

LIVING ATTIC

Transforming hidden spaces



A LIVING PLACES RENOVATION PROJECT

Living Attic continues the experimental tradition of the VELUX Group by using full-scale building tests to explore how we can create more sustainable and healthier buildings with the materials, methods and technologies available today.

This case applies the Living Places Principles to an attic conversion, taking a holistic approach to renovation to create a healthier indoor environment with a lower carbon impact for people and planet.

The project responds to two key challenges in European housing: many homes built in the 1960s and 1970s need energy-performance upgrades, and residents are increasingly seeking more usable living space.

The resulting renovation demonstrates the potential of an unused attic, transforming it into a comfortable living area while improving the functionality and energy performance of the entire house.

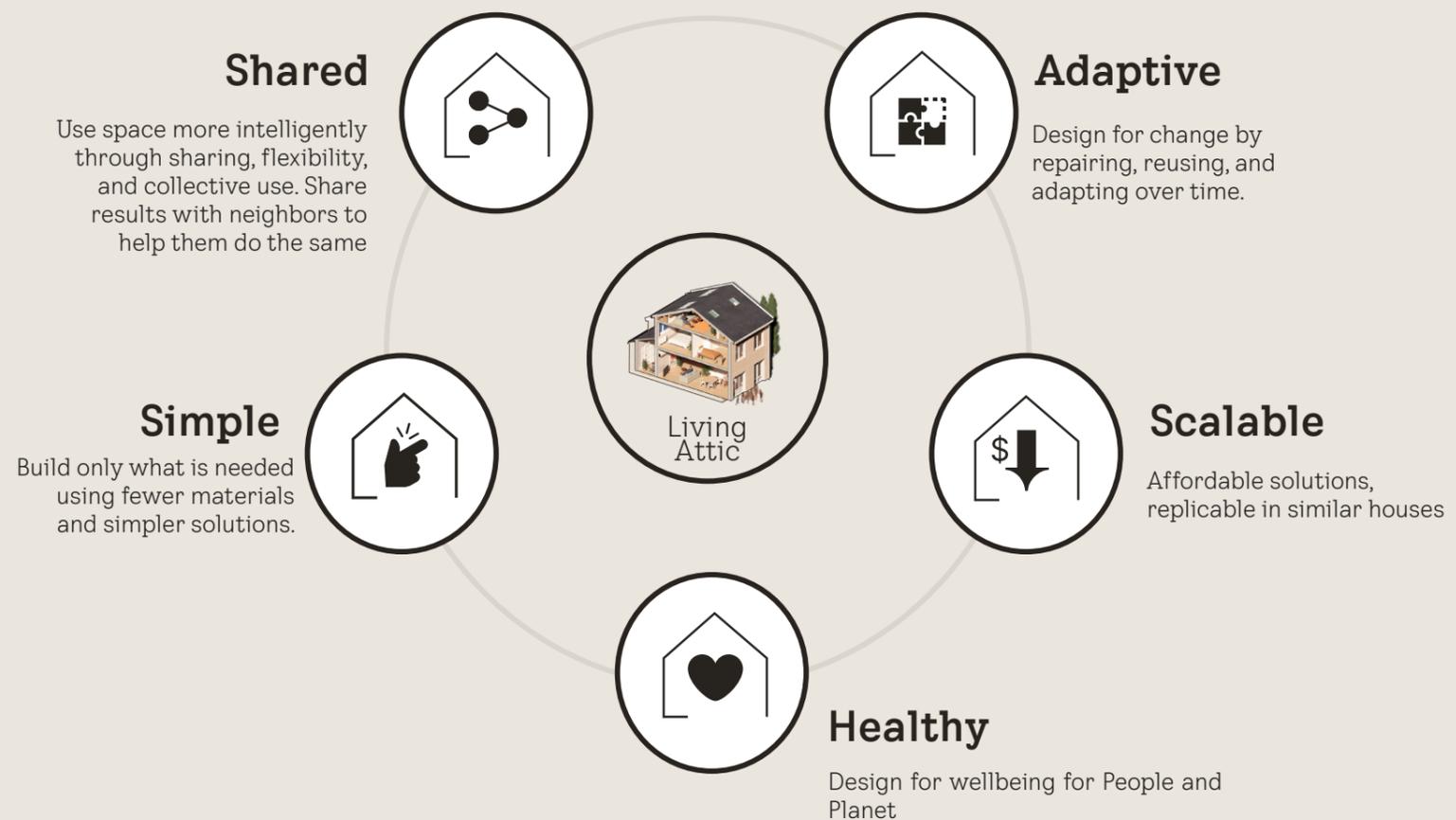
The renovation prioritised daylight and effective ventilation. These elements are central to the Healthy principle, which emphasises fresh air and daylight as part of creating a better indoor environment while also encouraging the use of lower-carbon building materials. The renovated house now provides flexible spaces for the family, with clear improvements in comfort, energy performance and indoor air quality.

By sharing their experience, the homeowners also contribute to the “shared over time” ambition of Living Places. Their practical insights become a resource for the neighbourhood, helping others consider similar renovations and strengthening community knowledge over time.

The homeowners, aware of the challenges of a house renovation, looked for a renovation company that would handle drawing the plans, finding and coordinating contractors, navigating subsidies for deep renovation and drawing on the company’s vast experience. The renovation company connected the homeowners with VELUX, as a correct placement of roof windows is crucial for creating great spaces with optimal daylight and fresh air flow. This is where the VELUX team joined the process, and the project took on a broader ambition. They proposed enhancing the original plan by improving what mattered most while keeping the budget: the quality of the spaces created, the choice of materials, energy performance, and, importantly, summer comfort.

In return, the homeowners agreed that the home could be monitored after completion and used as a communication “showcase,” a real-life example of what can be achieved through a well-designed renovation of a typical terraced house. To support evidence-based decisions, VELUX partnered with the engineering firm Artelia and ran a series of simulations. These included energy modelling, summer thermal comfort studies, daylight assessments, and carbon footprint calculations. The aim was to identify the most effective design choices based on the house’s original plans and constraints. The renovation added 25 m² of usable space under the roof. The only enlargement of the original footprint was the addition of an entry vestibule

The initial wooden roof has been replaced with a new one, just 70 cm higher, which met the requirement for a harmonious appearance of the houses while ensuring a comfortable room height. The new load-bearing structure created an open space without the king post and struts in the middle. The gable walls were cleared of chimneys, as they were not needed anymore thanks to the new heating system; the space gained has been used for additional insulation; also, under the wooden floorboards, a layer of footfall sound insulation has been added. The family lived in the house throughout the renovation: it was an intense adventure, but it allowed the owners to follow every step. They entrusted the specialists with the main decisions, being involved only in choosing the finishing materials.





HEALTHY

90% reduction of overheating



AFFORDABLE

From energy label F to A



SUSTAINABLE

Carbon payback time 10 years

THE RENOVATION POTENTIAL

With around one-third of homes in France having attics suitable for conversion, the project highlights a scalable renovation model to upgrade the existing housing stock in line with People & Planet goals.

Climate change is making French homes uncomfortable, making renovations urgent:

The data was provided by the Fondation pour le Logement des Défavorisés (Foundation for Housing the Disadvantaged) and by ADEME (agence de l'environnement et de la maîtrise de l'énergie):

- The yearly air conditioning sales have doubled from 2014 to 2020.
- 55% of French people feel too hot at home in summer
- 1 in 3 dwellings is a so-called "bouilloire thermique" - "thermal kettle" - meaning it's dangerously overheating in the summer due to lack of proper insulation, insufficient ventilation and poor solar protection.



64% of single-family houses have attics



6.6M already inhabited



6.2M ready for conversion

1 1946-1968



Detached + semi detached houses
= 2.3M houses

2 1982-1989



Detached houses
= 1.9M houses

3 1975-1981



Detached houses
= 1.5 M houses

A NEW FAMILY LIVING SPACE

Nathalie and Jonathan live with their two children, aged 7 and 11. They both work full-time, with some days from home, and settled into a terraced house in the suburbs of Paris, where they hoped to shape a home that fits their family's everyday life.

After a long search, they found their dream property in their hometown, near schools and amenities, with a small garden, and affordable too. When they moved in late 2016, they already knew the house would require renovation at some point, mainly due to its low energy rating.

The original house was built in 1968, during a construction boom in which the belt of towns around Paris grew significantly. It is part of a settlement of identical terraced houses: all with 25 cm brick outer walls and under-insulated roofs. The building materials used in houses from that era were inexpensive, but their thermal performance is far below today's standards. Shaped by tradition and local building rules, most single-family and row houses of the time were built with sloping roofs. These often created unused attics that remained cold and uninsulated.

Focusing on renovating these houses with a holistic perspective could provide significant CO₂ savings while also giving many families living in functional but ageing homes the additional space their daily lives now require. Nathalie and Jonathan's attic reflected the standards of the 1960s and 1970s. A narrow ladder led to a space used only for storage, and the lack of roof insulation made it extremely hot in summer and a major source of heat loss in winter.

