports the energy needs of the entire pavilion network. This makes the Resource Pavilion an essential component in maintaining the efficiency and sustainability of the system.



Programming overview

All pavilions and houses.

Resource Pavilion

The Resource Pavilion is essential for supporting a pavilion network, efficiently handling bike parking, waste management, and energy production. It ensures smooth operations and upholds the aesthetics and functionality of other pavilions. Emphasizing environmental responsibility, it adopts advanced recycling and waste reduction practices.

With a focus on renewable energy, using solar panels, it not only sustains itself but also powers the pavilion network, highlighting its critical role in the system's efficiency and sustainability.

Hygge House

The Hygge House combines traditional building techniques with modern low-emission practices, illustrating the advantages of timber frame construction. Its design meets environmental and community needs, proving that wood-based buildings can blend familiarity with superior quality.

The project showcases high-quality craftsmanship in timber framing, serving as an educational model for how traditional methods can evolve into sustainable, optimized living solutions.

Track pavilion

The Tracks Pavilion, located on historic train tracks, is a versatile space in Living Places Copenhagen, combining events and education focused on sustainability.

It regularly hosts talks, evolving into a center for learning about sustainable living and design. The pavilion's design, featuring the train tracks, highlights the 'design for disassembly' concept, merging the site's historical significance with sustainable architecture and modern innovation.

Materials Pavilion

The Materials Pavilion is an all-day open exhibition space exploring sustainable living and innovative residential design. Interactive displays offer insights into future living, focusing on urban living and low-emission housing.

It inspires new, eco-friendly living methods, making it a key destination for those interested in design, technology, and sustainability.

Haven House

The Haven House showcases the use of Cross-Laminated Timber in sustainable architecture, combining functionality with eco-friendly design. Its natural aesthetic with exposed wood surfaces highlights a connection to nature.

This project serves as an example of CLT's role in eco-conscious construction, promoting sustainable building practices and environmental awareness.

Event Pavilion

The Event Pavilion, with its versatile design and soft, diffuse light from polycarbonate materials, is suitable for a range of events, from intimate gatherings to large functions.

Its flexible space easily accommodates workshops, performances, and meetings, making it a popular choice for various community and cultural events.

Info Pavilion

The Info Pavilion is the initial structure visitors encounter, introducing the project and area. It educates and orients through interactive displays and multimedia, offering an overview of the project's vision.

The pavilion sets the stage for the experience, providing information, maps, and guides. As the first touchpoint, it's essential for enhancing visitors' understanding and engagement.

Project

A new place for all
of Copenhagen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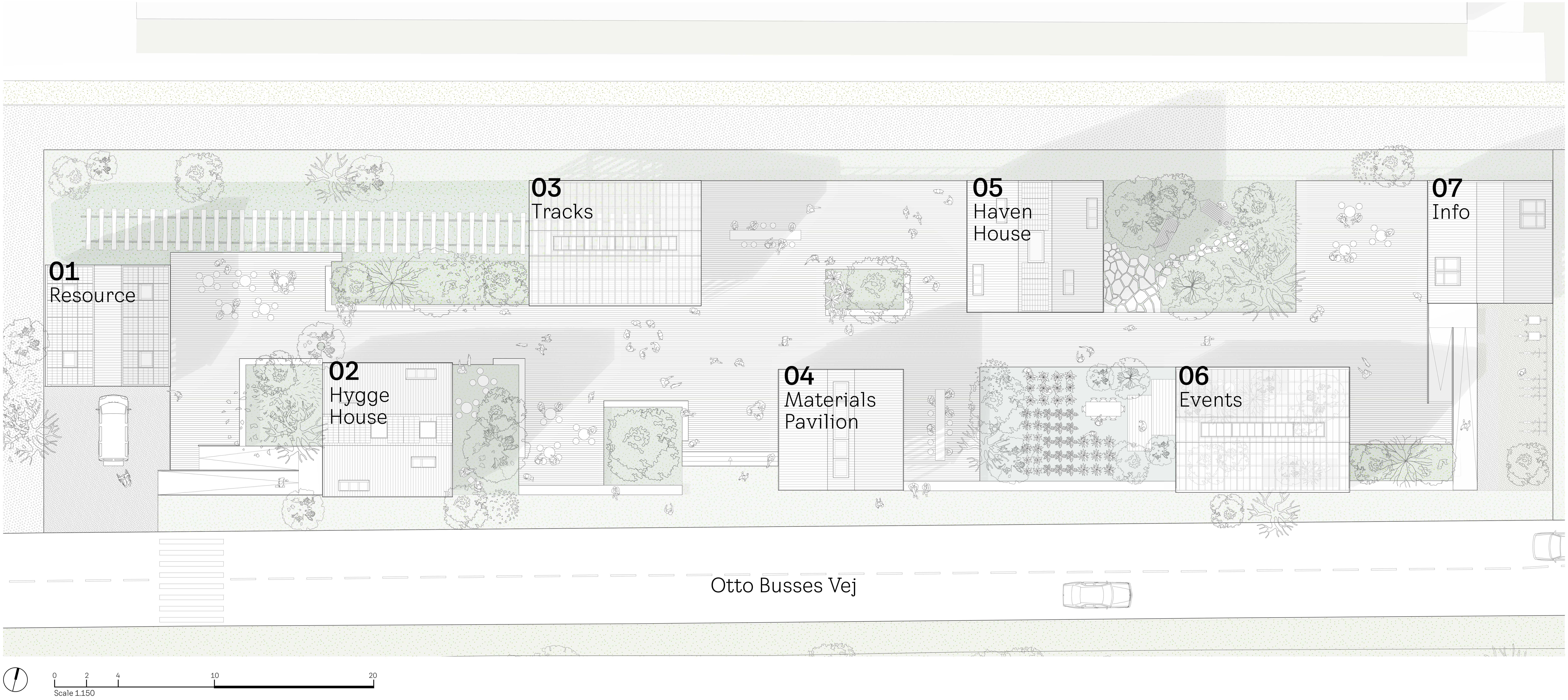
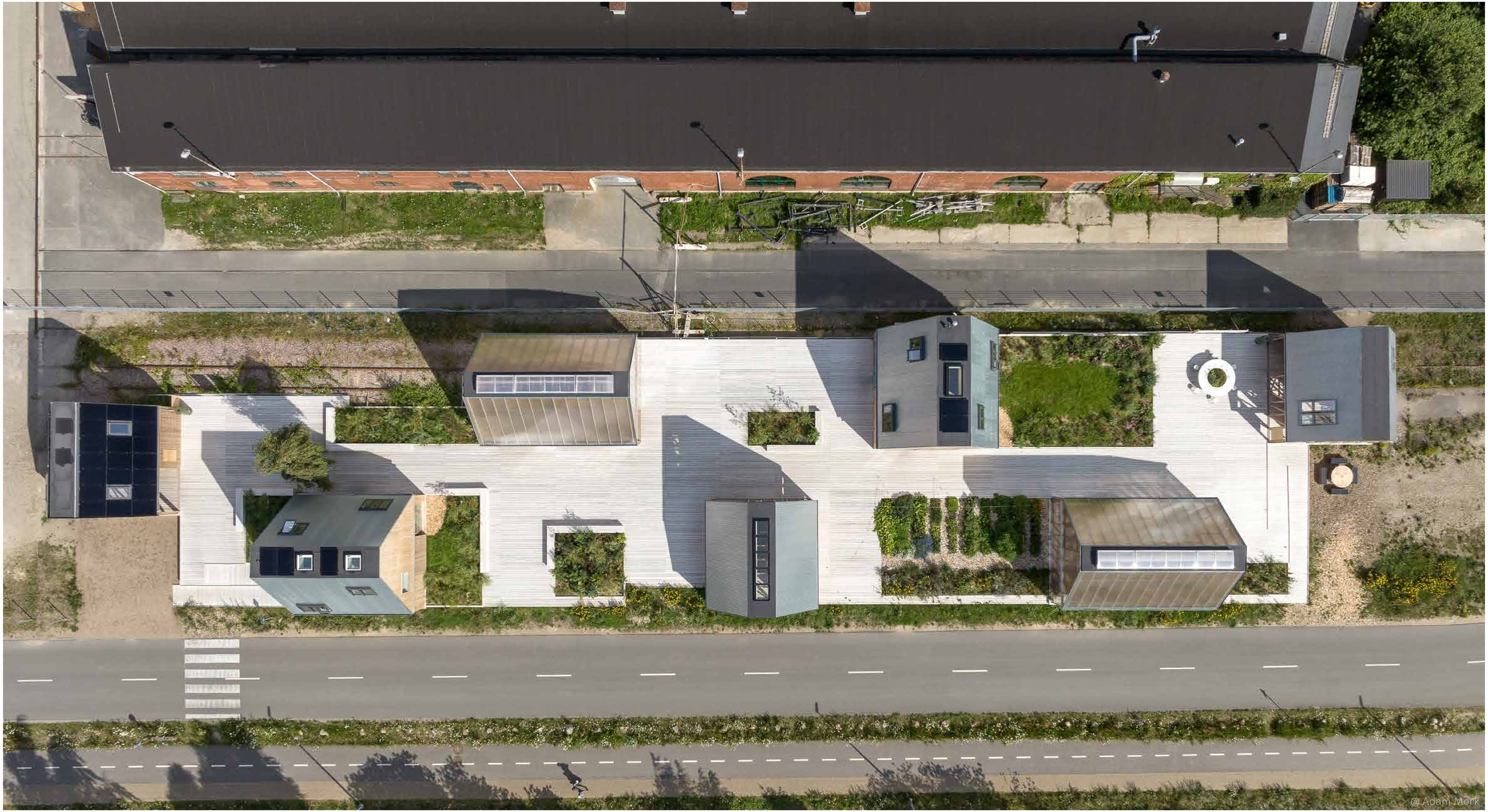
Site plan

Scale 1.150

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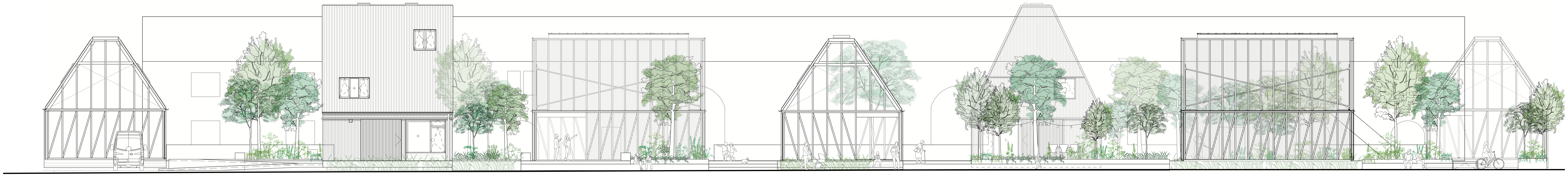
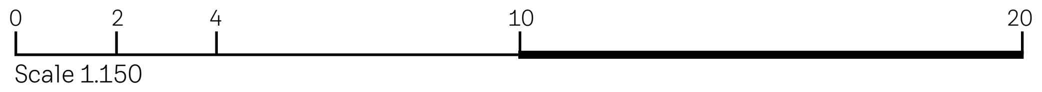
Elevations

Scale 1.150



SOUTH ELEVATION

NORTH ELEVATION



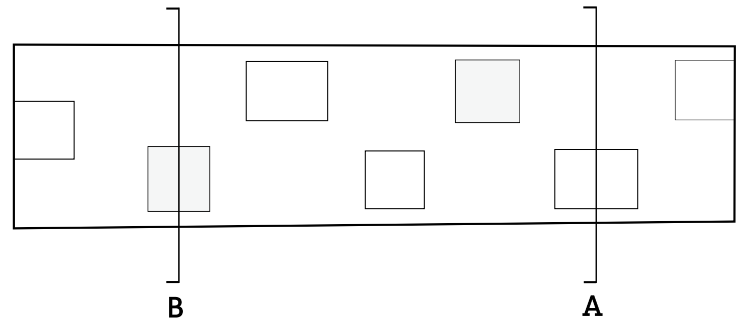
@ Adam Mork

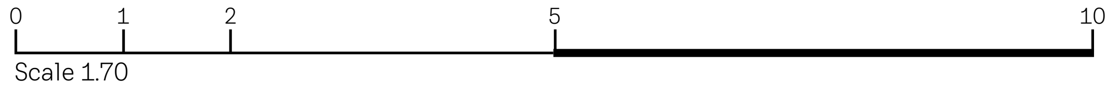
Sections

Scale 1.70

SECTION AA

SECTION BB





Green & shared spaces

© Adam Mørk







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Houses

Hygge House

Timber framing structures, also called “post and beam” structures, are traditionally used building technologies. It consists of vertical and horizontal linear elements that require incorporating stability planes.

Timber frame structures prove to be the most efficient use of materials when constructing buildings with less than four floors. Compared to CLT structures of similar geometry and size, timber frame structures require approximately three times less timber. Additionally, timber frame houses with identical interior sizes have the advantage of a smaller exterior site footprint. This is due to the ability to integrate insulation between the structural elements of the walls.

@ Adam Mork

Building system recipe

The slide provides detailed insights into the timber framing system used in our project. It highlights the structural elements and material efficiency of this traditional "post and beam" method, particularly suitable for buildings up to four floors. The slide details how timber framing requires less timber compared to CLT structures and demonstrates the integration of insulation within the wall structures, resulting in a smaller building footprint.

This detailed presentation serves as an informative guide to the specifics of our sustainable architectural approach.

