

Redesigning Housing Structures

Guidelines for socially responsible
refurbishment



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Cover photo: Timber-built winter garden façade, example design, model
Left: Flat after refurbishment, example design, model

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A new culture of rebuilding in Neuperlach

We cannot tear down
and rebuild our cities
every 50 years.

Right: Typical buildings of the 1960s and 1970s in Neuperlach-Nord, 2023

Large building inventory – major challenge

The phenomenon of large housing estates

Large housing estates of the 1960s to 1980s characterise many European cities and embody a shared and democratic idea of housing. Almost 15 % of all multi-storey flats in Germany are located in large housing estates built before 1979. How can these structures be made fit for the future in the spirit of a united Europe? "Creating NEBourhoods Together" implements ideas for transformations in Munich-Neuperlach that are intended to serve as a prototype for other large housing estates in Europe. Neuperlach is the largest German housing estate of the post-war period. From 1967 onward, the City of Munich built Neuperlach in accordance with modern urban planning guidelines of that time. The residential buildings have features typical of the period: small-family flats, efficient layouts, a high repetition rate, stairwells along the façades, north-south or east-west-facing orientation in a linear construction style, flats that have no barrier-free access, poorly insulated outer walls.

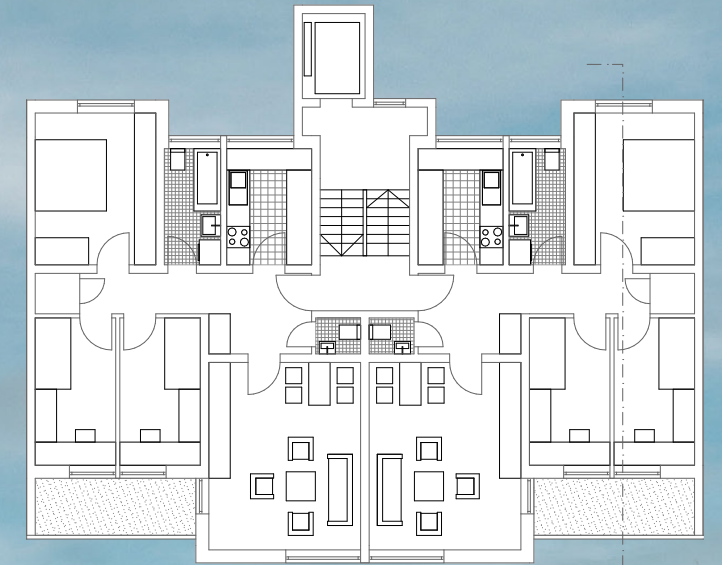
Compensating for deficiencies in the building inventory

Many of these building features are no longer up to date. Today, other forms of community living are required, and flexible-use spaces are in demand. In most cases, however, refurbishment measures improve only the energy efficiency of buildings. Our NEB Action seeks to use façade renovation for social improvement. If one looks at the building stock in Neuperlach, one can see many typological similarities, such as the split-level access points with lift stops at the intermediate landings. There are differences in construction method and floor plan configuration (arrangement/number of rooms). The task is to develop a systematic refurbishment principle that simultaneously allows for building-specific adaptations.



Left: Site plan of Neuperlach-Nord highlighting the common building type, "linear row"
Top right: Example floor plan of a building with two 4-room flats per floor
Right: Typical buildings of the 1960s and 1970s in Neuperlach-Nord, 2023

Almost 15 % of all multi-storey flats in Germany are located in large housing estates built before 1979. We are facing an enormous need for refurbishment.



Thinking beyond energy-efficiency

"Never demolish, always transform"

In order to develop new refurbishment concepts for large housing estates, it is worth taking a look at a neighbouring European country. In 2017, the architectural firm Lacaton & Vassal Architectes renovated three apartment blocks from the 1960s in Bordeaux. Following Anne Lacaton's motto "Never demolish, always transform", the 530 flats were not torn down but refurbished in a cost-effective and socially responsible manner using a new design solution. As part of the refurbishment, all flats were provided with a 3.80-metre-wide winter garden and a narrow balcony in front.