The couple discovered the potential of the attic space as the COVID-19 pandemic hit, bringing the need to work from home and the challenges that came with it. The couple set up their workstations in the living room and the bedroom, switching between the two spaces to balance work with the needs of their young children.

They realised that the only way to create a dedicated office was to make the attic habitable. The small plot and local building regulations, which emphasised the uniform appearance of the houses, meant that horizontal extensions or adding another full floor were not permitted.



FAMILY RENOVATION ASPIRATIONS

Every renovation is unique, but this transformation was guided by the family's specific needs and everyday life. The focus was on creating more usable living space, improving insulation to reduce energy consumption, increasing daylight and ventilation for a healthier indoor environment, and selecting materials with a lower carbon impact. The result is a home that supports comfort, well-being, and long-term sustainability for both the family and the planet.



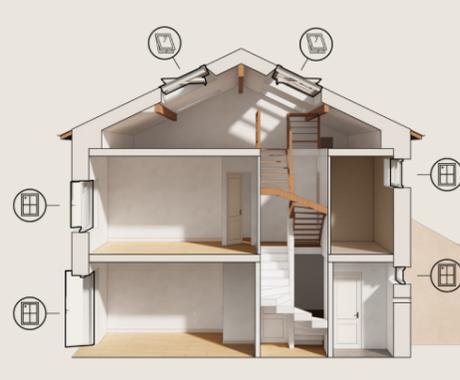
Residential attic

As part of an overall renovation with attic conversion, the unused attic was transformed into a living space designed for year-round use, creating additional space without the need of footprint enlargement.



Improved energy efficiency

Energy performance was improved through a new roof construction that includes effective insulation and heavy cladding materials designed to delay heat peaks. The rest of the house was externally insulated with glass wool, and all façade windows were replaced with high-performance double glazing while maintaining the existing roller shutters. The gas boiler was also replaced with an air-to-water heat pump.



Larger window area

The quality of daylight in the house increased significantly through the installation of VELUX roof windows: two motorised 3-in-1 solar roof windows (FFK F06) with integrated solar roller shutters and two motorised roof windows (MK06) with external solar blinds. This configuration floods the attic with natural light and maintains daylight access even when the solar protection is active.



Dynamic sun protection

Motorised, intelligently controlled external solar protections – including shutters for full coverage and awnings that filter daylight and reduce UV and glare – help prevent overheating and maintain comfortable indoor temperatures throughout the day and across seasons. Combined with the roof's high-performance insulation and an automated airing system, these measures eliminate the typical attic "boiler effect." The façade windows also retain their external roller shutters.



Stairwell providing daylight and ventilation

An open stairwell supports the distribution of daylight and natural ventilation from the ground floor to the attic. Automated night ventilation through roof windows and a sliding living room window creates a stack effect, efficiently removing warm air from the house during summer and improving overall indoor climate performance.



Hybrid ventilation system

A hybrid ventilation strategy combines mechanical ventilation by insufflation with natural ventilation through automated openings. This ensures constant air renewal, sustainably removes accumulated pollutants, and maintains excellent, healthy indoor air throughout the year.

PROJECT DATA



Family:
The Flandins
(2 adults, 2 children)



Location:
Morangis,
France



Original House:
1968 semi-detached
Area =82 m²
(Period of Parisian suburb
expansion)



Motivation:
Need space for
growing family and
home working



Challenge:
Stay in community
or move away?



Before

82 m²
Overheated
Energy EPC Rating F
Intense operational carbon emissions



After

107 m²
Naturally Cool
Energy EPC Rating A
Carbon payback time of 10 years



A BREATH OF FRESH AIR

To improve summer comfort while preserving natural light, Nathalie and Jonathan's renovation focused on shading, ventilation and air circulation between floors, with the VELUX roof windows playing a central role in the ventilation strategy. Traditional attics often overheat, but their project shows that careful planning can avoid this.

On the east-facing roof, light-filtering blinds were installed to maintain daylight while providing sun protection, preventing overheating on warm afternoons without darkening the room. On the west-facing roof, which receives the strongest afternoon sun, roller shutters were chosen for more robust solar protection. The blinds are equipped with sensors that allow them to close automatically when needed, even if no one is home.

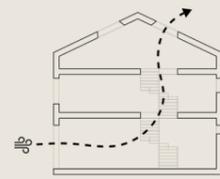
One improvement suggested by the VELUX team was to add a Somfy system to operate the dining room sliding window. Together with the sensor-equipped and automated VELUX roof windows in the attic, this enables full automation of the stack effect, allowing warm air to leave the house efficiently through the roof. The roof windows are programmed to open safely in the morning, when outdoor temperatures are usually at their lowest. The free-floating steps of the new staircase support unobstructed air movement between the floors.

Nathalie credits the enormous improvement in the allergic reactions she and the boys have experienced since the renovation to the healthy building materials and finishes, as well as, if not foremost, to the perfect airflow in the house. The integrated pollen filters ensure allergen-free air during peak allergen periods, and the constant airflow prevents mould growth.

“We had a heatwave in July and August. Even when the outside temperature was above 35°C, the attic temperature stayed around 25°C. There was never a day when we thought it was too hot in the house.”

Nathalie, owner

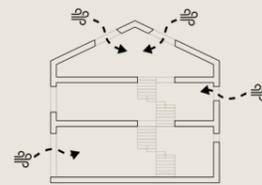
Thermal Comfort and Energy



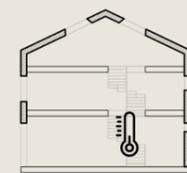
Ventilative cooling



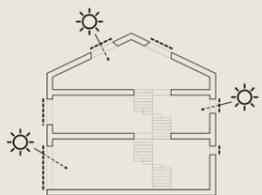
Unlock the attic



Draught control



Upgrade Exterior Wall Insulation

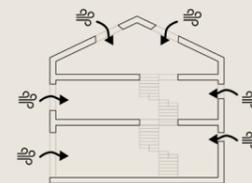


Dynamic shading



Install High-Performance Windows

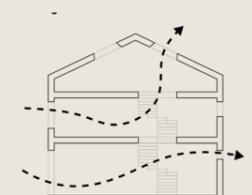
Indoor Air Quality



Fresh air
(CO₂ concentration)



Hybrid ventilation



Dampness
(cross and stack ventilation)

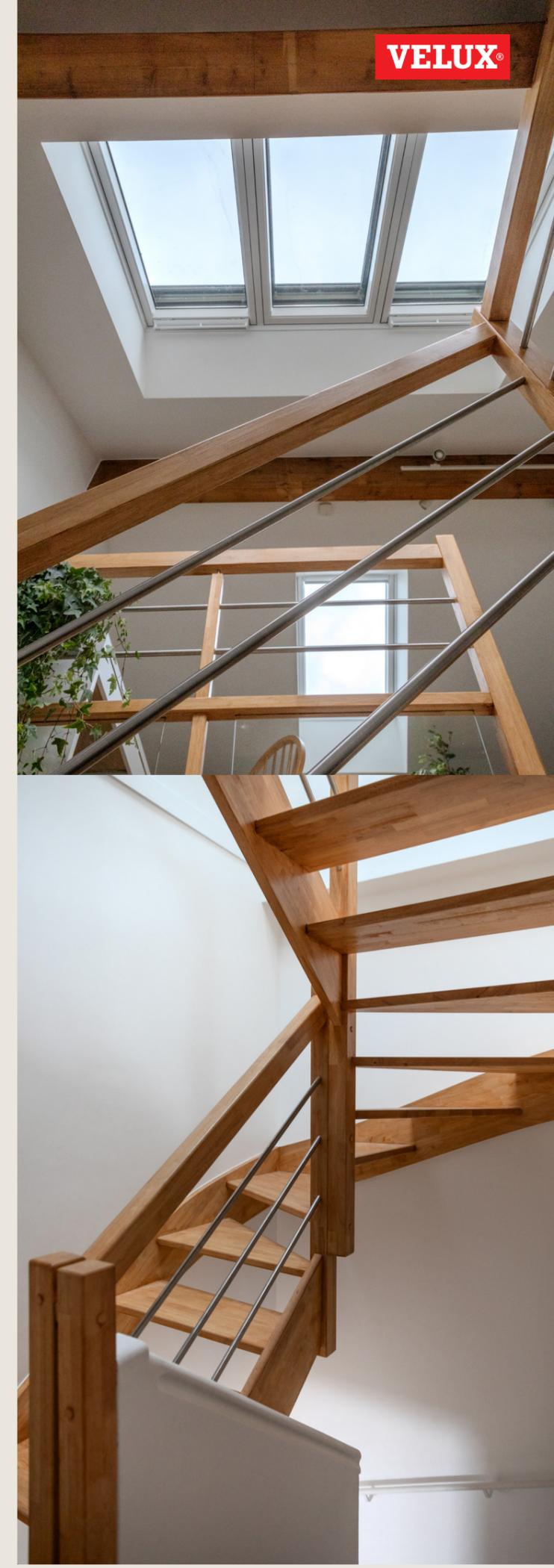
As part of the renovation, the house was fitted with a mechanical ventilation system designed to meet the constraints of an existing building. Unlike the more common systems used in France, which typically extract stale air from kitchens, bathrooms, and toilets, this installation primarily supplies purified fresh air into the home. Air is blown into two key locations: one between the attic and the first floor, and another in the living room. From there, the air circulates through the house and exits via the ventilation slots integrated into the windows. In the attic, the air is discharged through dedicated ducts.