0.0 DESCRIPTION

1. Foundation / Ground slab
- Floor treatment with Indoor climate certified oil
- Ask plank floor with click system, 15x185 mm
- Spruce battens, 50x70 mm
- Vapor barrier, 0,20 mm
- Pine structural timber C18, 45x295 mm
- Cellulose insulation, 375mm. Fire class: B-s2, d0
- Hard wind barrier, 8 mm

2. Facade
- Spruce facade cladding boards, 21x124 mm. Vertical
- Spruce roofing battens, 38x73 mm. Horizontal
- Spruce roofing battens, 25x50mm. Vertical
- Wind panel with open diffusion, 8mm
- Pine structural timber C18, 45x295 mm
- Cellulose insulation, 295 mm. Fire class: B-s2, d0
- OSB plate G3, 18 mm
- Pine wood framing, 45x70 mm
- Wood fiber insulation, 45mm. Fire class: B-s2, d0
- Fiber gypsum boards, 15mm. Visible connections
- Interior linoleum paint

3. Roof construction
- Steel sinus plate, 18 mm. Zink-Magnesium treatment
- Spruce roofing battens, 38x73 mm. Horizontal
- Spruce roofing battens, 25x50mm. Vertical
- Wood fiber roofing plate, 25 mm
- Pine structural timber C18, 45x295 mm
- Pine interior battens, 45x45 mm
- Cellulose insulation, 340 mm. Fire class: B-s2, d0
- OSB plate G3, 18 mm
- Pine wood framing, 45x70 mm
- Wood fiber insulation, 45mm. Fire class: B-s2, d0
- Fiber gypsum boards, 15mm. Visible connections
- Interior linoleum paint

4. Slab
- Floor treatment with Indoor climate certified oil
- Ask plank floor with click system, 15x185 mm
- Fiber gypsum floor boards, 13 mm
- Pine floor plywood, 18mm
- Pine roofing plywood, 25mm
- Pine structural timber K18, 270x120 mm

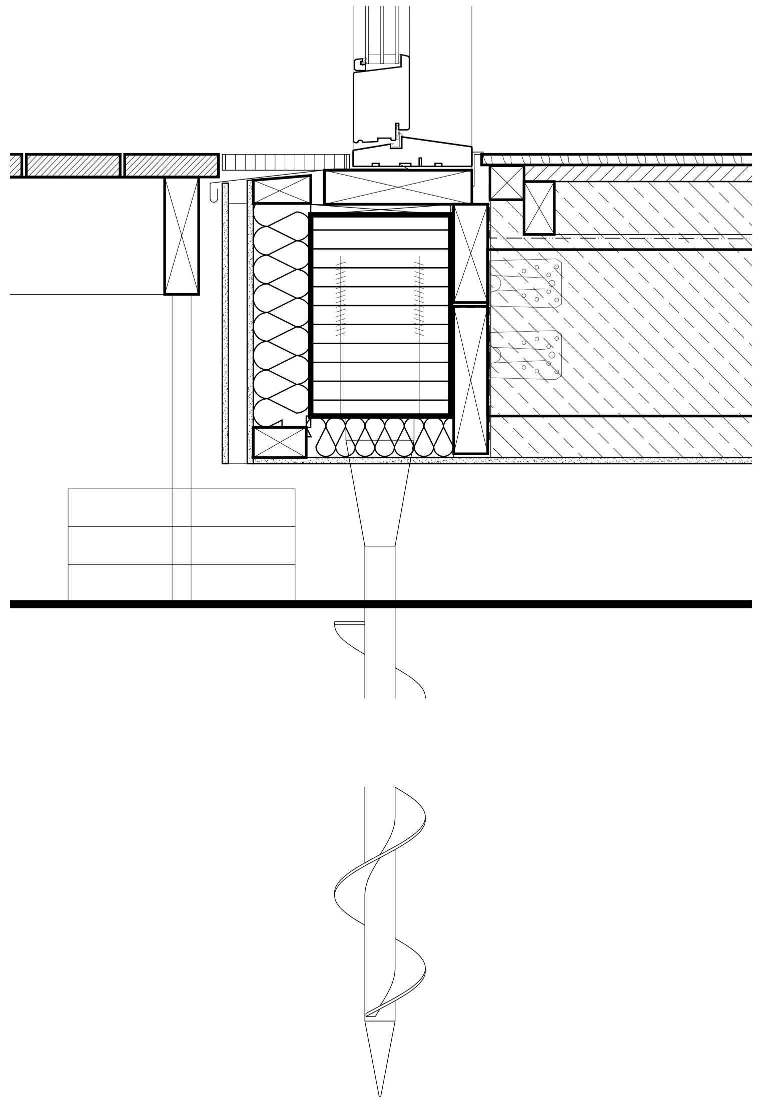
5. Interior wall
- Interior linoleum paint
- Fiber gypsum boards, 15mm. Visible connections
- Pine wood framing, 45x70 mm
- Fiber gypsum boards, 15mm. Visible connections
- Interior linoleum paint

6. Windows
- Oiled oak frame
- Glass. Triple layer 6+14+4+14+6

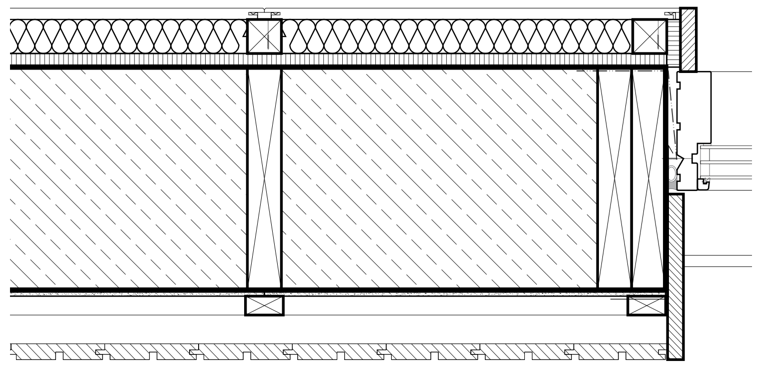
7. Roof windows
- Remote controlled window. Solar powered
- Indoor blinds. Solar powered
- Outdoor black out curtains. Solar powered

8. Flat roof windows
- Flat glass rooflight, 800x800 mm
- Black out curtains. Solar powered

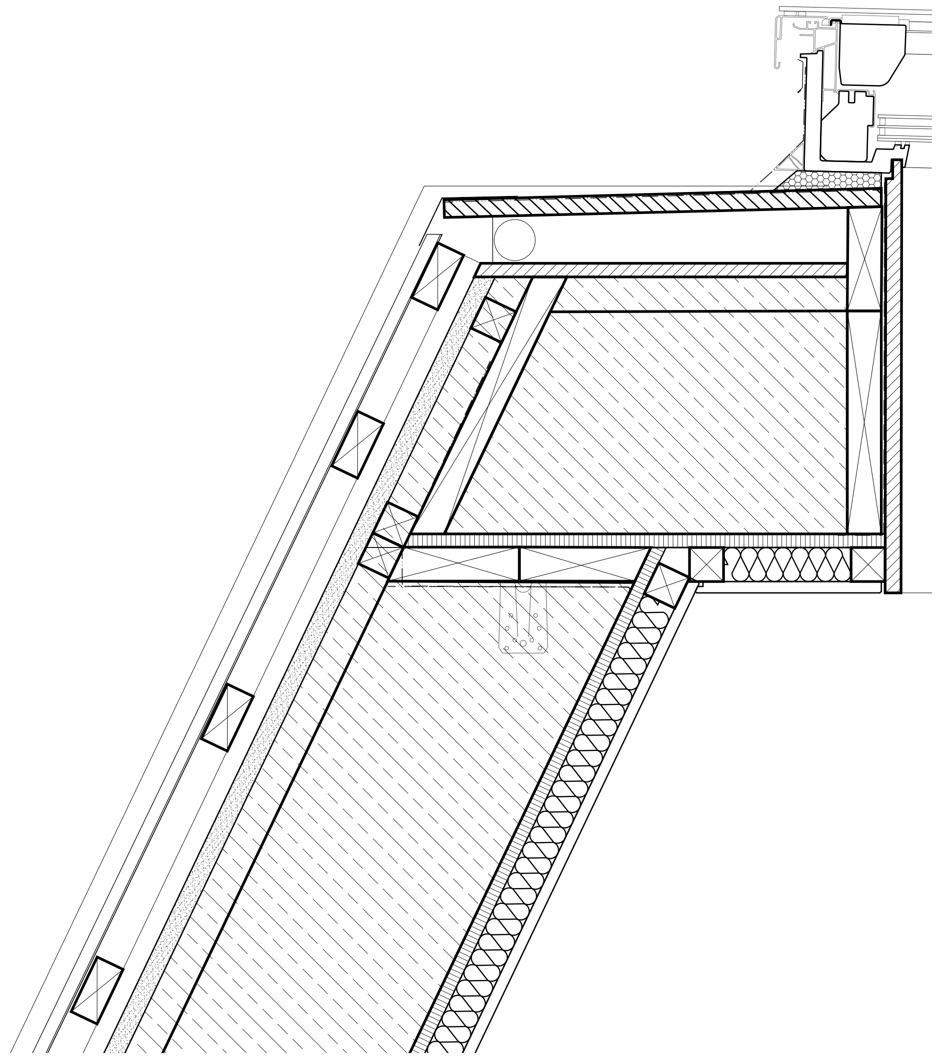
1. FOUNDATION / GROUND SLAB



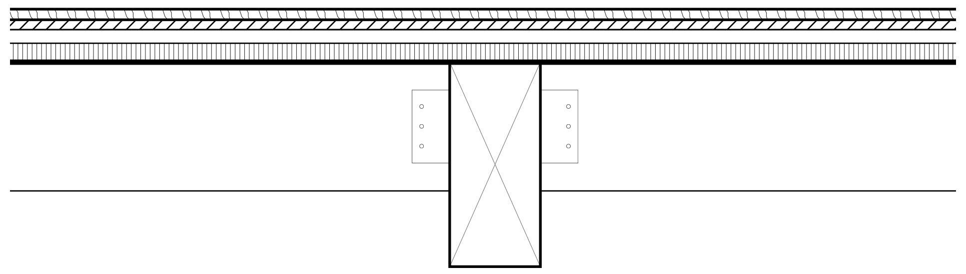
2. FACADE



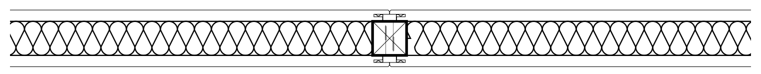
3. ROOF CONSTRUCTION



4. SLAB



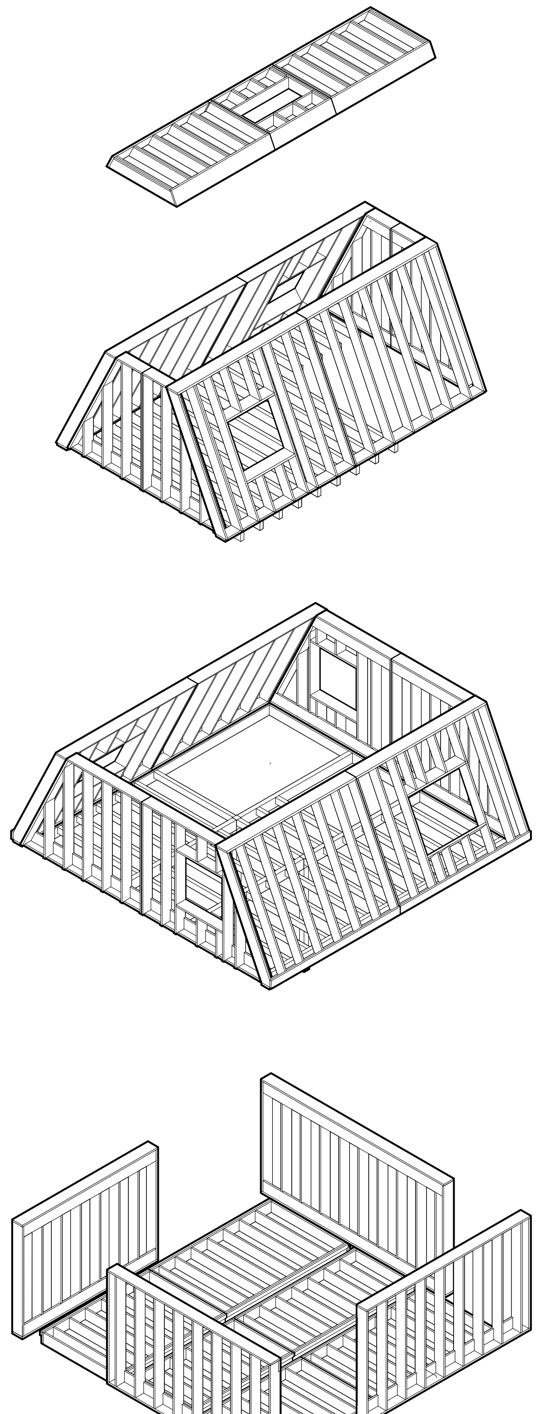
5. INTERIOR WALL



9. INSTALLATIONS

Natural ventilation (VELUX Active)
Direct ventilation through facade
Radiators
Wireless switch for light
Air to water heat pump

0. AXO



Technical system recipe

The slide details the technical systems used in the Timber frame house in our project, describing the heating system, the ventilation system and the different components selected for this version.