Functional principle of the thermal buffer zone

The winter gardens were prefabricated from concrete and installed on site in 12-16 days per flat. As a thermal buffer zone with a façade made of polycarbonate panels, they significantly improve the building's energy balance. The sliding, translucent polycarbonate elements allow the winter gardens to be used both open and closed, all year round. This additional space

increases the quality of living and offers a more flexible utilisation of the flats.

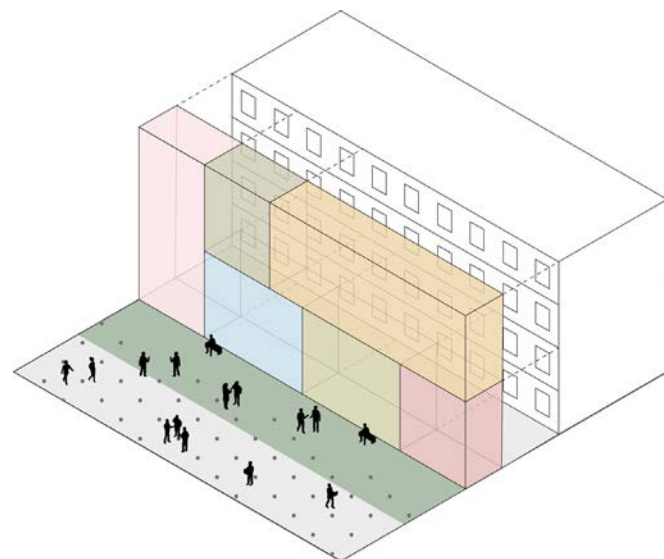
Lacaton & Vassal Architectes' example in Bordeaux illustrates that simple structural measures can be used not only to improve technical aspects, but also to significantly impact the possibilities for social interaction and to increase the variety of uses. However, the materials employed, concrete and plastic, are not ecologically sustainable.

The NEB Action's goals

How can this refurbishment concept be applied to the Neuperlach building stock in the spirit of the New European Bauhaus?

In this NEB Action, we are developing a solution that

1. makes the social potential of this idea
2. systematically applicable to many buildings,
3. offering a more ecological alternative (e.g. by using timber and glass), while still
4. representing an economically affordable option.



Left: Winter gardens, prefabricated concrete construction, Lacaton & Vassal Architectes, Bordeaux, 2017, Credit: Philippe Ruault
Middle: Logo of the "Redesigning Housing Structures" NEB Action
Right: Transformation of a Neuperlach residential building with a winter garden façade, example design, model

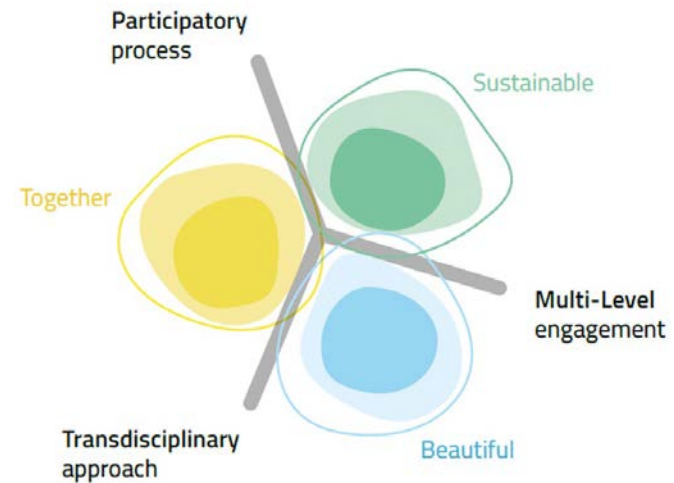
The idea of the winter garden as a thermal buffer zone is being further developed in Neuperlach in an ecological and inclusive way.