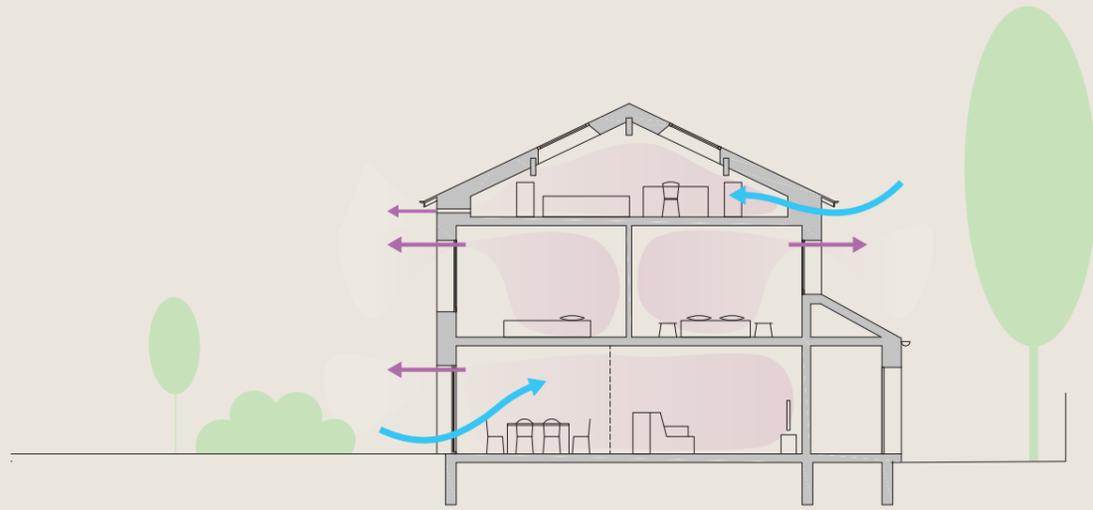
This approach was chosen for practical reasons: it requires far fewer ducts than a conventional extraction-based system. In renovation projects, creating space for multiple duct runs can be complex, disruptive, and costly. By simplifying the ductwork, the system is easier to integrate into the existing structure and more cost-effective to install. The ventilation unit's motor is located in the attic near the stairwell and enclosed in a soundproof box to prevent noise from disturbing the living areas.

“Both children and I are allergic to pollens, mould and dust mites. The constant flow of fresh air in the renovated house, thanks to new mechanical and natural ventilation, brought us enormous relief!”

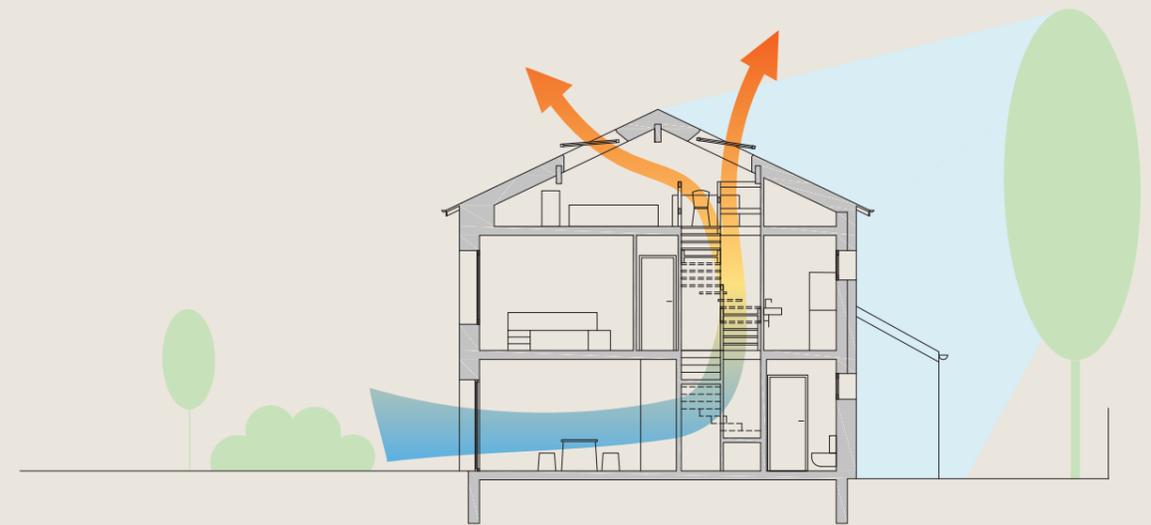
Nathalie, owner

CO₂ levels tend to rise most in this room, particularly at night, when two people sleep in a relatively small space, making it a reliable indicator of when increased ventilation is needed. When the sensor detects higher CO₂ concentrations, the system increases airflow accordingly. This is especially relevant, as the bedroom windows are not motorised, so programmed airing through is not possible. The ventilation system efficiently draws out humidity from the bathroom to prevent toxic mould.





Cross-section before the renovation. The uninsulated, dark attic was accessible via a narrow ladder with a trapdoor, making it unsuitable even for storage. The lack of insulation led to significant energy losses in the cold season and overheating of the entire floor below during hot summers.

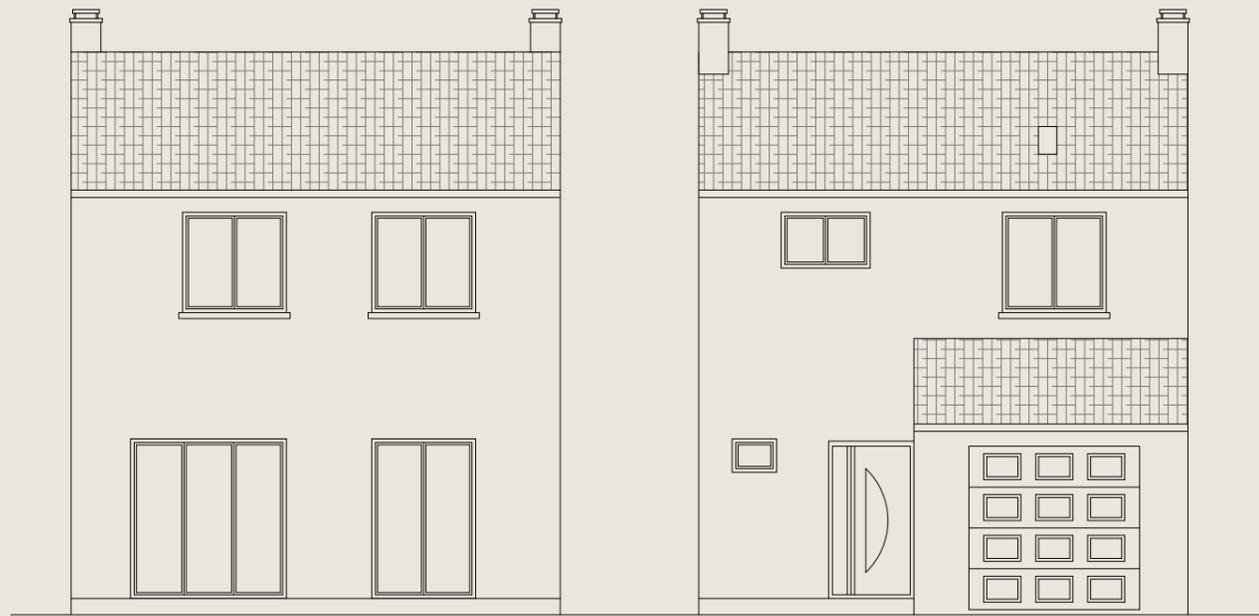


Cross-section after the renovation. Natural ventilation scheme: a Somfy sensor automatically opens a narrow, security-restricted gap in the downstairs terrace door; simultaneously, the VELUX windows in the attic open, creating a stack effect that efficiently ventilates the entire house. On hot summers, this works best in the early morning hours. A tall birch tree on the west side of the house is a welcome, though not necessary, part of the system, as it casts shade on the western roof slope.