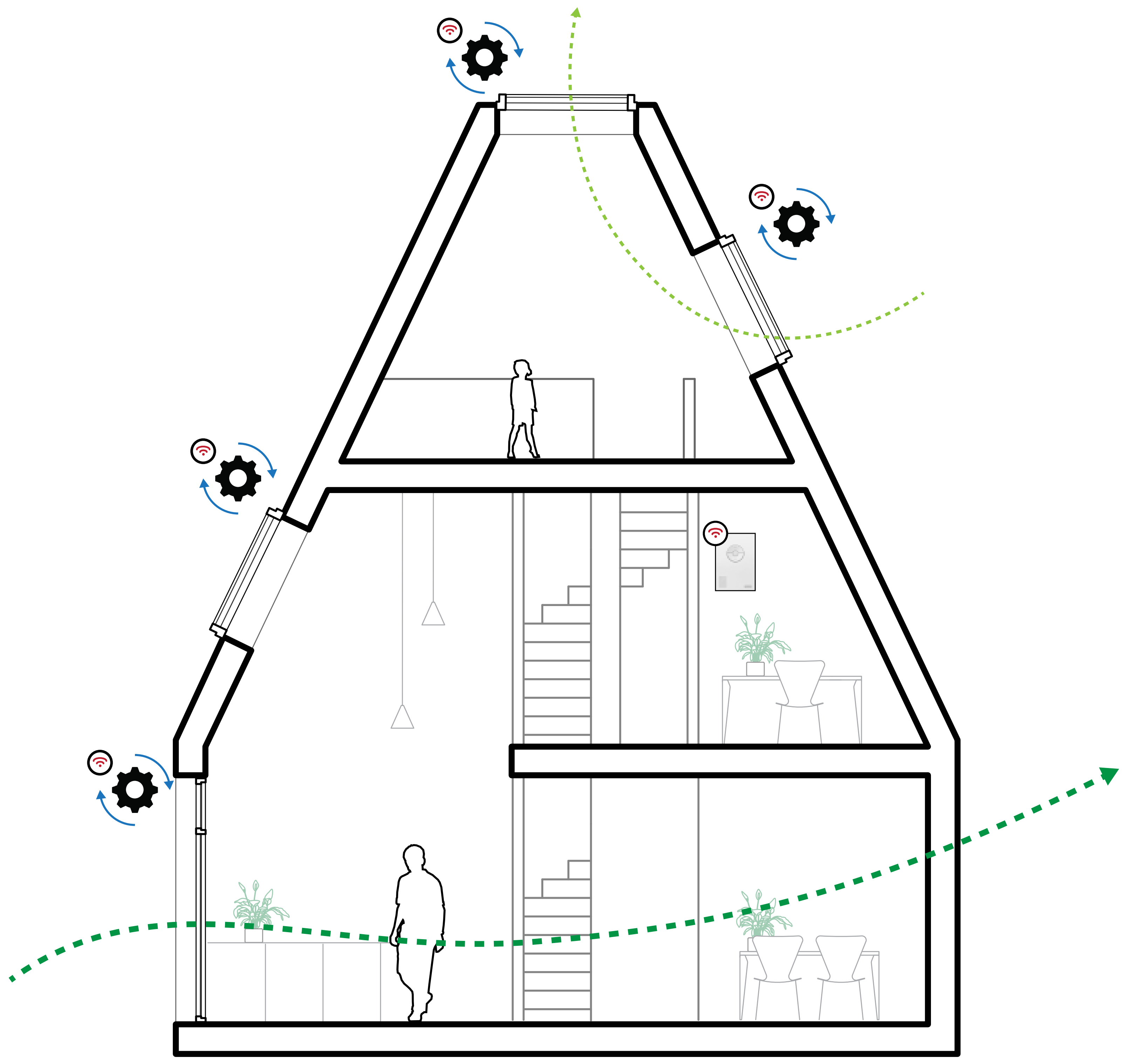
0.0 DESCRIPTION

1. Ventilation system
Natural ventilation
(VELUX active)

2. Heating
Air to water heat pump
Radiators

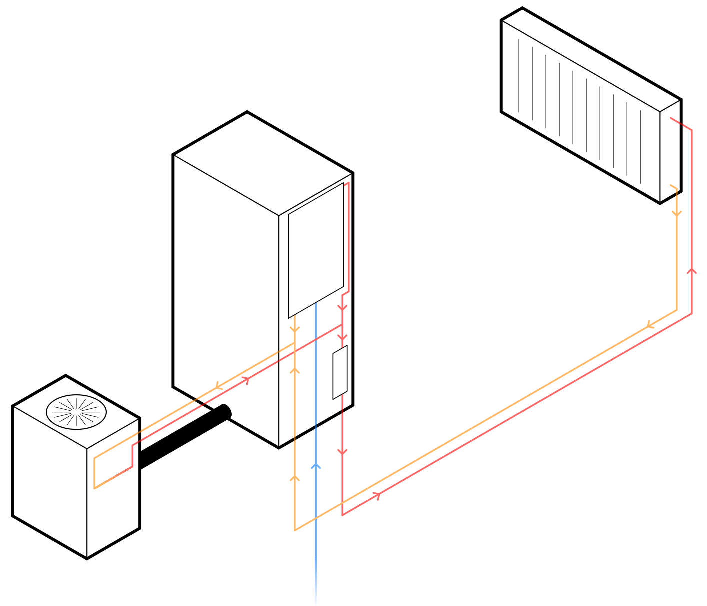
3. Energy
Wireless switch for lights
Solar Panels: SPR-MAX3-375 (Sunpower)

1. VENTILATION SYSTEM



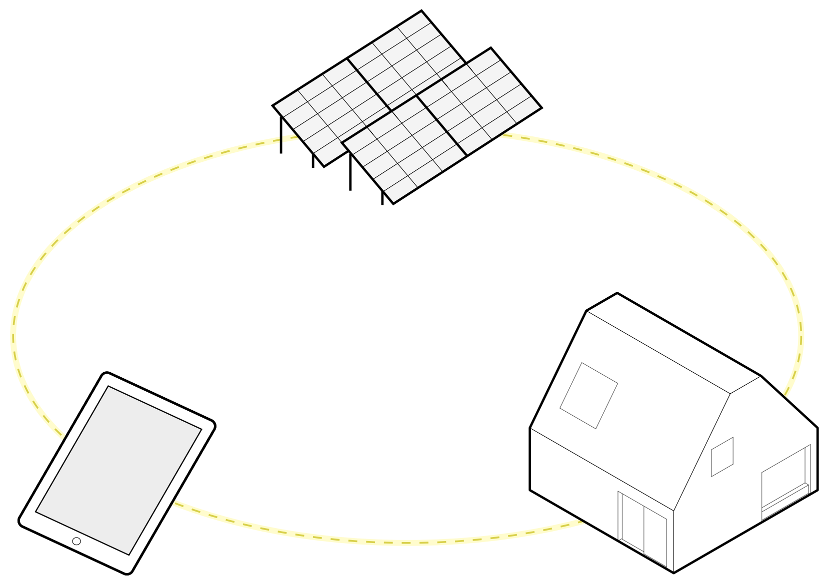
Ventilation based on only natural ventilation. by designing with stack effect and other healthy building principles we ensure a high-quality indoor environment, highlighting the effectiveness of sustainable design in providing comfort and energy efficiency.

2. HEATING



We use an air-to-water heat pump and radiators for heating , ensuring energy-efficient comfort year-round.

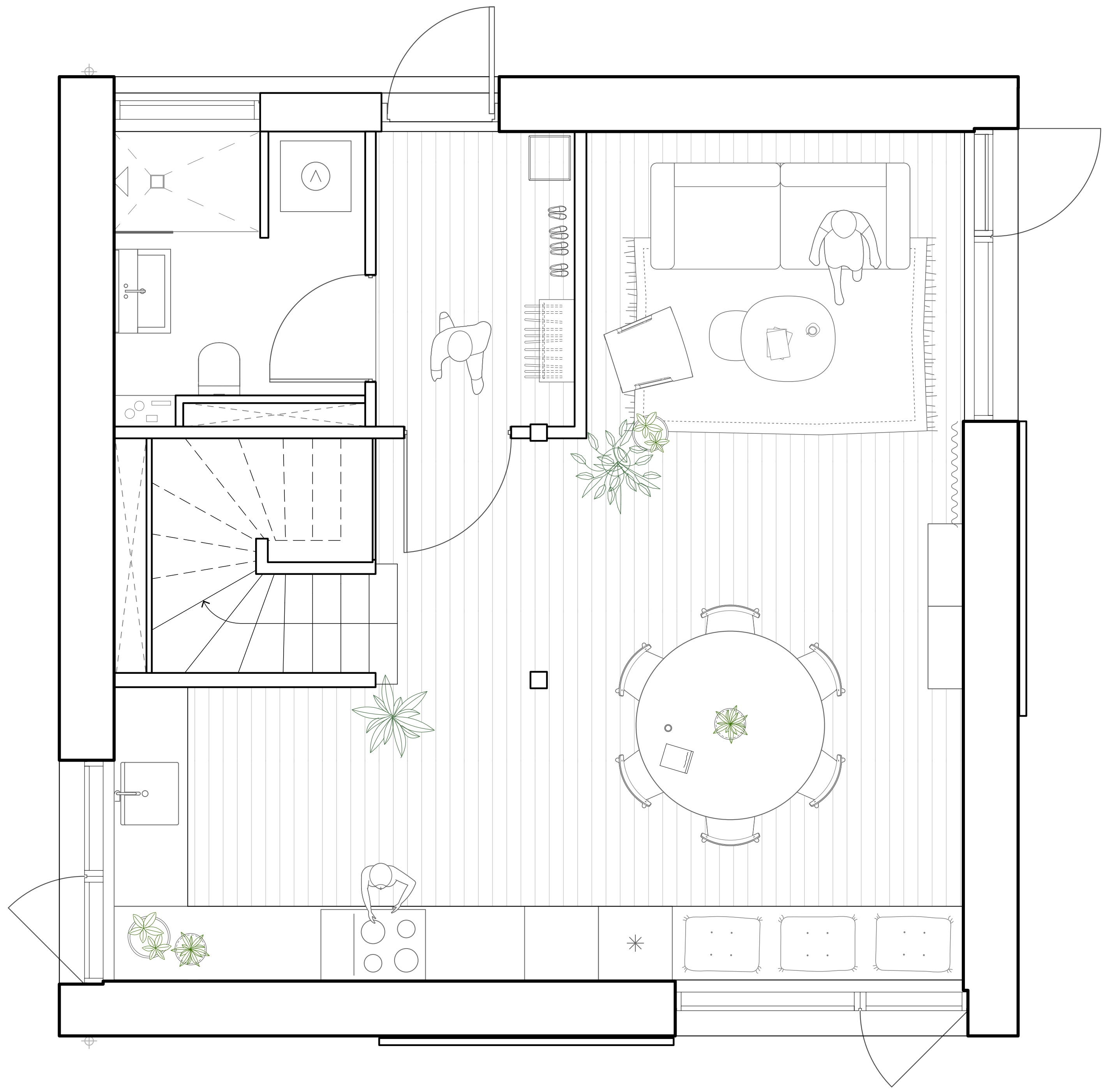
3. ENERGY



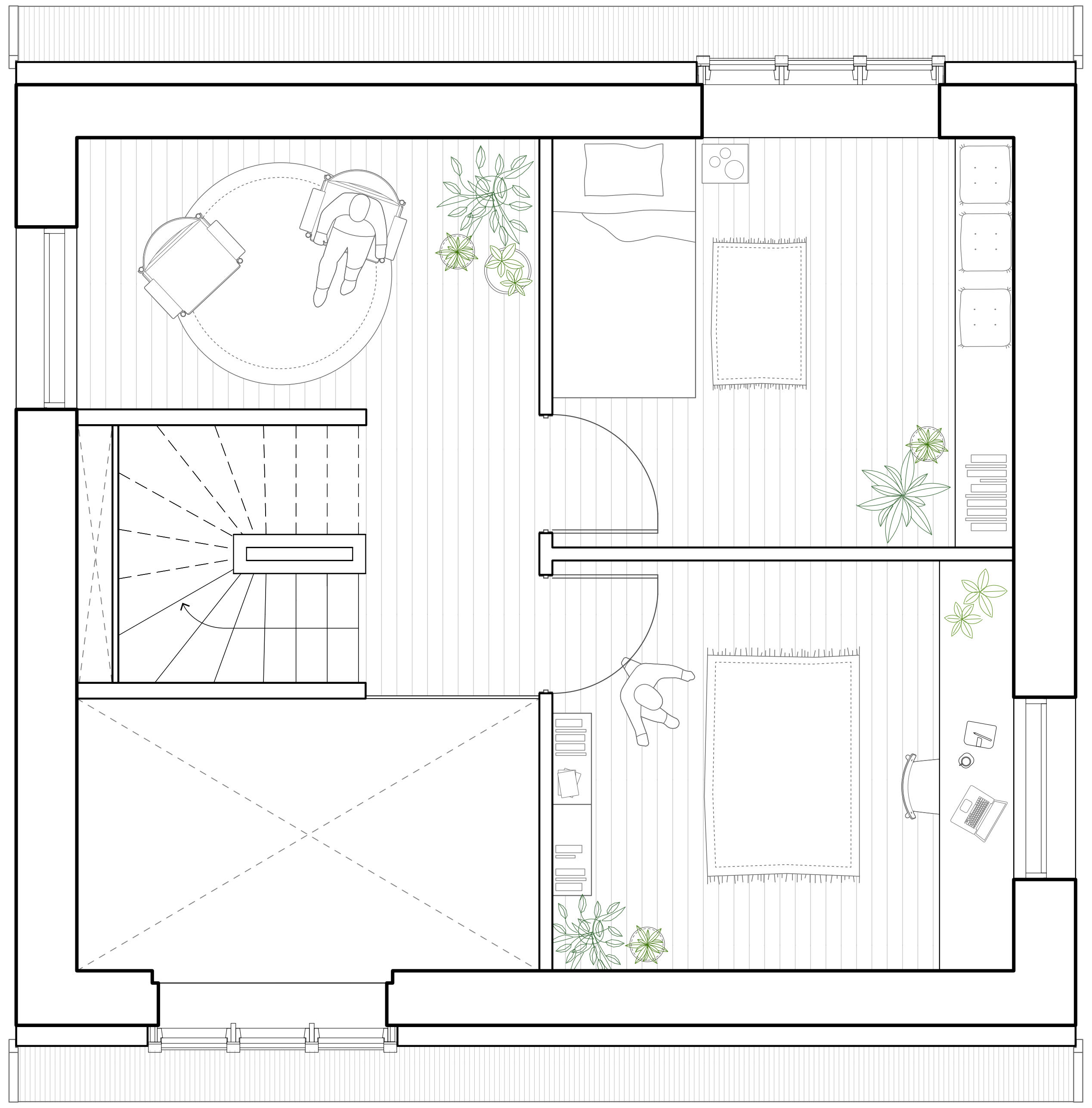
Our electricity and heat pump are powered by solar panels, significantly reducing emissions and cost. This provides us with stable and clean energy.