Today for tomorrow

In a deviation from the traditional market economy model, there is a growing realisation that many other factors exist beyond economic criteria that are critically important in obtaining a balanced share of the earth's resources. The construction industry in particular has an enormous responsibility: it is accountable for 40 % of global CO₂ emissions and 60 % of the waste produced worldwide.

The most important tool for measuring the impact of our NEB Action is the New European Bauhaus Compass. The NEB Compass reflects the close relationships among social, ecological and structural factors. Our project orients itself within the values and principles of the compass as follows:



Beautiful (Ambition II-III)

The existing buildings are adapted to today's living requirements using the solution developed in the NEB Action. The winter gardens create a variety of utilisation options that contribute to well-being in numerous ways. Interaction among people is increased through improved activation of the entrance area on the ground floor.

Sustainable (Ambition II-III)

To avoid demolition in the future, the main goal of the NEB action is the preservation and continued use of the existing building fabric. Energy-efficient refurbishment with renewable and recyclable materials reduces the ecological footprint of the residents and increases the lifespan of the buildings. A new mix of different flat sizes enables better utilisation of the living space.

Together (Ambition II-III)

The solution improves the social mix and participation of people in the neighbourhood in various ways. These include flats with more flexibility of use, retention of existing rents and a higher proportion of barrier-free flats.

Participatory Process (Ambition I-II)

In cooperation with the main stakeholders, including residents, owners, construction companies and cultural professionals, different perspectives are considered. At the end of the project, a summary of the results will be produced to enable people across Europe to participate independently in transformation processes in large housing estates. A short film will play a special role in providing a low-threshold explanation of the complex interrelationships of the project.

Multi-level engagement (Ambition II)

A local solution for Neuperlach is being developed with the involvement of the city administration. This solution serves as a foundation for replication at the Europe-wide level.

Transdisciplinary Approach (Ambition I-II)

To achieve this task, social, ecological, technical and economic aspects are considered simultaneously. For this reason, a collaboration has been formed involving various scientific disciplines, the construction and property industries, the administration and cultural professionals.



The goals of the NEB Action go far beyond economic efficiency, fully in line with the spirit of the New European Bauhaus: Beautiful, Sustainable, Together.

Demolition or façade insulation?

Efficient use of the life cycle of buildings

Two approaches currently dominate construction practice when dealing with residential buildings from the 1960s and 1970s: Replacement with a new building or installation of façade insulation. However, these two options take insufficient account of the long life cycles of buildings.

Demolition followed by new construction – sustainable?

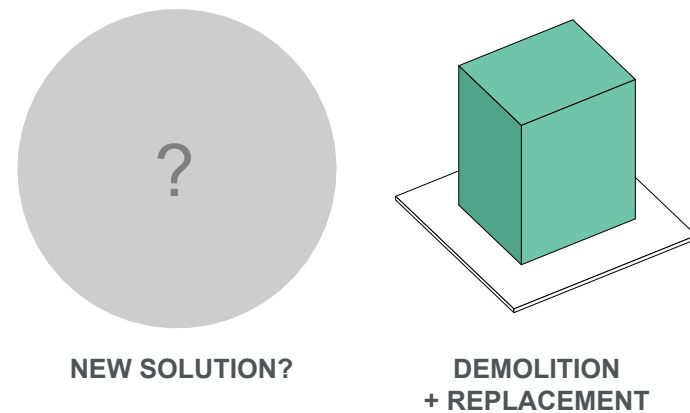
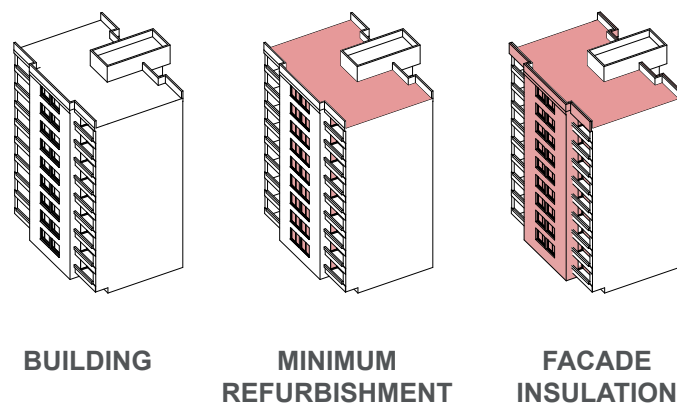
The demolition of an existing building and the construction of an inexpensive replacement building, preferably serially constructed, are often used to alleviate the housing shortage. The number of social housing units is declining continually because many old flats are becoming delapidated, and the proportion of affordable flats in new buildings is being reduced to a minimum because laws, standards and requirements make new buildings expensive and unprofitable in the social sector. Two thirds of the time, the main reason for demolishing a residential building is to build a new residential building on the same site. The associated resource consumption on this scale is ecologically and culturally unacceptable.