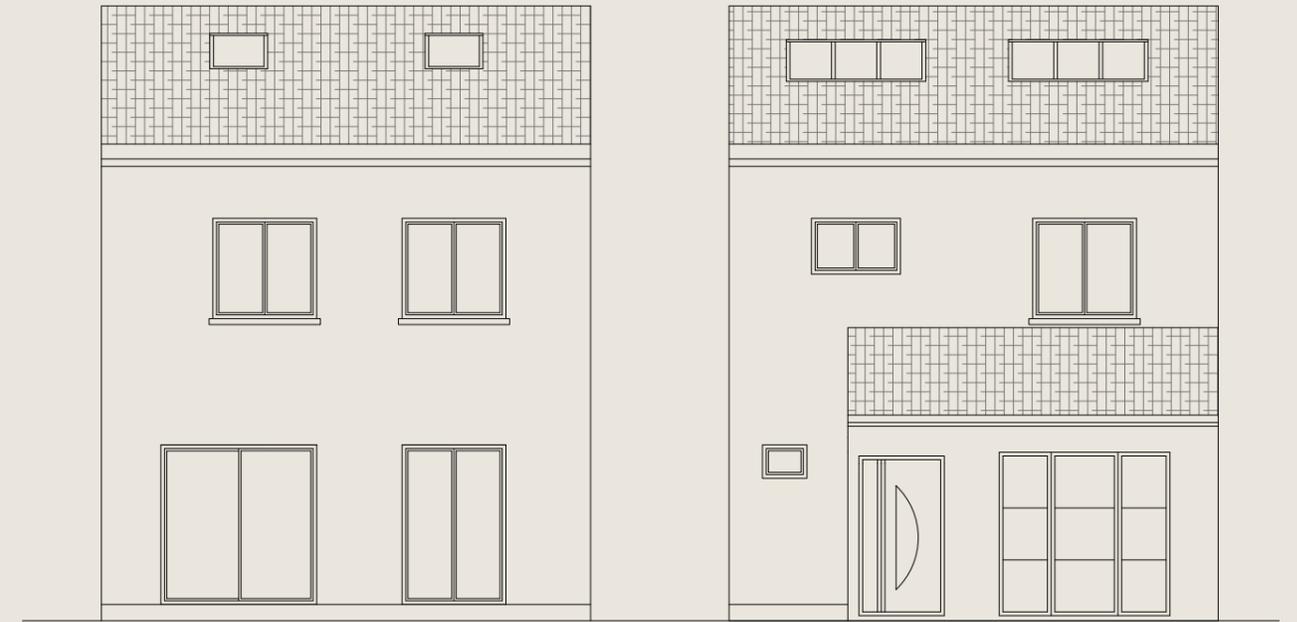


The new space is bright, even on rainy winter days, becoming the only room in the house that does not need electrical light. Plants now thrive in the renovated attic, where the ground floor previously had too little daylight for most plants to grow well.

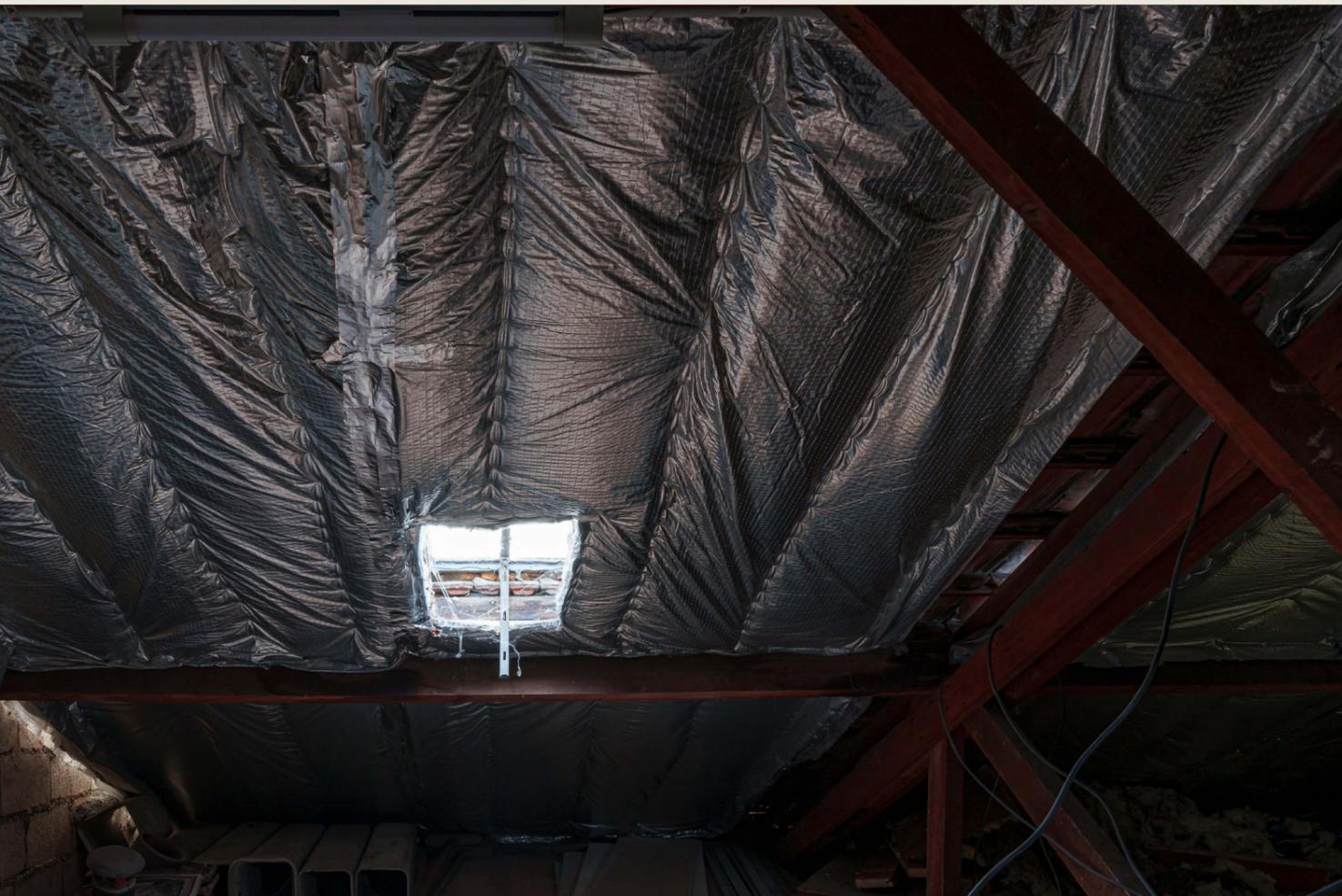


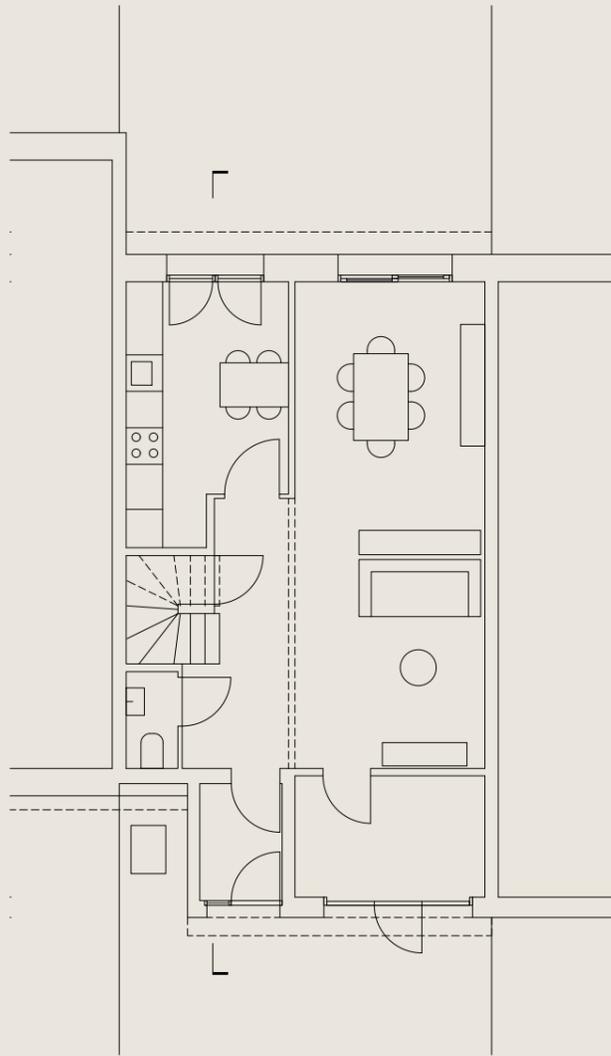


Garden and front facades before the renovation.