Hygge house Plans

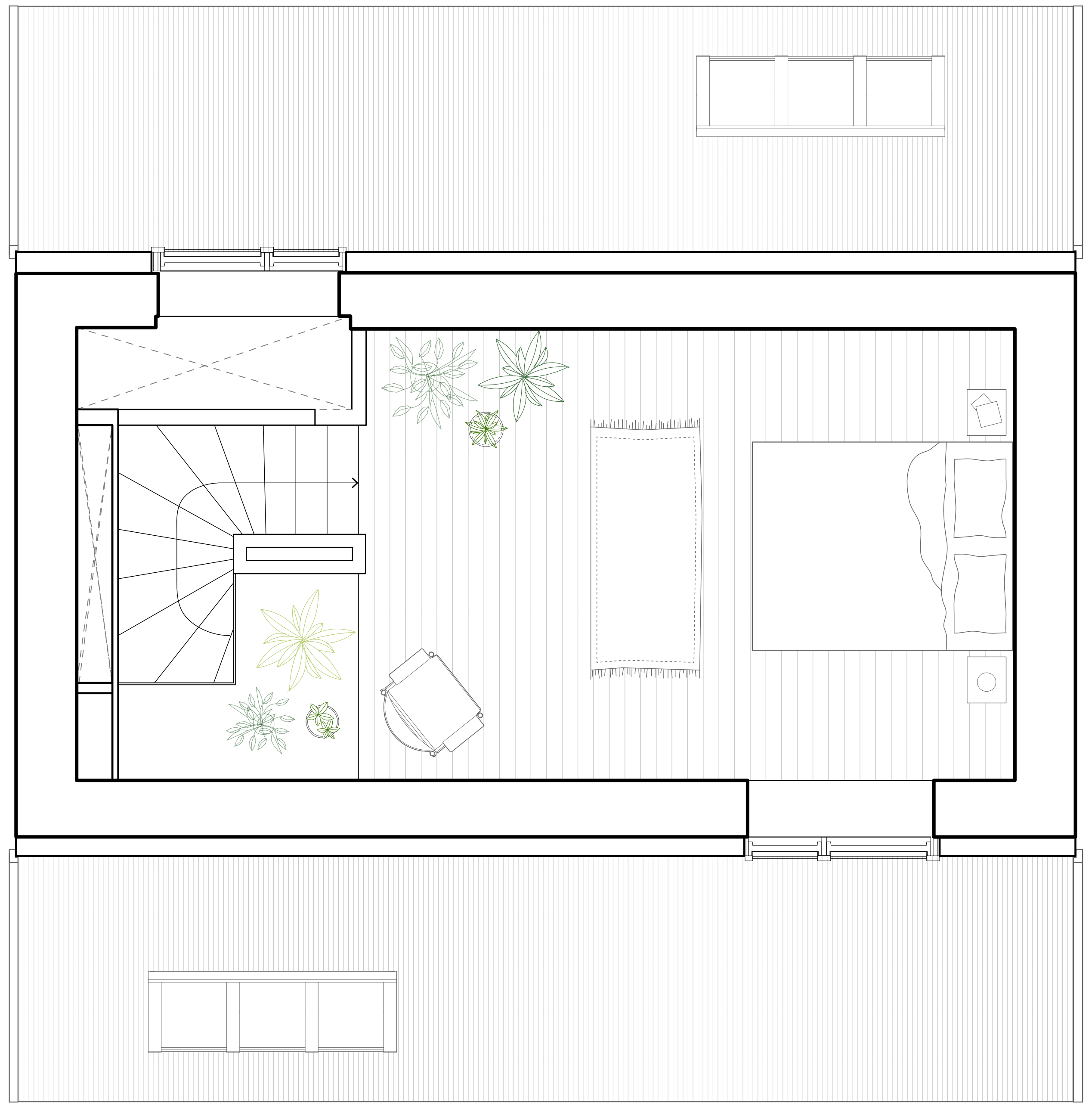
Scale 1.50



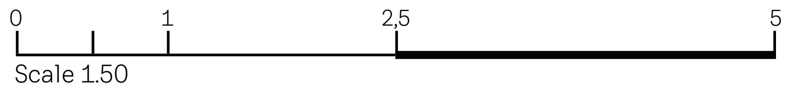
GROUND FLOOR



FIRST FLOOR



SECOND FLOOR



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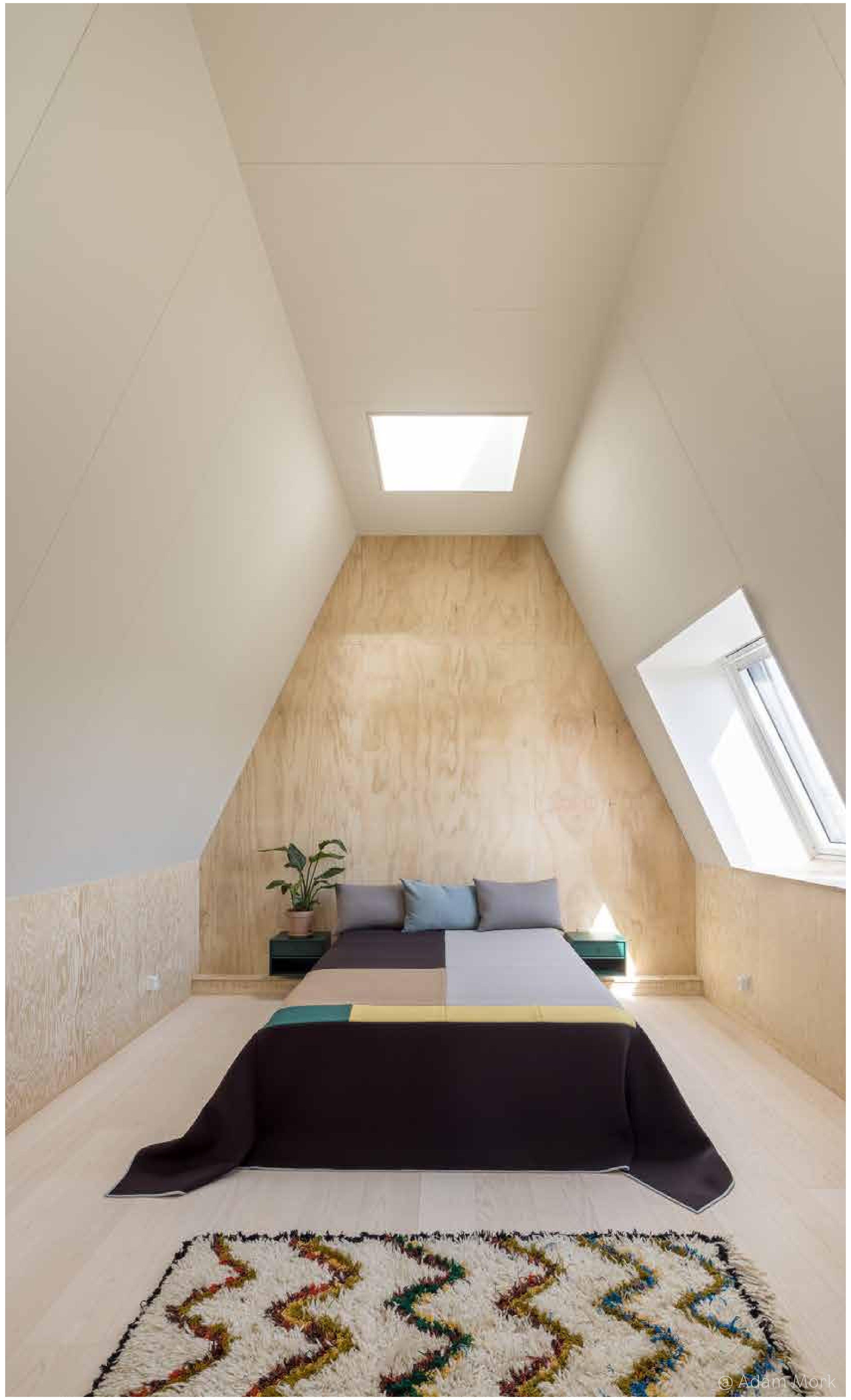

© Adam Mørk

Haven House

Cross-laminated timber (CLT) structures are constructed using mass timber elements, which means structural planes made of solid wood bonded in a perpendicular direction.

CLT decks offer the advantage of larger spans without requiring intermediate supports, even with similar dimensions. Additionally, CLT elements can be left exposed, in the interior, without the necessity of adding another interior finish layer. However, it is important to note that CLT elements must be covered with a thermal insulation layer, resulting in increased overall thickness of roofs and walls compared to timber frame elements.

Building system recipe

The slide details the use of Cross-Laminated Timber (CLT) structures in our project, describing the system as a key component of the building process. CLT structures are built with mass timber elements, comprising solid wood bonded perpendicularly, allowing for larger spans without intermediate supports. Notably, CLT elements can be aesthetically left exposed internally, eliminating the need for additional interior finishing.

However, it's important to incorporate a thermal insulation layer with CLT, leading to thicker roofs and walls compared to timber frame structures. This slide serves as a comprehensive guide on integrating CLT into our low-emissions building design.

0.0 DESCRIPTION

1. Foundation / Ground slab
- Floor treatment with Indoor climate certified oil
- Ask plank floor with click system, 15x185 mm
- Floor chipboard, waterproof, 22 mm
- Spruce battens, 50x70 mm
- Vapor break 0,20 mm
- Pine structural timber C18, 45x295 mm
- Cellulose insulation, 375mm. Fire class: B-s2, d0
- Hard wind barrier, 8 mm

2. Facade
- Spruce facade cladding boards, 21x124 mm. Vertical
- Spruce roofing battens, 38x73 mm. Horizontal
- Spruce roofing battens, 25x50mm. Vertical
- Wind panel with open diffusion, 8mm
- Pine structural timber C18, 45x295 mm
- Cellulose insulation, 345 mm. Fire class: B-s2, d0
- CLT C5s, 100 mm. IVQ vertical elements
- Varnish with UV protection, Indoor climate certified

3. Roof construction
- Steel sinus plate, 18 mm. Zink-Magnesium treatment
- Spruce roofing battens, 38x73 mm. Horizontal
- Spruce roofing battens, 25x50mm. Vertical
- Wood fiber roofing plate, 25 mm
- Pine structural timber C18, 45x295 mm
- Cellulose insulation, 395 mm. Fire class: B-s2, d0
- Vapor break, 0,20 mm
- CLT C5s, 100 mm. IVQ vertical elements
- Varnish with UV protection, Indoor climate certified

4. Slab
- Floor treatment with Indoor climate certified oil
- Ask plank floor with click system, 15x185 mm
- CLT C7s, 240 mm. IVQ
- Varnish with UV protection, Indoor climate certified

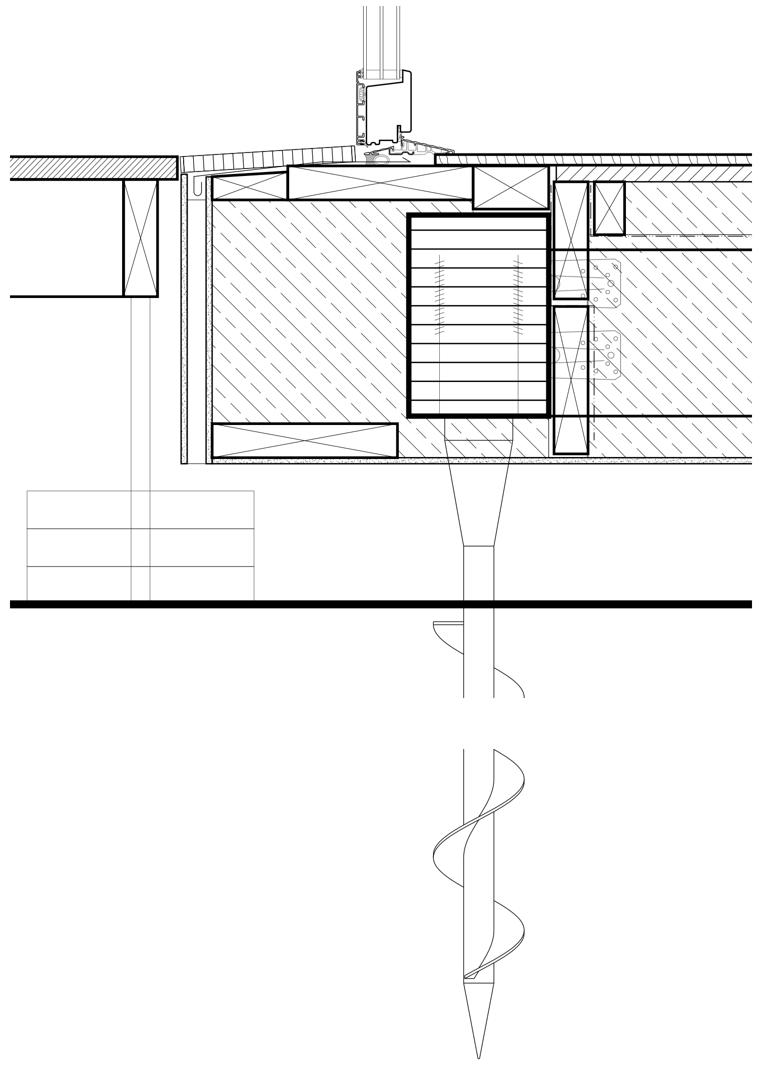
5. Interior wall
- Varnish with UV protection, Indoor climate certified
- CLT C3s, 90 mm. IVQ vertical elements
- Varnish with UV protection, Indoor climate certified