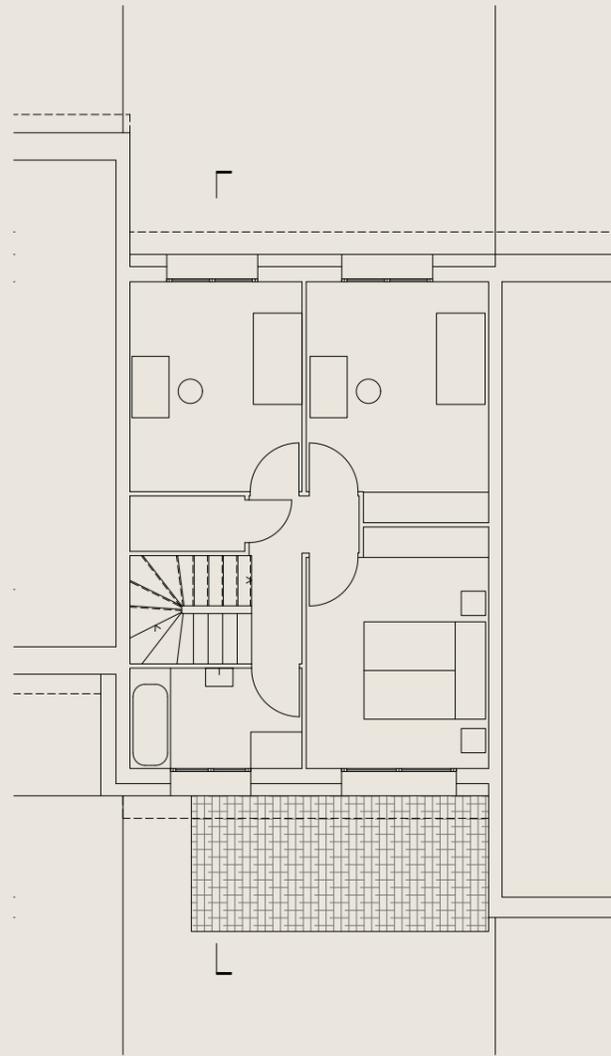


Garden and front facades after the renovation.

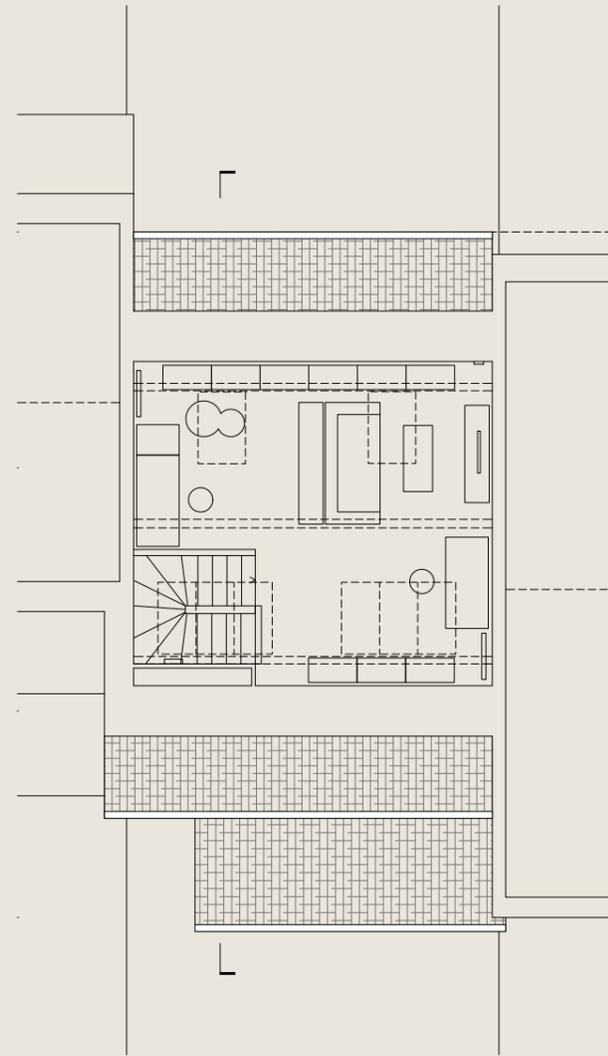




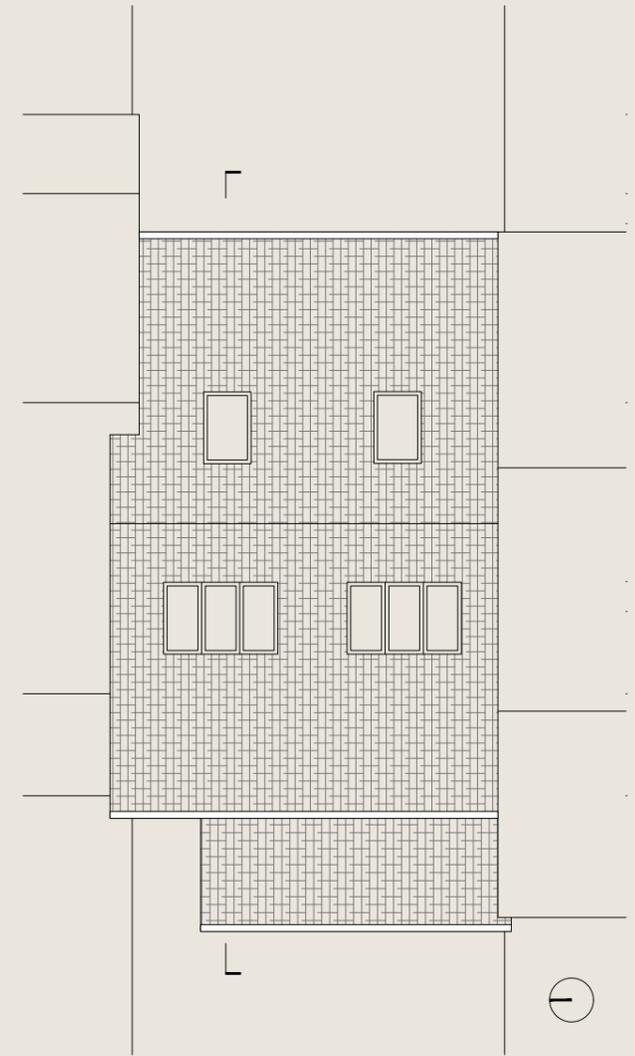
Ground floor after the renovation. A wall between the living room and the corridor has been torn down to enlarge the space and guarantee a perfect air circulation through the house. A vestibule has been added to the entrance, providing wardrobe space and draft protection in the cold season.



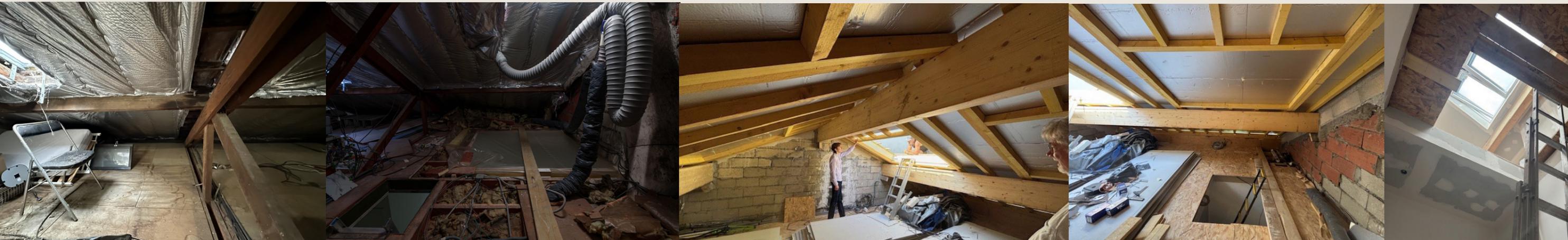
First floor after the renovation. This floor did not change, except for the addition to the stair, leading to the attic. The original trap door and ladder have been removed. As the rest of the house, it got equipped with new window glazings and mechanical ventilation system.



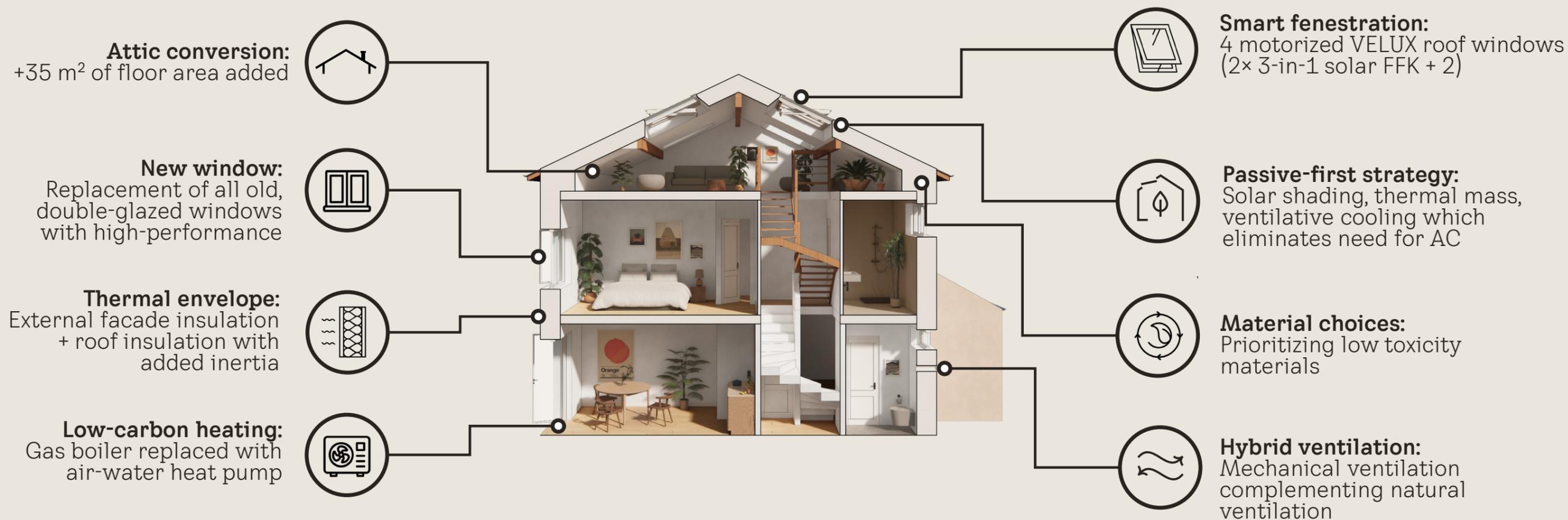
Attic after the renovation. A healthy new space for the family to enjoy and spend their time in.



Roof after the renovation. The old roof structure has been replaced with a new one, well-insulated and 70cm higher, to create a generous living space underneath. The VELUX windows ensure perfect daylight as well as efficient airing of the house.



THE LIVING ATTIC RECIPE



PEOPLE & PLANET MODEL

The Living Attic project shows that thoughtfully designed attics can offer comfort and support a healthier indoor environment throughout the year. The People & Planet Model assesses how the renovation affects both indoor comfort and environmental performance. By illustrating the connection between comfort, energy use and environmental impact, the method helps teams set priorities and make informed trade-offs instead of aiming for a single headline metric.

Every building project involves choices, and better choices come from weighing human wellbeing, affordability and environmental impact together. To support a truly holistic approach, VELUX developed the People & Planet model, which brings together the limits that keep the planet stable with the conditions people need to thrive indoors.

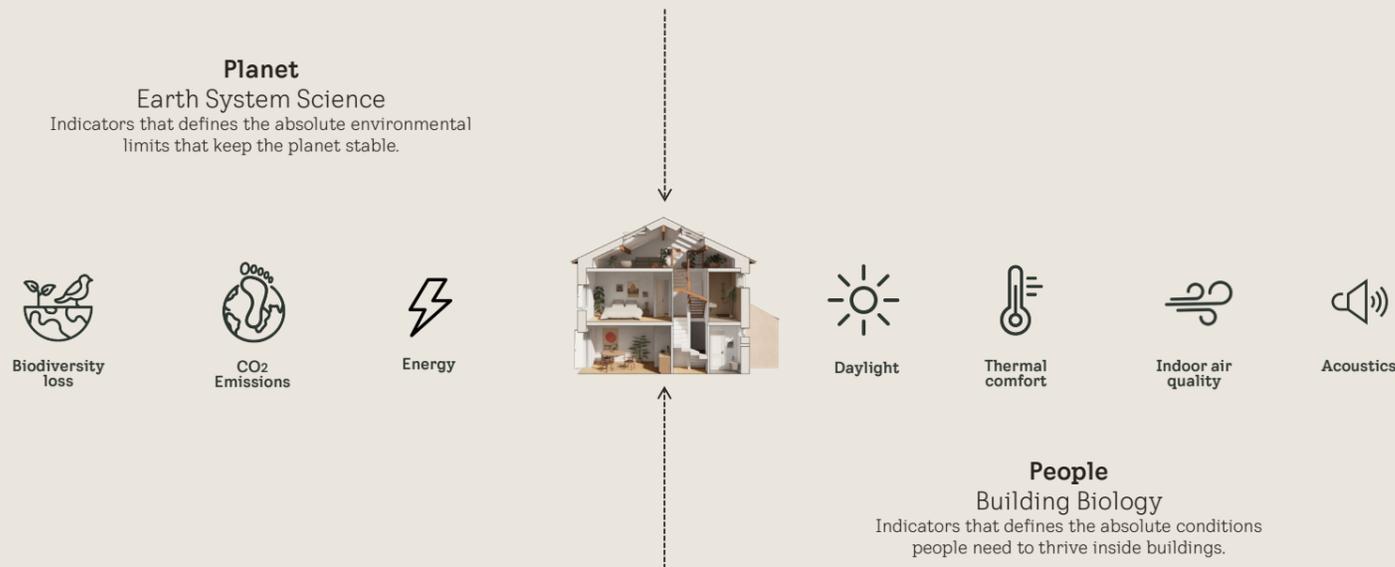
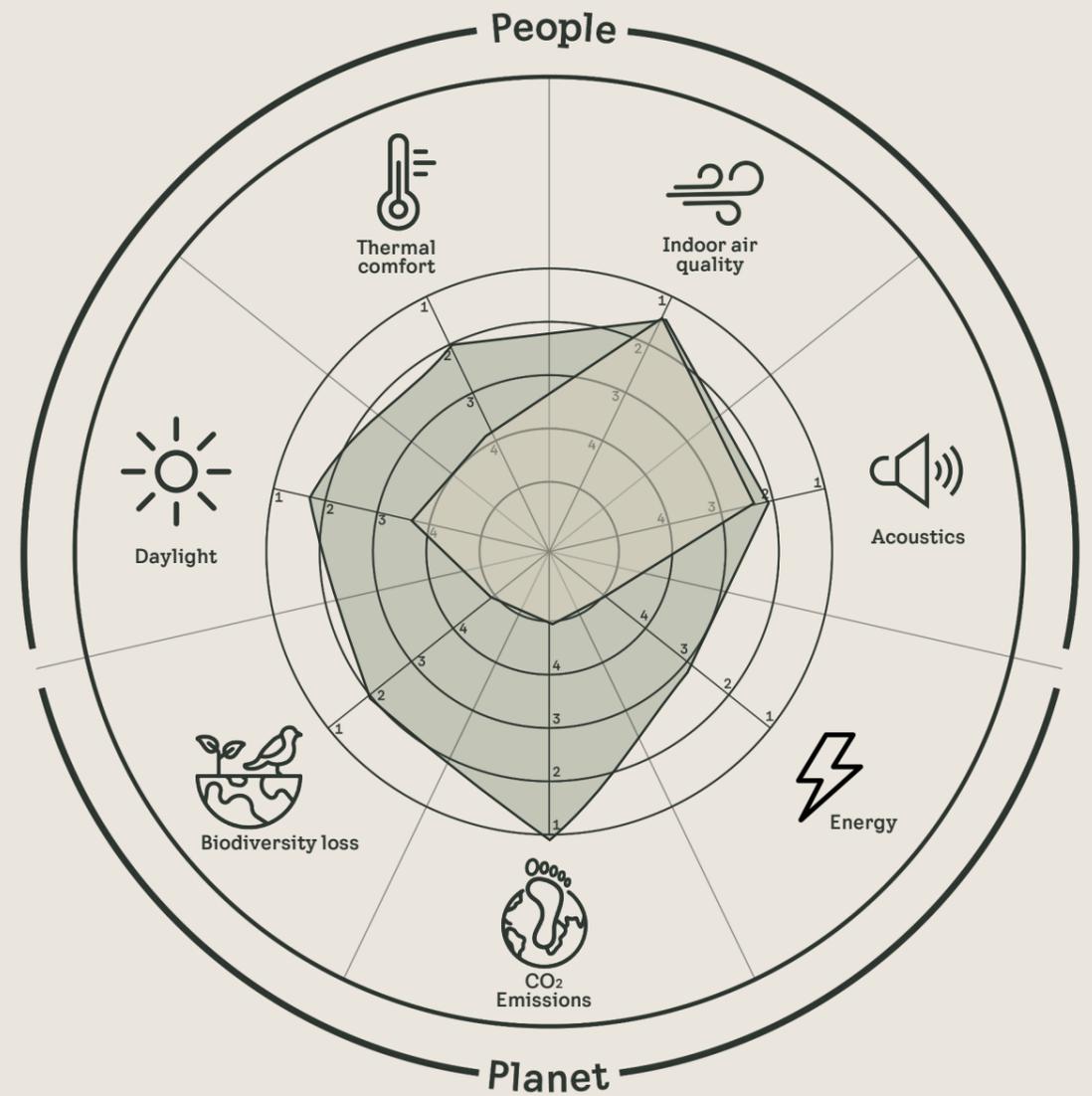
Building on this foundation, the People & Planet model evaluates performance across three key pillars: Comfort (for people), Energy, and Environment (for the planet). It can be used both during design, through simulations and calculations, and in operation, through monitoring, giving each project a clear profile of how well it serves people and planet.