6. Windows
- Aluminium - Pine frame
- Triple glass layer. 6+14+4+14+6

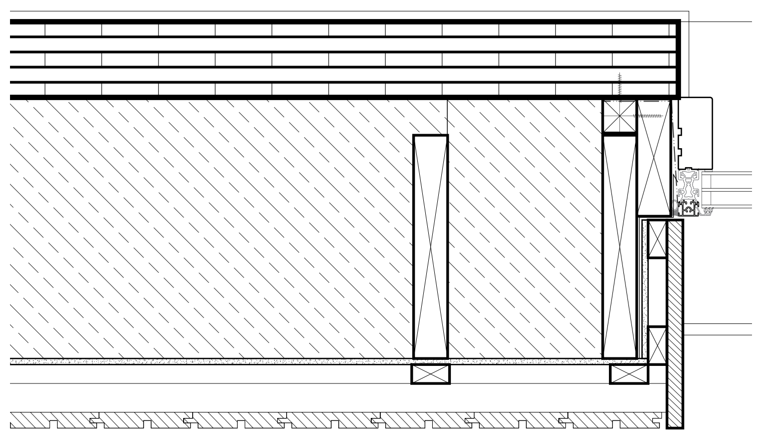
7. Roof windows
- Remote controlled window. Solar powered
- Indoor blinds. Solar powered
- Outdoor black out curtains. Solar powered

8. Flat roof windows
- Flat glass rooflight, 800x800 mm
- Black out curtains. Solar powered

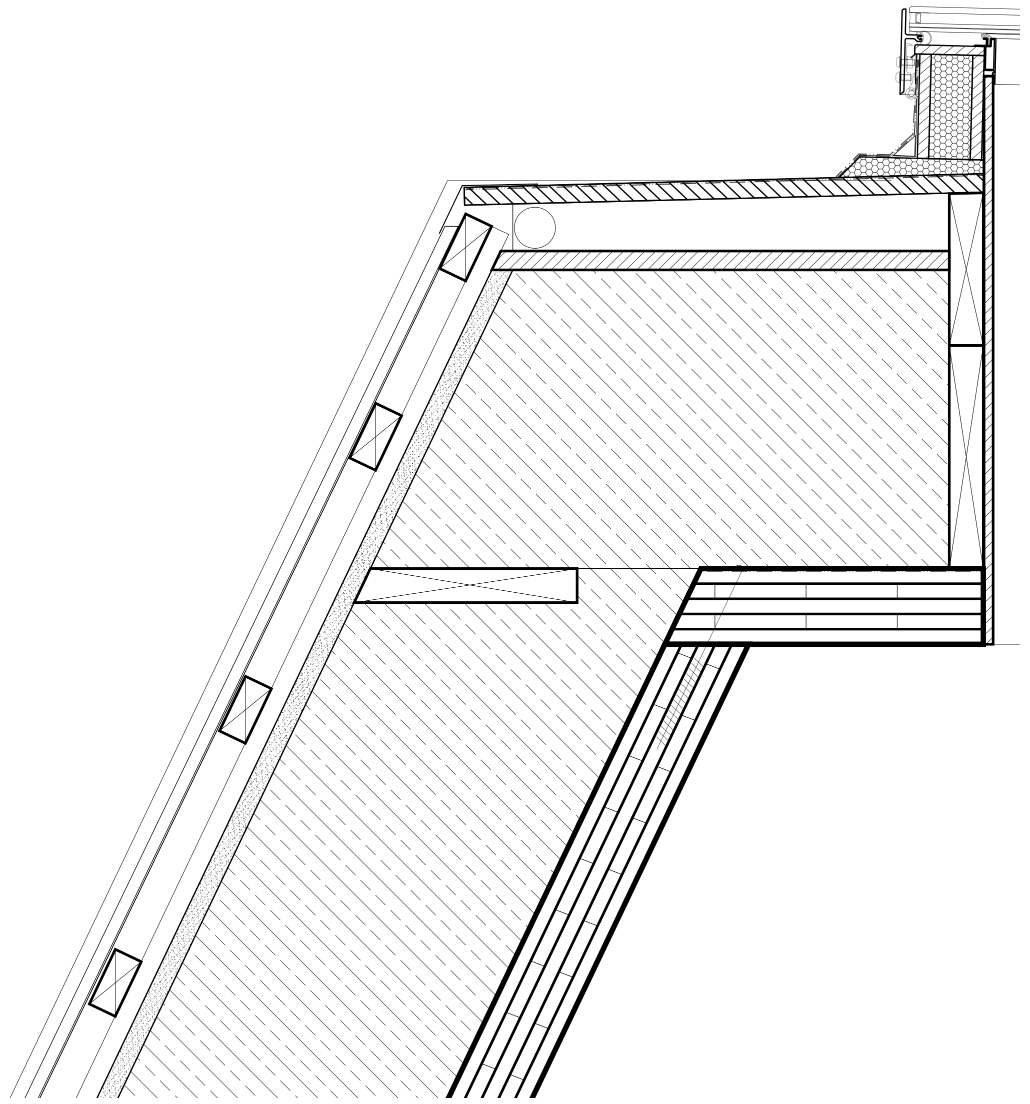
1. FOUNDATION / GROUND SLAB



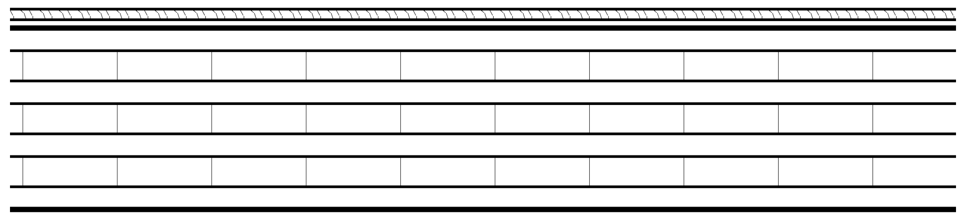
2. FACADE



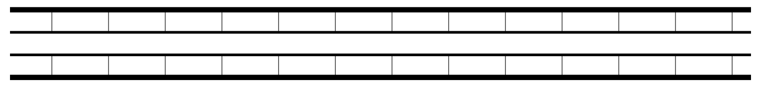
3. ROOF CONSTRUCTION



4. SLAB



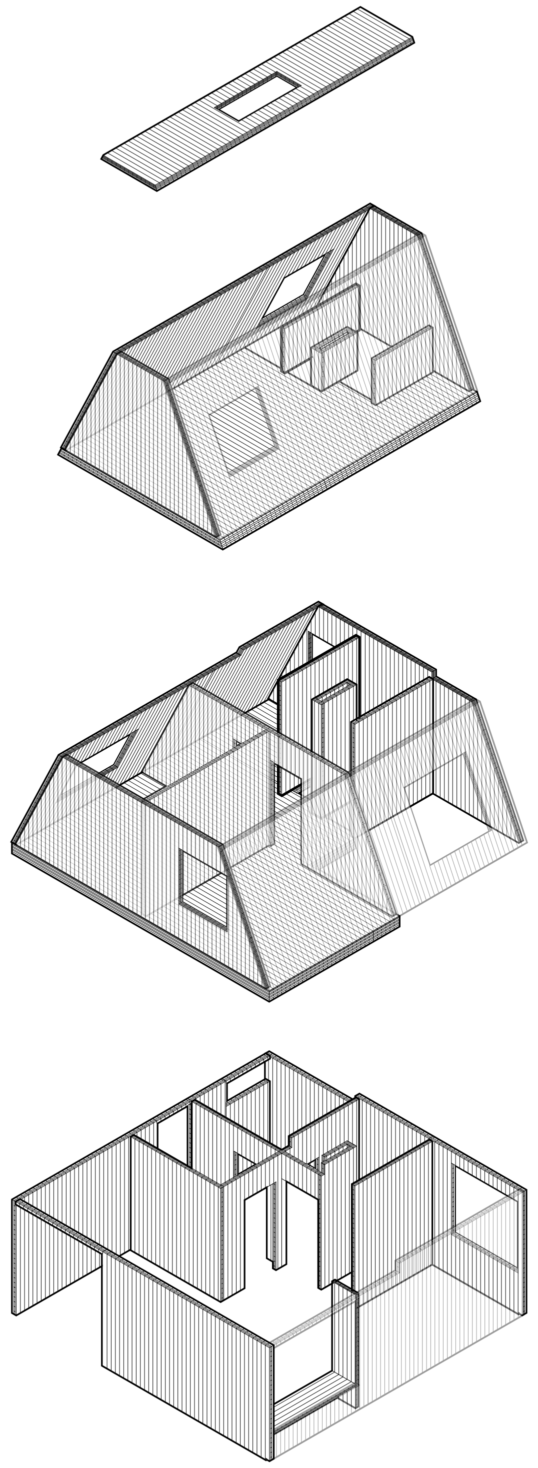
5. INTERIOR WALL



9. INSTALLATIONS

Hybrid ventilation (VELUX Active + Mechanical system)
Vent through mechanical ventilation
Radiators
Wireless switch for light
Air to water heat pump

0. AXO



Technical system recipe

The slide details the technical systems used in the Cross-Laminated Timber (CLT) house in our project, describing the heating system, the ventilation system and the different components selected for this version.