Thermal comfort takeaways from monitoring:

- During the warmest period (four days with outdoor temperature peaks around 35°C) the attic temperature was on average 8°C cooler than outside at the warmest time of the day.
- A 3.5°C temperature decrease at night mainly due to ventilative cooling (stack effect: automated opening of the roof windows and a ground floor window).

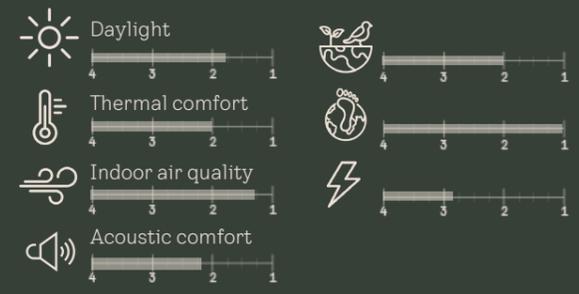
Indoor air quality takeaway from monitoring (1 month):

- The average CO2 level below 800 ppm (threshold recommended by the French HCSP, High Council for Public Health)



□ before renovation
■ after renovation

Score:
1 Highest
2
3
4 Lowest



OPTIMIZING FOR PLANET

Optimal conditions for a household's wellbeing, including daylight, thermal comfort, indoor air quality and acoustics, can be achieved in many ways. Each renovation has its own characteristics, shaped by the existing building, its location and the specific needs of the homeowners. In this project, considerations such as the environmental allergies affecting Nathalie and the children also influenced the decisions made. The diagram to the right shows the measures implemented in Nathalie and Jonathan's home.

Before Renovation



Score -
Biodiversity impacts unaccounted for.

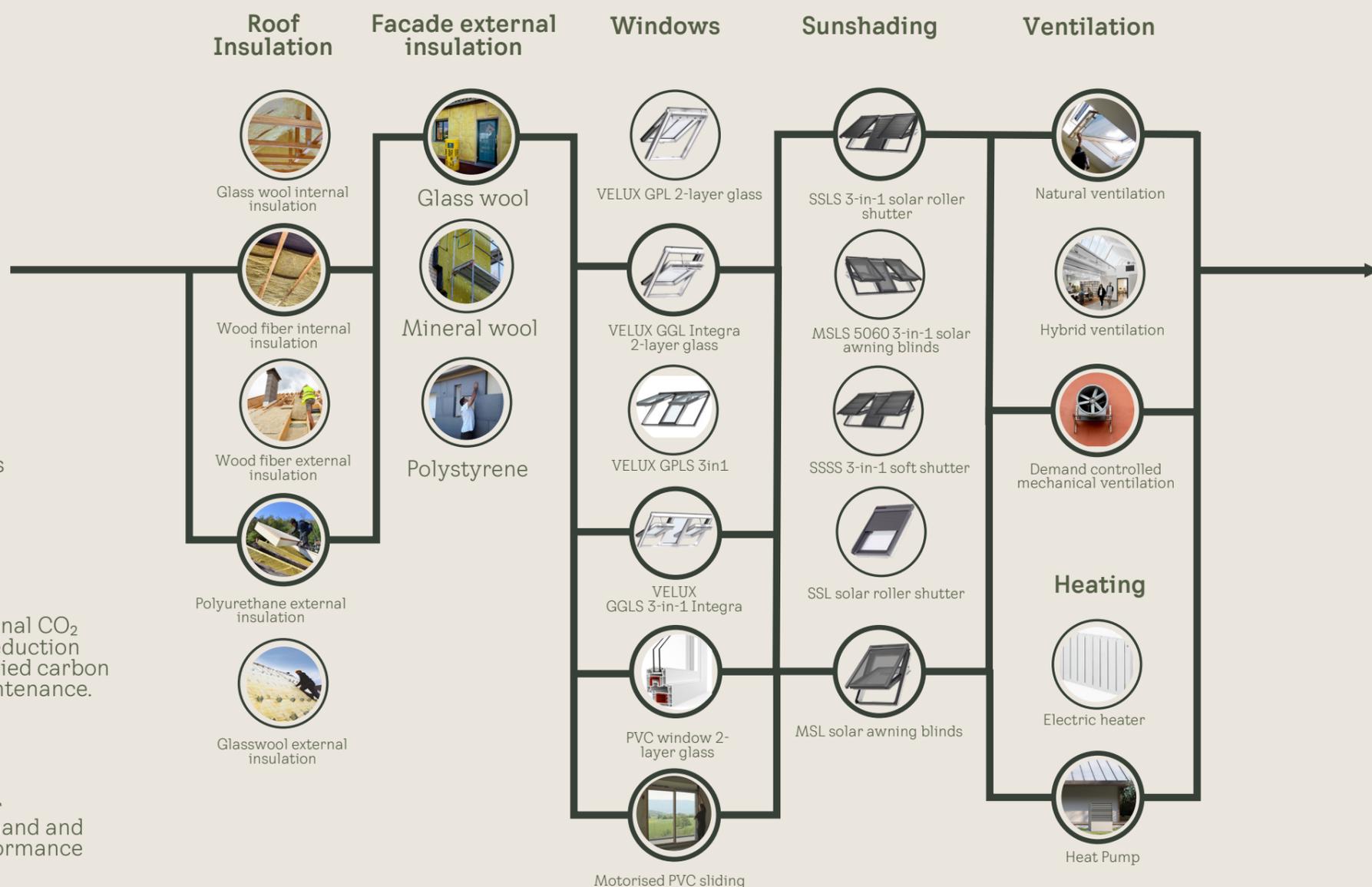


Score -
Continuous operational CO₂ emissions with no reduction pathway and embodied carbon emissions from maintenance.



Score -

- 250 kWh/m²/year
- High heating demand and poor energy performance
- EPC F



After Renovation



Score 2
Biodiversity impact offsite assessed.



Score 1
CO₂, embodied carbon repaid in 10 years, net positive impact thereafter.

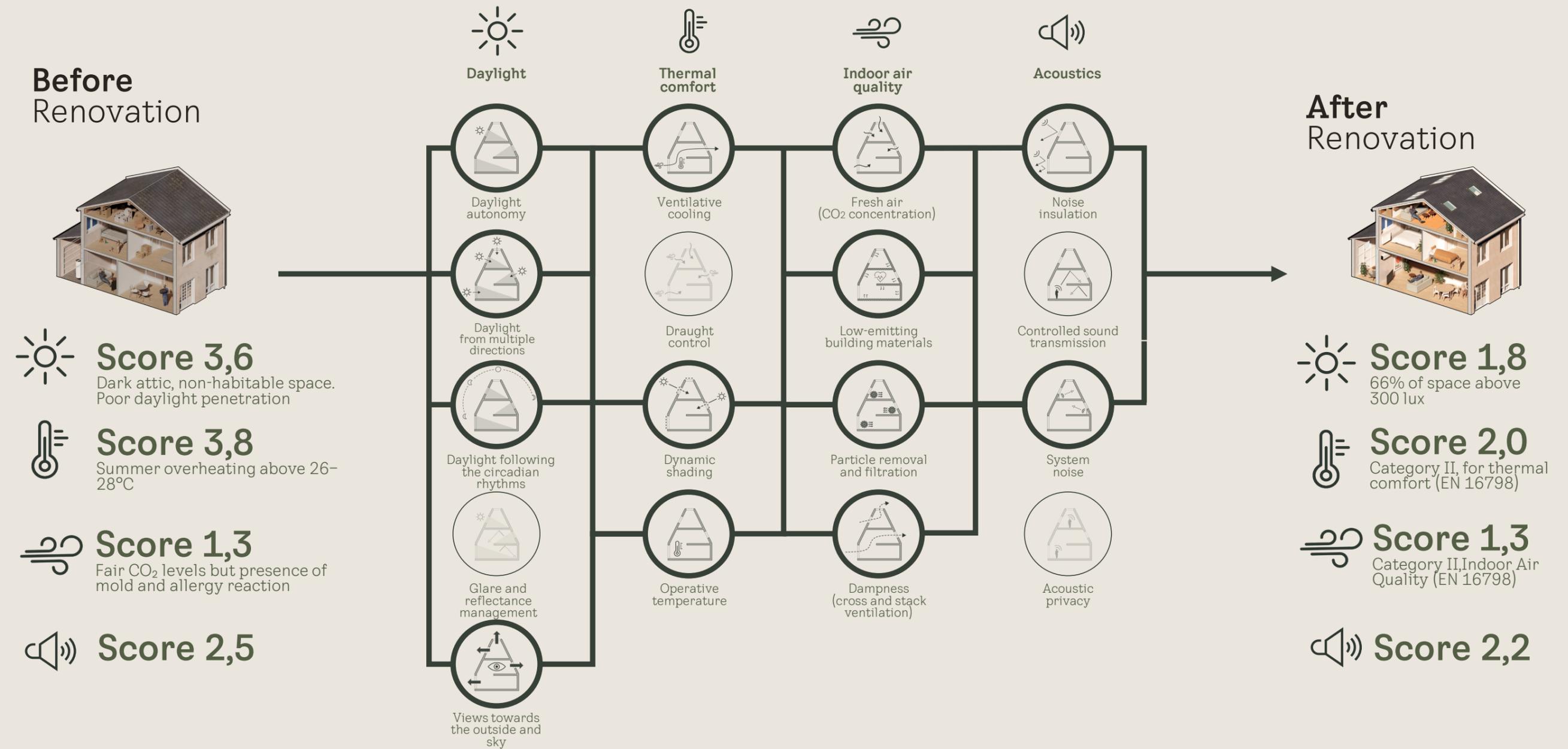


Score 2.9

- 86 kWh/m²/year
- 66% better energy performance
- No mechanical cooling needed
- EPC A