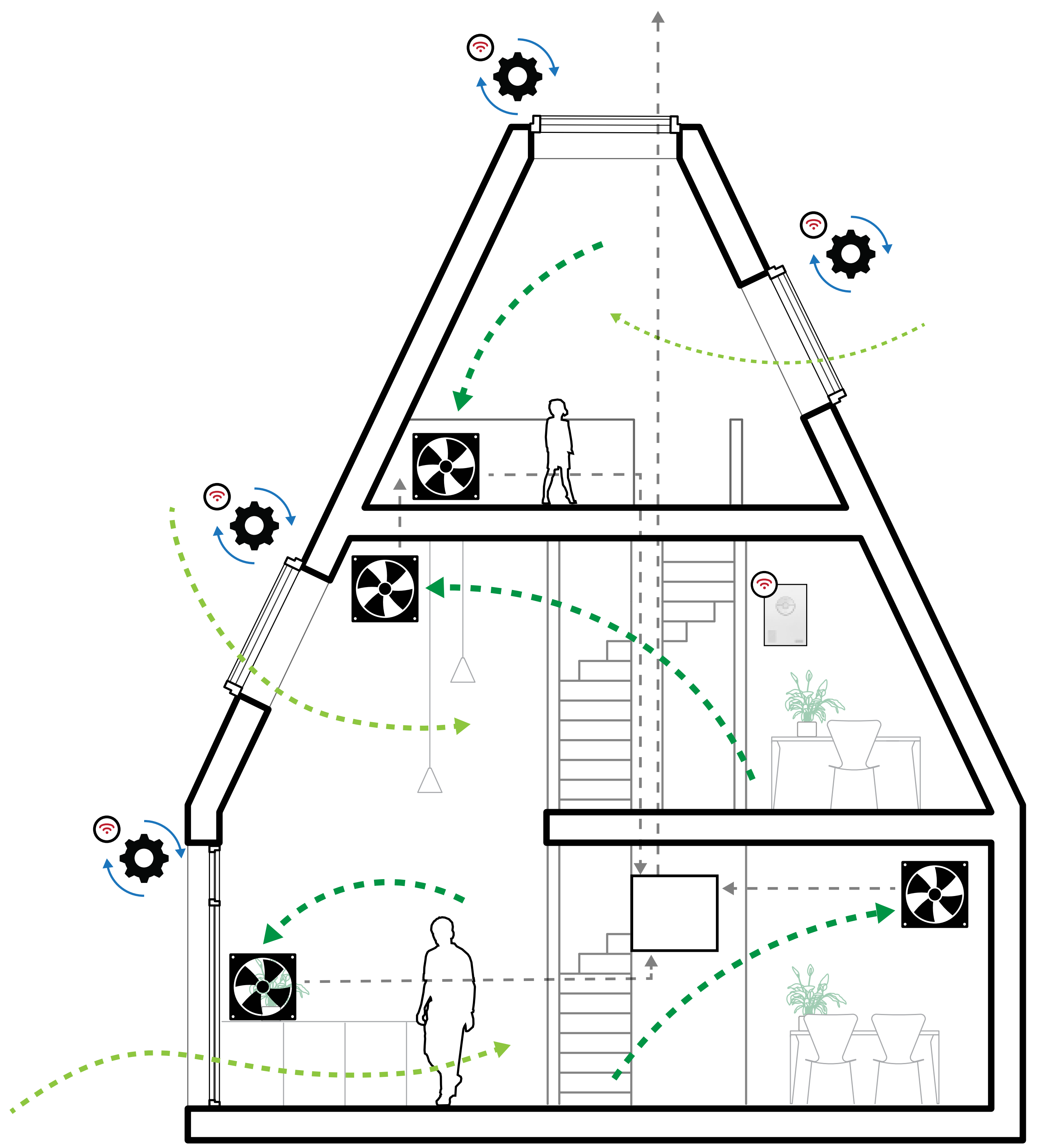
0.0 DESCRIPTION

1. Ventilation system
Hybrid ventilation
(VELUX active + Mechanical system)

2. Heating
Air to water heat pump
Radiators

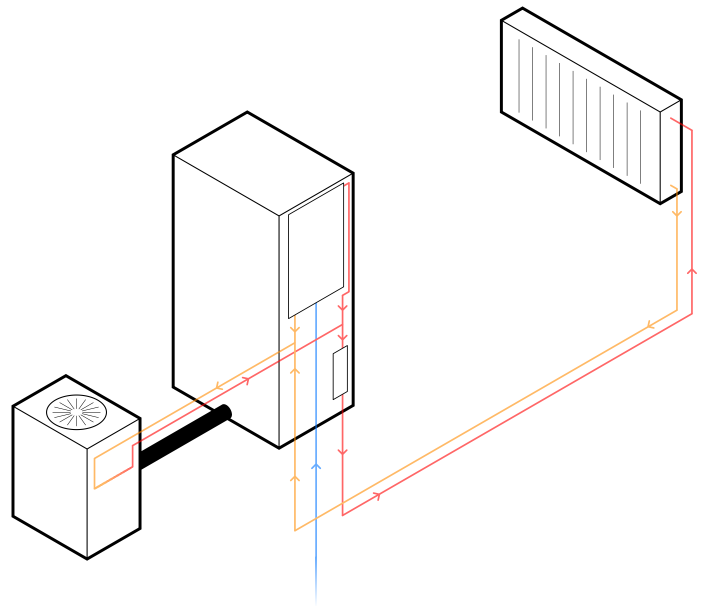
3. Energy
Wireless switch for lights
Solar Panels: SPR-MAX3-375 (Sunpower)

1. VENTILATION SYSTEM



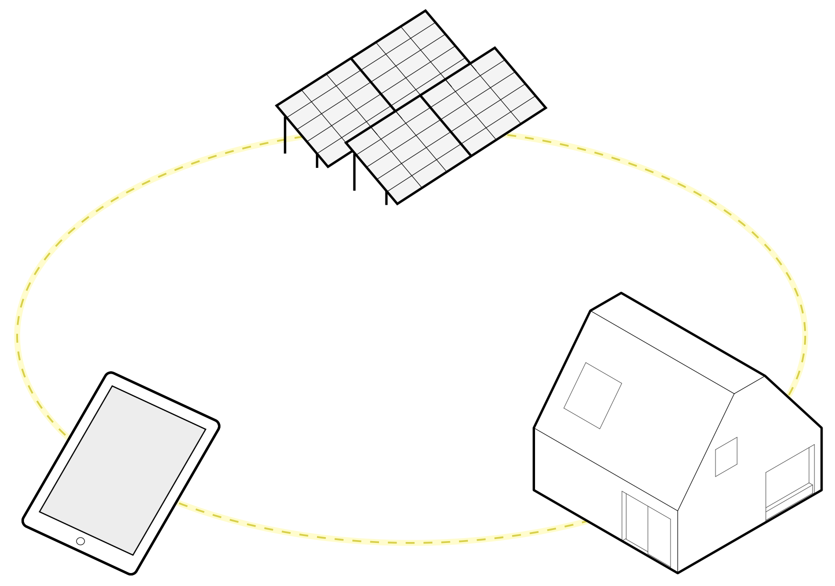
Our ventilation strategy for this house combines mechanical and natural methods, incorporating principles like the stack effect to create a superior indoor environment. This systems delivers both comfort and energy efficiency.

2. HEATING



We use an air-to-water heat pump and radiators for heating , ensuring energy-efficient comfort year-round.

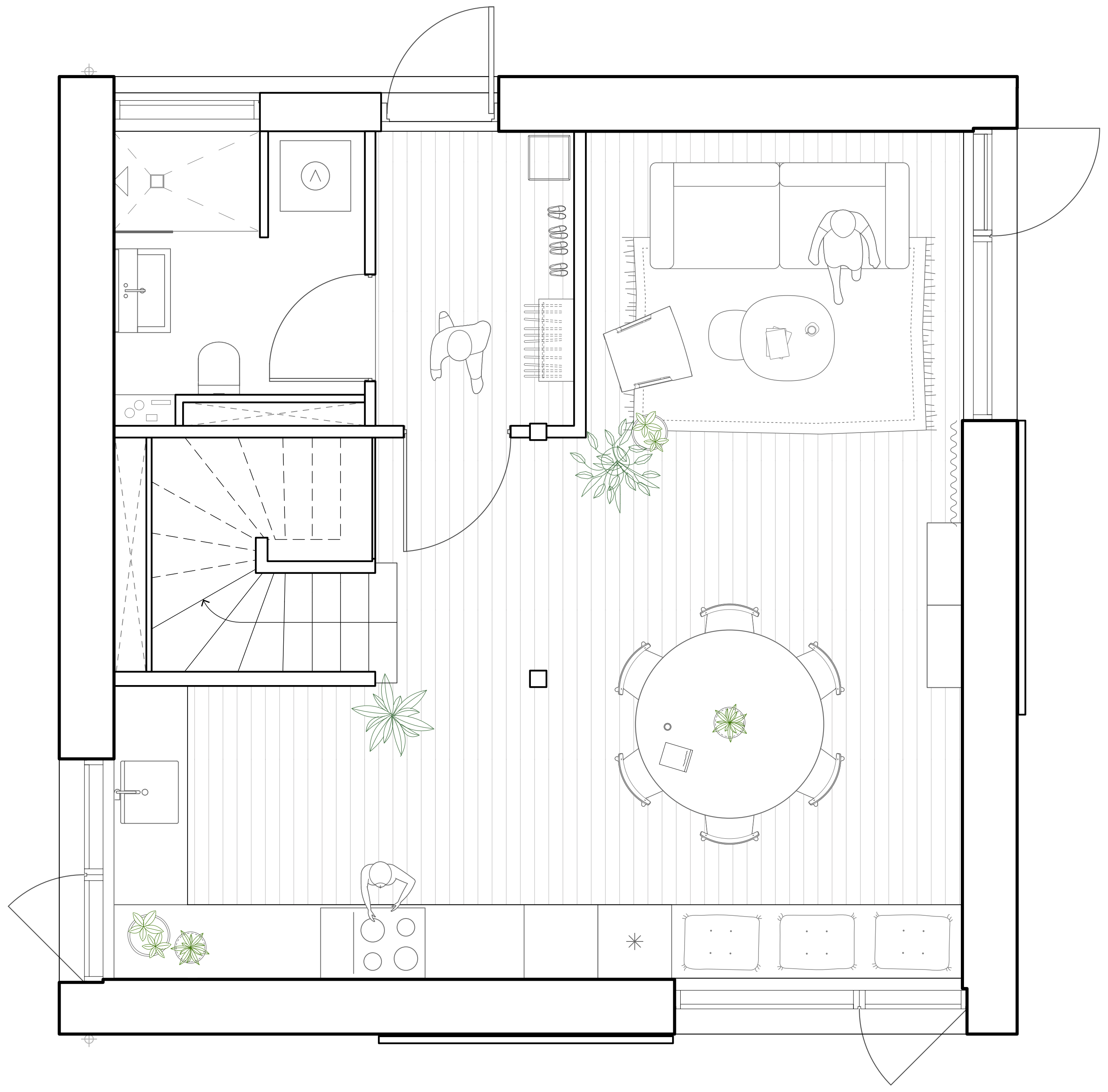
3. ENERGY



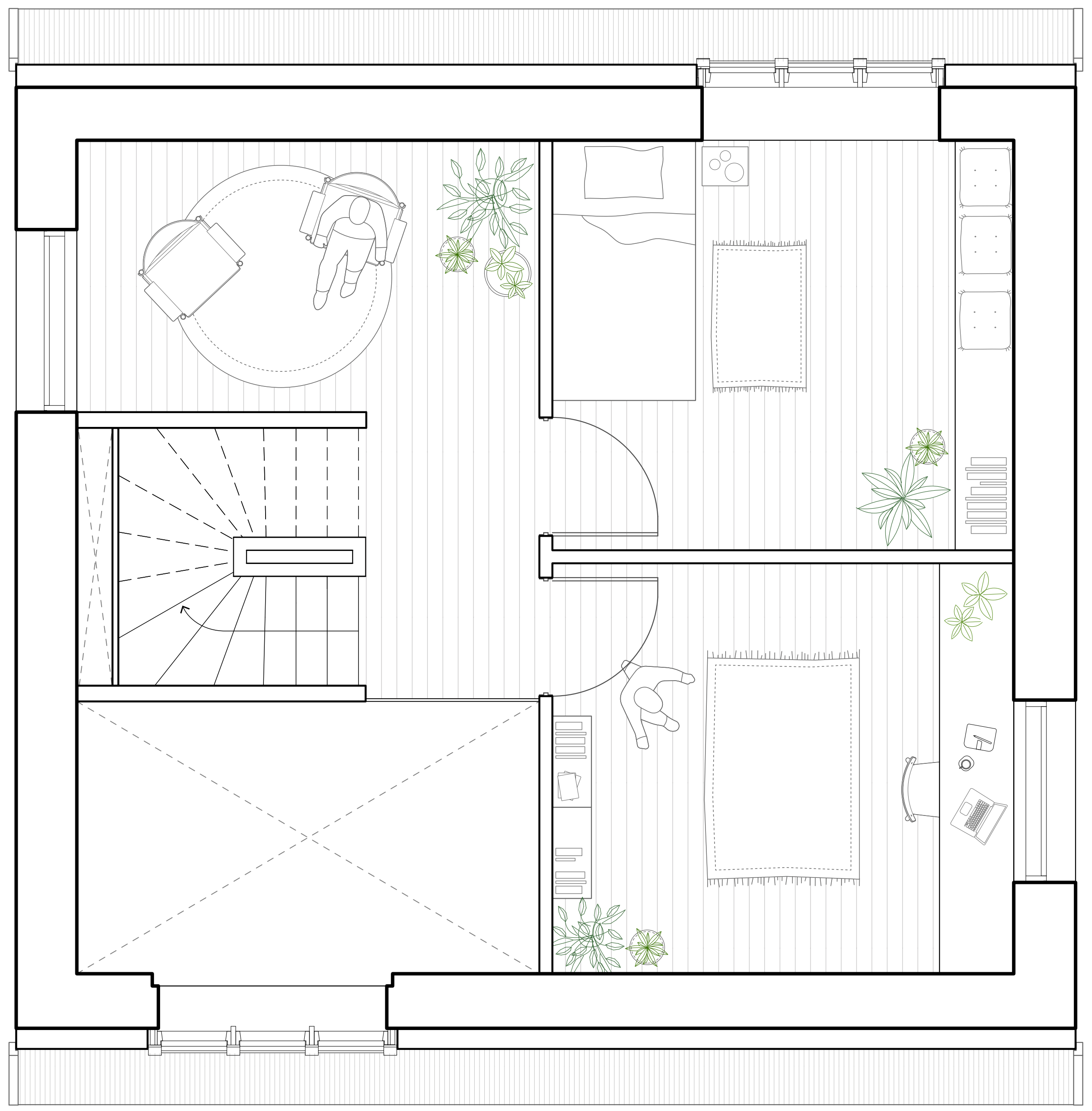
Our electricity and heat pump are powered by solar panels, significantly reducing emissions and cost. This provides us with stable and clean energy.

Haven House
Plans

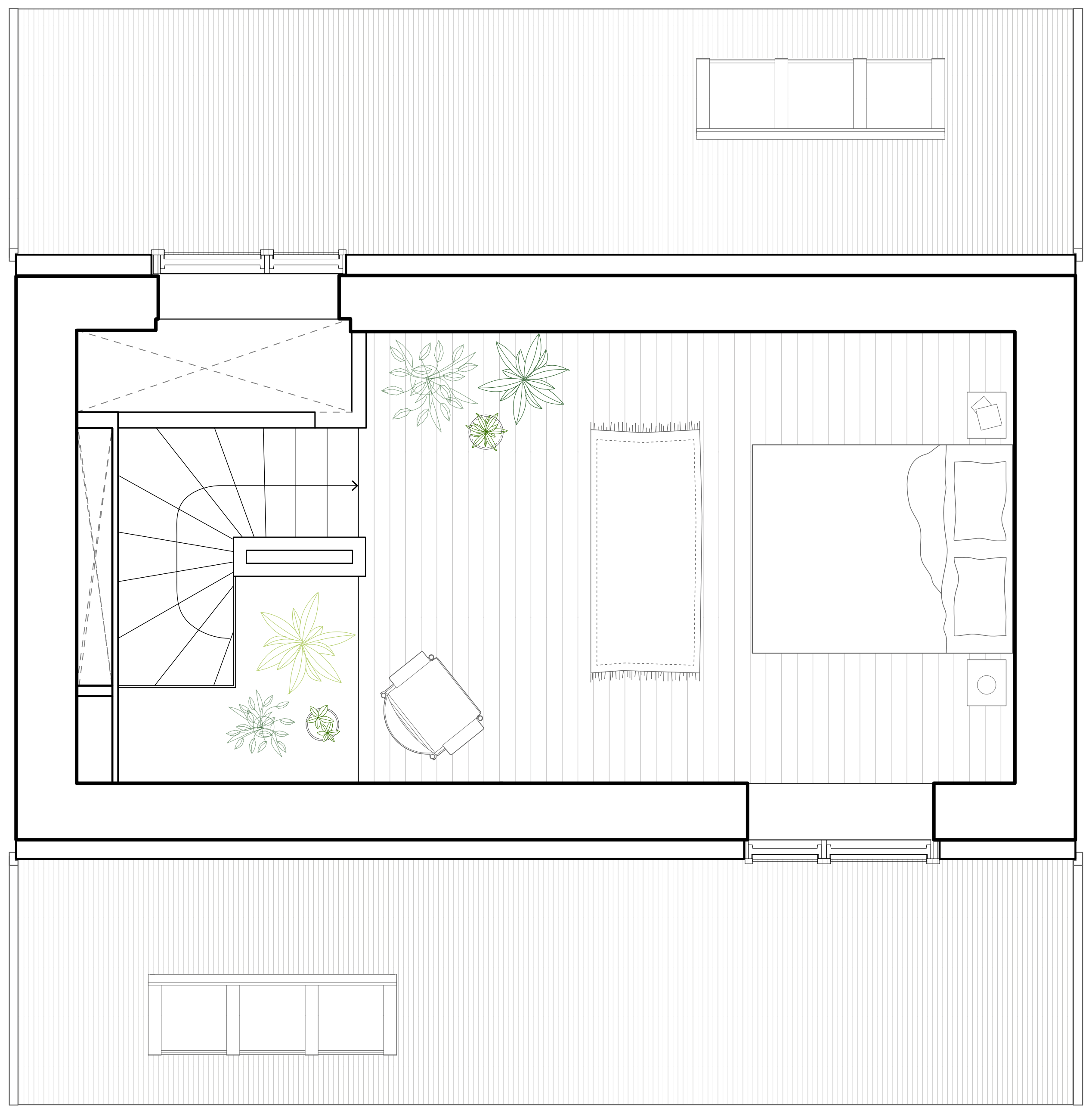
Scale 1.50



GROUND FLOOR



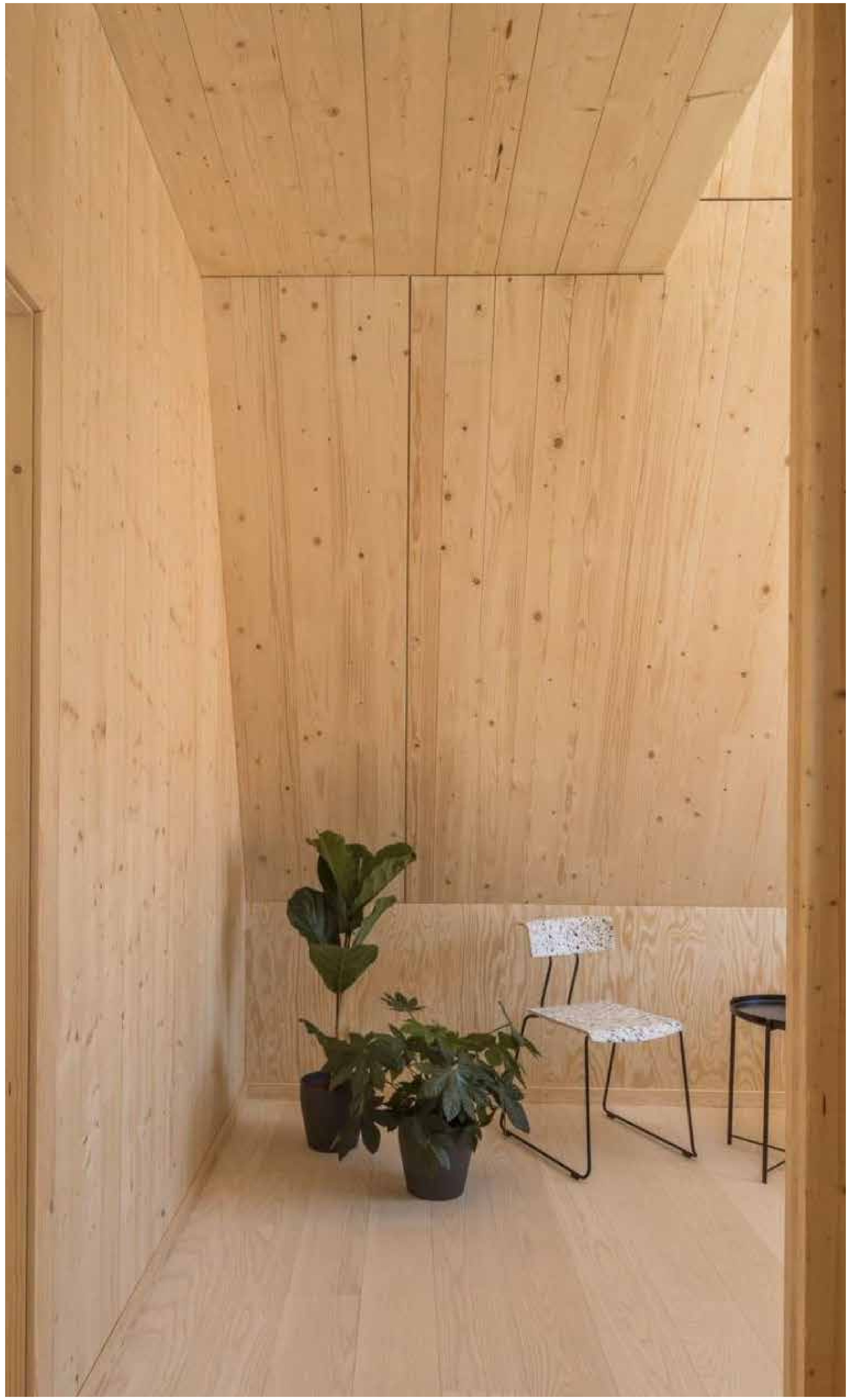
FIRST FLOOR

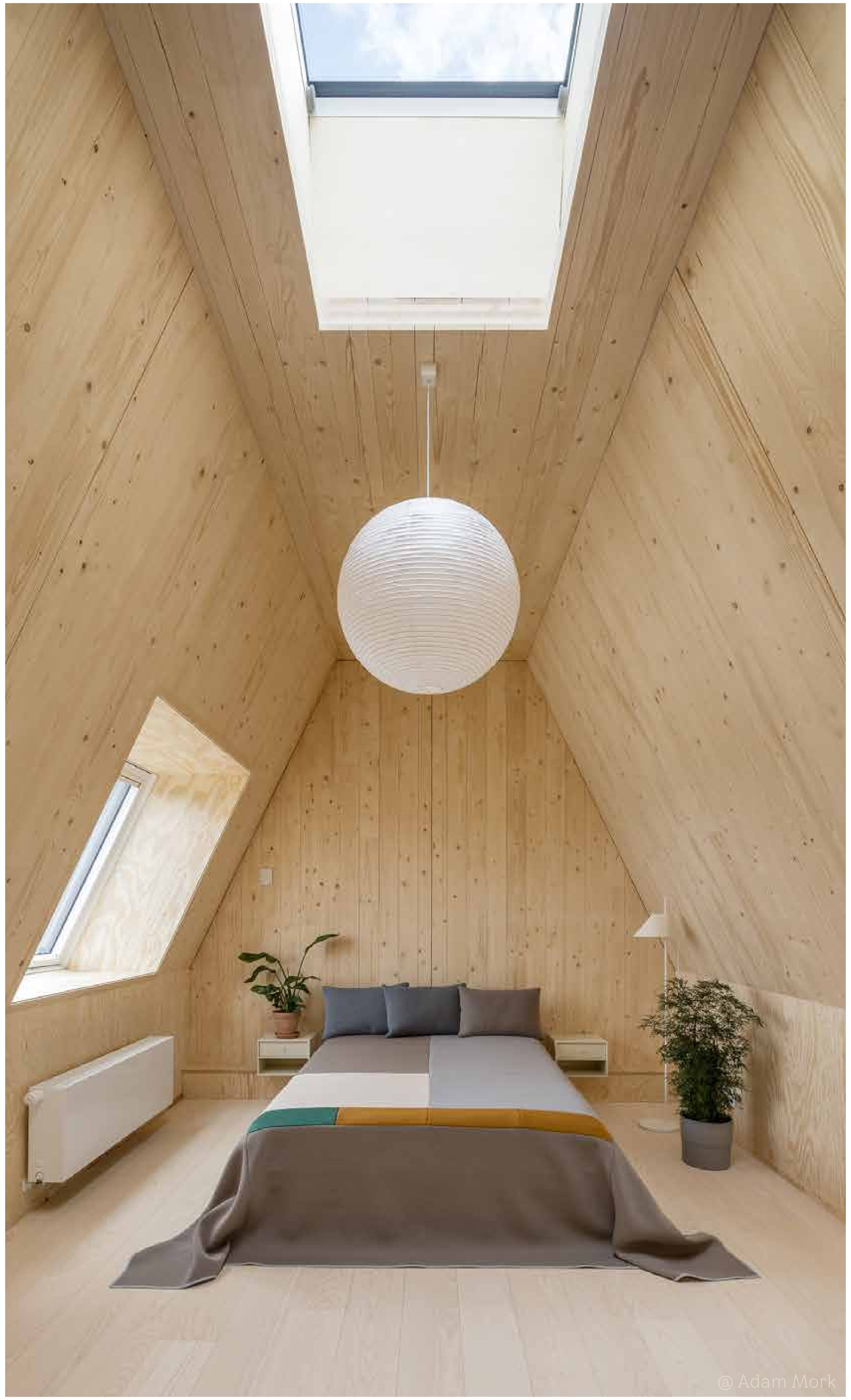


SECOND FLOOR

0 1 2,5 5
Scale 1.50

© Adam Mork





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Light & Colors

How we have worked with
light an color

Color Concept

BY MARGRETHE ODGAARD & ACT COLOR TOOLS

Colour is a key medium for energy transfer and sensory stimulation. Living Places Copenhagen's colour concept is designed to enhance sensory perception of colour, creating an interior space that supports health, the environment, and sensory stimulation, thereby rejuvenating the mind. This concept draws from the qualities found in natural earth minerals, similar to early pigments used in ancient cave paintings like Lascaux and Altamira.

Colours have an impact that goes beyond aesthetics. Human well-being is greatly influenced by sensory stimulation, and colour plays a pivotal role in this. Studies indicate that within the first 90 seconds of encountering a space, 62% to 90% of a person's assessment is based on colour alone.

Living Places Copenhagen promotes the use of natural pigments over synthetic alternatives. Natural pigments and binders enhance the interplay of light and texture, providing a more authentic sensory experience and bringing colours to life.

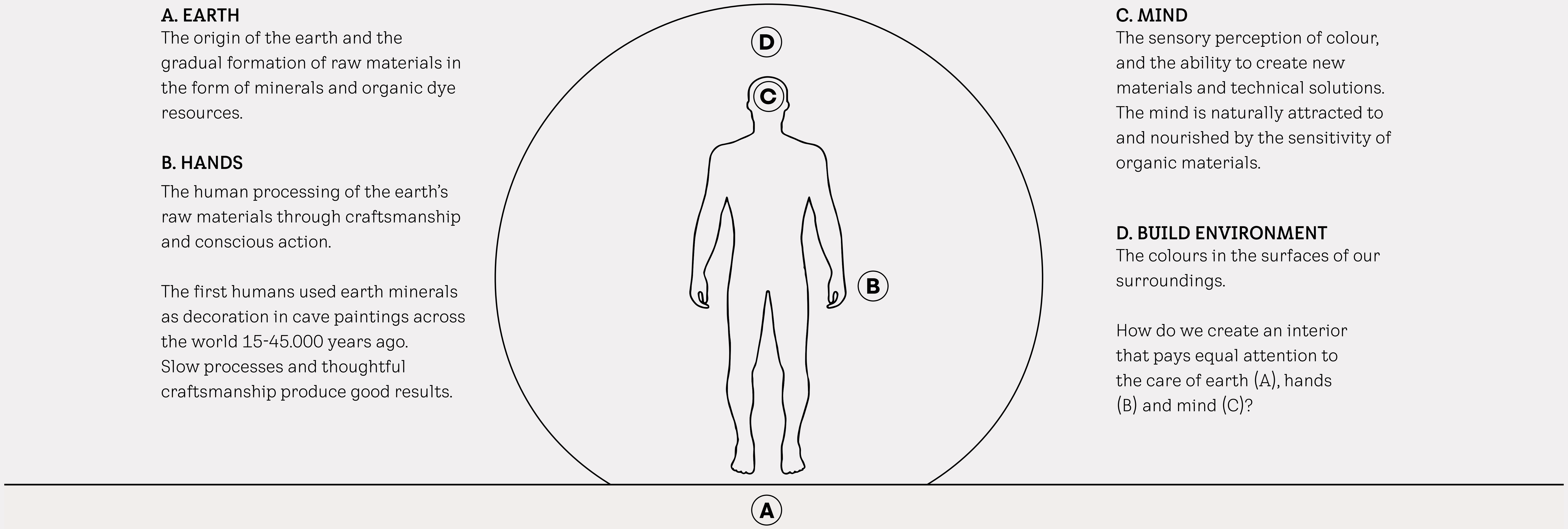
A key part of their vision is to use natural, diffusion-open binders on architectural surfaces, avoiding heavy metals and other harmful substances. For wall and ceiling applications, they will use Aqualinum from Linolie & Pigment, a natural interior paint composed of water, linseed oil, cellulose gum, and pigments, free from heavy metals, solvents, preservatives, and microplastics. This approach reflects Living Places Copenhagen's commitment to an environmentally friendly and health-conscious interior design.