OPTIMIZING FOR PEOPLE

The environmental impact of a building project is assessed by considering the CO₂ emissions and biodiversity loss associated with producing and transporting the materials used, together with the future energy savings achieved through improved insulation and the installation of an ecological heating system. In this case, a gas boiler was replaced with an air-to-water heat pump. The diagram to the right presents the choices made during the renovation of the attic.



CONSTRUCTION MATERIALS

The changes toward ecological construction materials, compared with the initial project, were made with a balance between construction budget, carbon impact and long-term performance in mind. Not all substituted materials have the lowest carbon footprint, but they were selected to achieve a practical balance between cost, durability, insulation performance and overall environmental impact. As a result, the house's insulation performance improved significantly, even though the individual materials differ in their thermal properties.

The façades were originally planned to be insulated with polystyrene, but this was replaced with 16 cm of glass wool, with an R-value of 4.7 m²K/W, to lower the carbon footprint. The brick gable walls, which were raised to the new height, were also insulated with 16 cm of wooden wool.

The roof construction now includes an 8 cm layer of wood wool insulation placed between the rafters, in addition to the initially planned and executed polyurethane layer. Instead of commonly used plasterboards, two layers of Fermacell boards were installed to increase internal thermal mass, since Fermacell is almost twice as heavy as plasterboard, and to improve sound insulation.

The old roof structure required replacement, which created the opportunity to raise the building height to the maximum approved by the municipality. New, larger beams replaced the dense 1960s construction, allowing an open space without a central king post. The new rafters were spaced to accommodate the VELUX windows.

Our initial renovation focused solely on enlarging of the space and minimising energy loss. We had not considered air quality, natural brightness, or overall well-being inside the house. It was VELUX that introduced these important topics, revealing what could be accomplished beyond our original scope.

Jonathan, owner



VELUX Products used in the project:

The windows, shutters and awnings are equipped with sensors and can be also steered manually from a remote control and mobile phone..



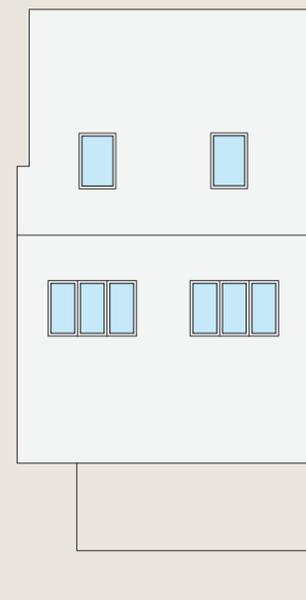
East side (garden):

GGL 2057 MK06 with motor kit KSX 100K

(manual windows motorised with a kit) 74*118 cm
with solar powered awning blinds MSL MK06

EDW 2000 MK06 (BDX and BFX included)

BBX 0000 MK06



West side (street):

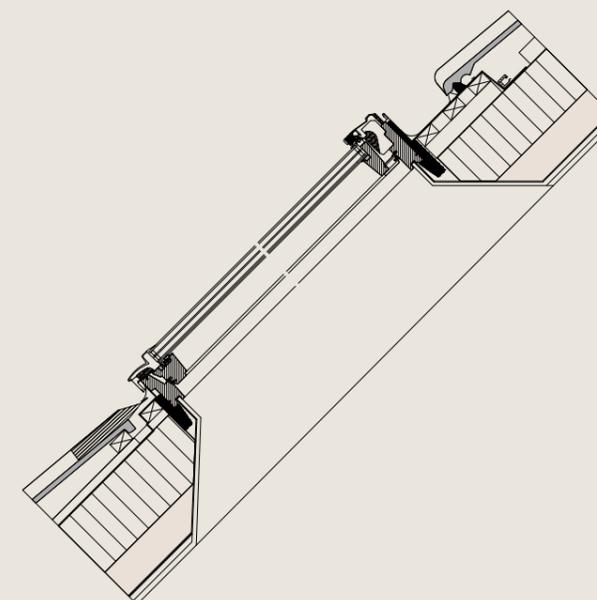
GGLS 205730 FFKF06

(solar powered motorised
windows 3-in-1). 188*118 cm

with solar powered roller shutters
SSLS FFKF06 with ZOZ 246 kits

EDWS 2000 FFKF06 ((BDX and BFX included)

BBX 0000 FFK06



Roof layers:

Roof tiles
Horizontal wooden battens 4 cm
Vertical wooden battens 2 cm
Rain guard
Polyurethane sarking panel
(R=7.4) 16 cm width
Wooden wool 8 cm (R=2,1)
between rafters
Vapour barrier
2 layers of Fermacell (2*12,5mm)

NEW SPACES IN THE HOUSE

“The new space in the attic opened new ways of spending time together as a family, even when everyone is busy with their tasks. The adults work at their desks, while the boys play in the middle of the space: we’re all together, in a beautiful, daylight-filled space. Before, everyone would be isolated in their rooms.”

Nathalie, owner

The new space in the attic is used intensively for work almost every weekday, either by Nathalie or Jonathan, or sometimes both. It also provides storage for the family’s cherished belongings, including toy collections and sewing supplies. The attic has even introduced a new family hobby: indoor plants, which previously lacked the daylight and space needed on the lower floors.

The top floor has a strong influence on the rest of the house. The most noticeable improvements are felt on the ground floor, where the living room no longer needs to shift constantly between home office, indoor playground and dining area. This has made spontaneous visits easy and enjoyable. Nathalie and Jonathan are now preparing for their second Christmas celebration with both families since moving in in 2016. The first gathering marked the symbolic house-warming of their newly renovated home, and they are looking forward to welcoming everyone again for a festive meal.

The couple also mentions, with a smile, the practical benefits of having two sets of sofas with televisions, one for the children and one for the adults. The sofa bed in the attic allows them to host overnight guests whenever needed.

The children, although each has their own room, spend many hours playing in the attic, where bright daylight helps them build even the most intricate constructions without switching on the lights. Nathalie says she rarely uses lamps when sewing and often walks upstairs thinking the boys have left lights on, only to find that the warm glow comes from the setting sun.





“The ground floor turned out exactly how I imagined. How the attic turned out exceeded all my expectations: it’s a dream!”

Nathalie, owner



A BETTER LIFE

Nathalie and Jonathan achieved their renovation goals and even surpassed their expectations for space, daylight in the new attic and fresh air flow throughout the house. They say the project made them more aware of how important daylight and ventilation are, and they now find it hard to imagine living in the conditions they once considered normal.

Visiting friends and family admire what they call the “new house.” Those who knew it before find it hard to believe what has been achieved within the original walls. Neighbours will soon be able to see the surprisingly generous spaces for themselves, as Nathalie and Jonathan are planning an open-door day to share their experience with other families.

Another piece of advice they would share with anyone planning a house renovation is to seek professional support. Navigating construction law, understanding subsidy schemes, selecting contractors, choosing appropriate materials, evaluating technical solutions and having a good grasp of light and space are all important for a successful renovation, and not everyone has that expertise. Resolving on-site issues, including unexpected discoveries or challenges with workers, is also better handled by experienced renovation companies.

Nathalie and Jonathan feel grateful for the work of the construction company and for the guidance of the VELUX team. They appreciate the opportunity for their home to serve as a case study and, smiling, describe themselves as new ambassadors for daylight and fresh air.

“In the attic, the light stays with us until sunset; we make the most of the end of the day.”

Nathalie, owner



"We're immensely happy with what has been achieved here and would like to share the experience with our neighbours: there are plenty of houses just like ours, and all of them can become healthy and sustainable. Also, surprisingly spacious inside for their small outside dimensions!"

Jonathan, owner



"The converted attic gives us a beautiful, bright space where we work and spend time together: had we recognised the potential, we would have done it years earlier!"

Nathalie, owner