A. EARTH
The origin of the earth and the gradual formation of raw materials in the form of minerals and organic dye resources.

B. HANDS

The human processing of the earth's raw materials through craftsmanship and conscious action.

The first humans used earth minerals as decoration in cave paintings across the world 15-45.000 years ago. Slow processes and thoughtful craftsmanship produce good results.



C. MIND
The sensory perception of colour, and the ability to create new materials and technical solutions. The mind is naturally attracted to and nourished by the sensitivity of organic materials.

D. BUILD ENVIRONMENT
The colours in the surfaces of our surroundings.

How do we create an interior that pays equal attention to the care of earth (A), hands (B) and mind (C)?

From physical to digital

People need sensory stimuli to thrive, as external inputs elicit responses on the central nervous system that can enhance well-being. Colors are a powerful motivator and affect us far more than we might think. Studies estimate that color has a 62 to 90 percent influence on how we interpret our surroundings. Therefore, it is important to consider the quality of the colors we use in the spaces we inhabit.

With the natural pigments as the focal point of the compass, we give the earth a voice in Living Places. Physical and mental well-being is enhanced through the use of natural colors, extracted from the Earth's minerals, converted into pigments and applied to the digital interfaces of the Compass. Using natural analogues to provide an indirect sense of the great outdoors triggers our biophilic human link to nature and therefore inspires a subconscious sense of well-being.

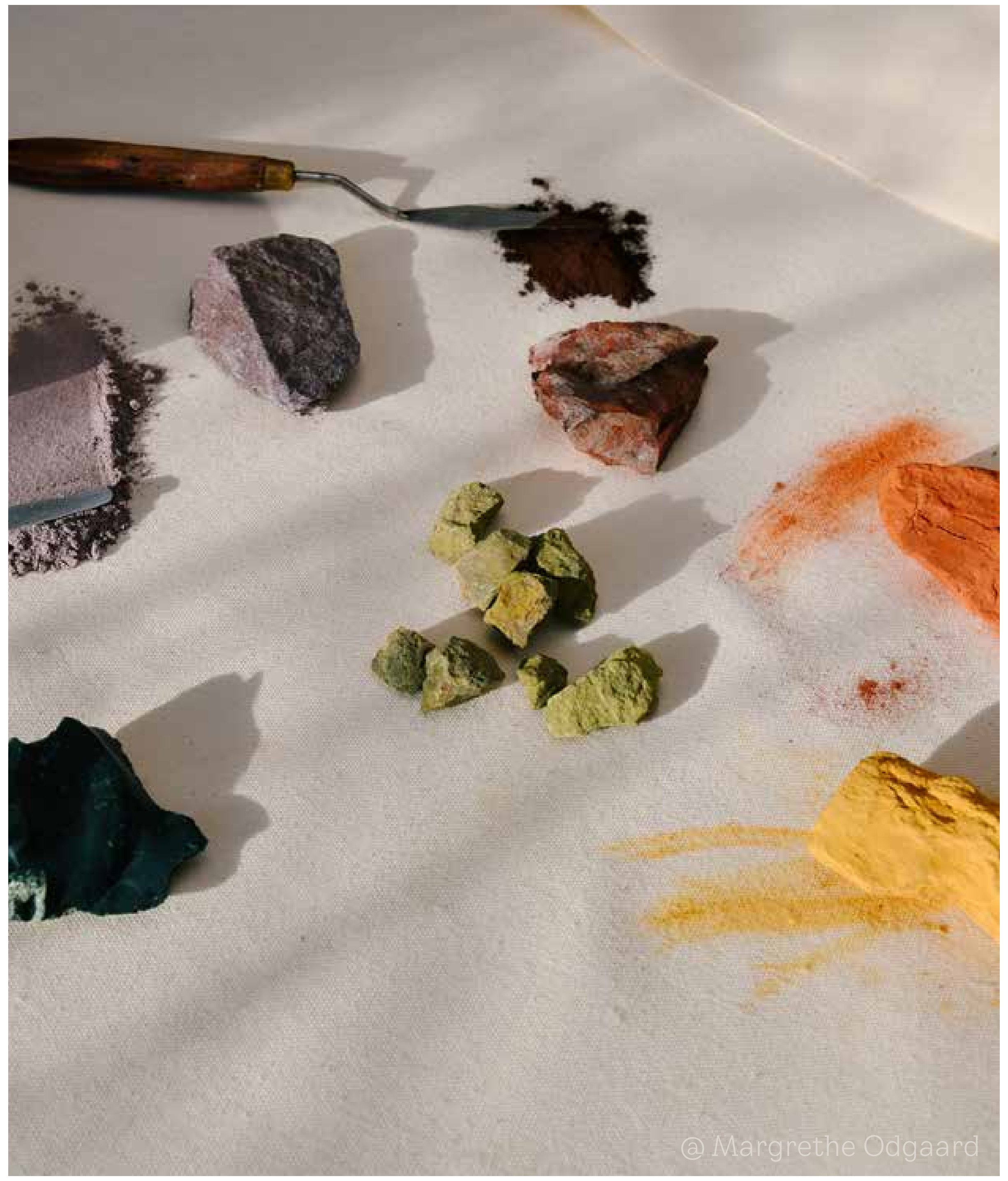
Living Places is based on innovation, health and sustainability; the solutions lie not on the horizon, but rather on the ground beneath our feet.

"PSYCHOLOGISTS HAVE DOCUMENTED THAT LIVING, BREATHING COLORS DO MORE THAN APPEAL TO THE SENSES; THEY ALSO BOOST MEMORY FOR SCENES IN THE NATURAL WORLD AND THUS ENHANCE OUR SENSE OF CONNECTEDNESS WITH THE ENVIRONMENT."

Wichmann, F. A., Sharpe, L T., & Gegenfurtner, K. R. The contributions of color to recognition memory for natural scenes. Journal of Experimental Psychology: Learning, Memory and Cognition,

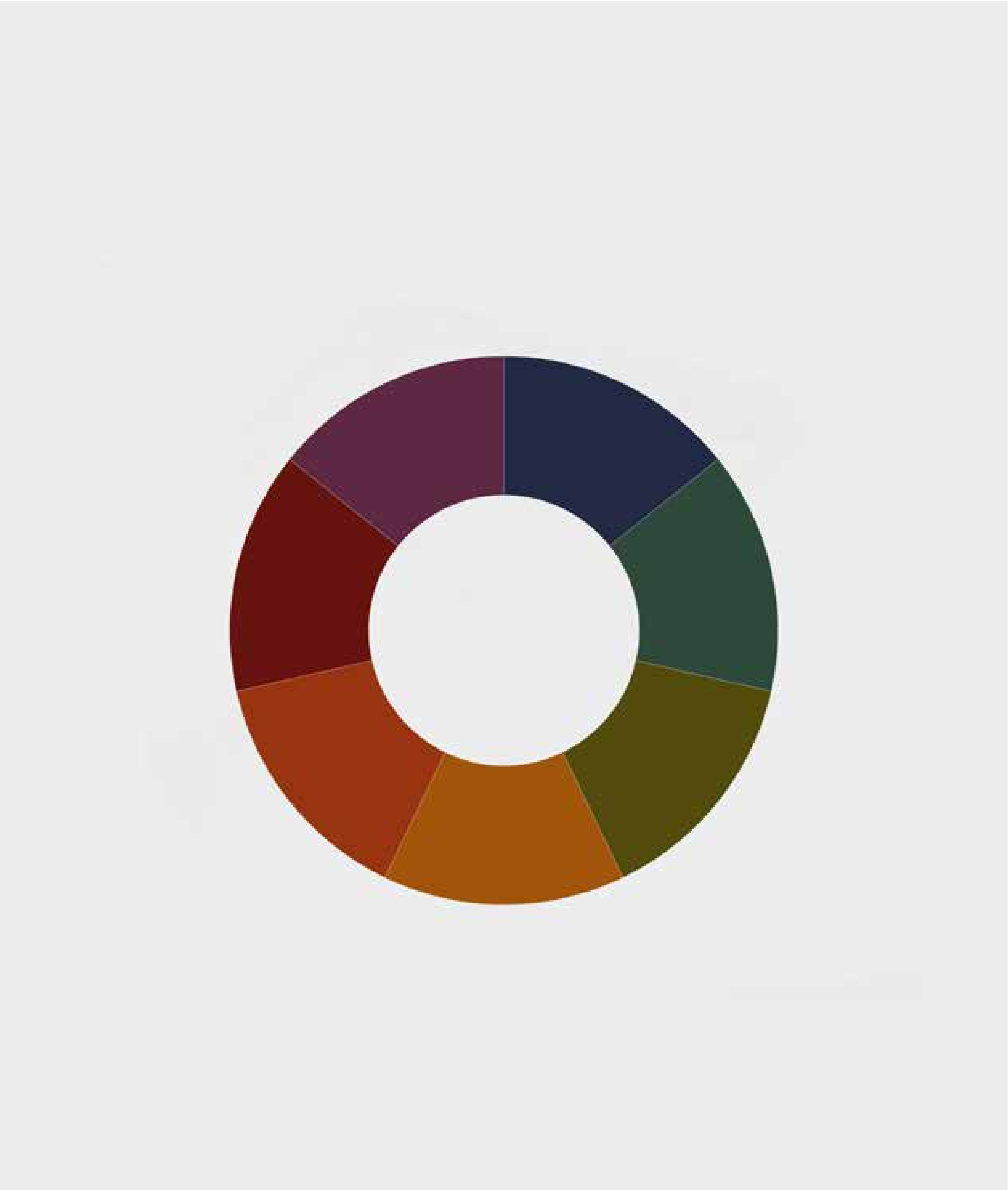
MINERAL

The colors of the Compass derive from the Earth's minerals. They are primitive colors; colors that have been a part of Earth's history for millions of years.



PIGMENT

When we use synthetic pigments and binders, we limit the color to artificial and flat expressions. Natural pigments, on the other hand, optimize the play of light on the surface, and with this sensory stimulation is achieved quite naturally.



DIGITAL INTERFACE

By drawing on the qualities of natural pigmentation the Compass makes use of the principle of biophilia to bring nature into the digital realm through the use of color.

Light Concept

BY MERETE MADSEN
FOR THE LOVE OF LIGHT

In the latter part of the Jernbanebyen lighting design concept, significant emphasis is on the interaction between light and darkness, targeting sustainability and minimizing light pollution.

This approach aims to preserve the natural night ambiance and the ecological benefits of darker areas, especially in urban settings. The lighting strategy is designed to work with darkness, using carefully placed and directed fixtures to cast light downwards, reducing light spill into the sky and surroundings.

This enhances aesthetic appeal and mitigates light pollution. Key to this strategy is dusk lighting, which uses low-intensity lights as daylight fades, ensuring safety and maintaining a balance with the natural twilight. This, along with preserving darker zones, supports the goal of sustainable, eco-friendly urban spaces. The concept also includes sustainable, recyclable materials for fixtures, emphasizing the project's commitment to environmental goals and long-term sustainability.

Overall, this lighting design for Jernbanebyen represents a thoughtful urban lighting approach, focusing on harmony with darkness and sustainable practices.


@ Adam Mork


@ Adam Mork

Learnings

What did
we learn?

Learnings

01

Environmental Impact

The project proves it's possible to build a house with a reduced environmental impact of 65%-75% with existing readily available materials.

02

Health Impact

The project proves, that we can achieve best in class indoor environment, by design and by using hybrid and natural ventilation

03

Affordability Impact

The project proves that we can achieve a reduction in environmental impact and increase the indoor environment, at market price.

04

Collaborative Impact

The project proves that together we can do so much more. Through collaboration and transformative partnering we have made a leap for what we thought was possible.

05

Construction Impact

The project proves that by thinking in systems modularity and prefabrication, we can speed up the construction process.

06

Market Impact

The project stands as a compelling example of how sustainable practices can be made appealing to a broad audience.

07

Social &Cultural Impact

The Project Proves: That it's possible to create a sustainable place that attracts over 5000 people, establishing itself as a new social hub.

Partnerships

Arkitekturhovedstad 2023
OFFICIEL PARTNER

COPENHAGEN IN COMMON
UNESCO-UIA
COPENHAGEN 2023

WORLD CONGRESS OF ARCHITECTS · UIA 2023 · COPENHAGEN ·

Living Places Concept

VELUX®

Owner & Ideator

Living Places Partners

EFFEKT
Architects
Concept partner

ARTELIA
Engineers
Concept partner

Enemærke & Petersen a/s
Contractor

DSB
Landowner

Compass partners

ACT colour
Color concept
Textiles, surfaces

BOLIG LABORATORIUM EKSPERIMENT VIDEN
STATENS KUNSTFOND OG REALDANIAS BOLIGLABORATORIUM
Exhibition on 7 experimental housing projects

BANEBY KONSORTIET
Exhibition on Future railway district

LANDSBYGGEFONDEN
Exhibition on 'Neighborhoods for Generations'

FÆLLES HAVEN
Nature, Biodiversity and gardens

CXF
Architecture programme curators

Compass suppliers

Stykka®
Kitchens

Montana
Furniture

mater
Furniture

kvadrat
Curtains

louis poulsen
Light

URBAN HELP
Facility support

06

What's next

a way forward

Living Places is more than just a design; it's an ongoing dialogue between the traditions of the past and the innovations of the future.

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