Conventional façade insulation – sustainable?

The other practice is the continued use of a depreciated existing building through the utilisation of the structural substance of the building. Buildings are refurbished by replacing windows and external thermal insulation composite systems (ETICS), but only in situations where the refurbishment pays for itself within a few years through subsidies and rent increases. Core renovations are the exception. Combining the necessary energy and technical refurbishment with social considerations (for example by adding living space), is rarely discussed and is considered uneconomical.

What is there in between?

None of these options can be described as sustainable in the spirit of the NEB Compass. Our NEB Action therefore looked for a new solution – inspired by the idea of making the insulation “habitable”...



Left: Options for dealing with unrenovated residential buildings in large housing estates
Right: Typical buildings of the 1960s and 1970s in Neuperlach-Nord, 2023



Façade insulation or replacement building: these are the current extremes that dominate construction practices.

"Habitable insulation"

The search for a solution other than façade insulation or replacement building led us to the principle of 'habitable insulation'. An additional layer of space in front of the buildings extends the flats and acts as a thermal buffer zone, contributing to lower heating energy demand.

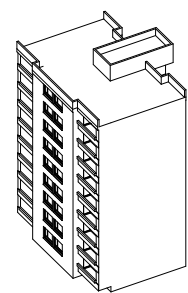
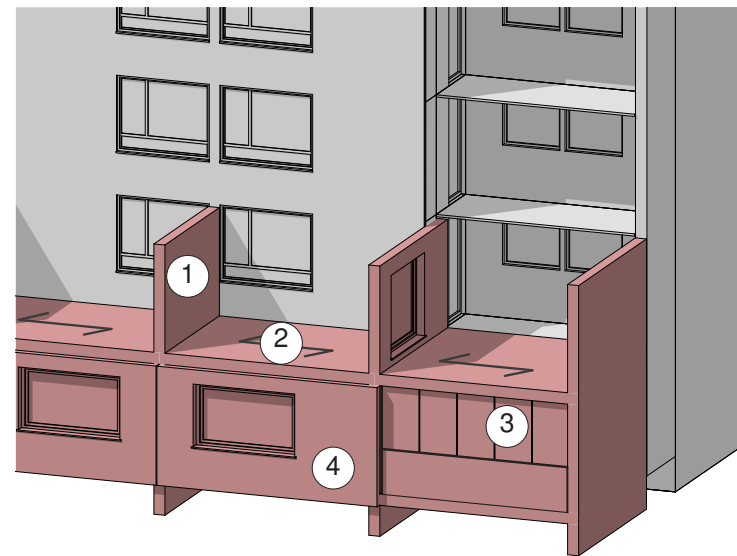
Customisable timber construction – the wooden shelf

A modular timber construction principle was developed as part of the NEB Action. Wooden walls are positioned at regular intervals across the façade (1). Timber ceilings are placed on top of these bulkhead walls (2). As the façades in Neuperlach have many projections and recesses, the depth of the construction varies between 2.50 and 4.00 metres. Depending on the design, either single glazing (3) or an insulated exterior wall (4) is used to finish the façade.

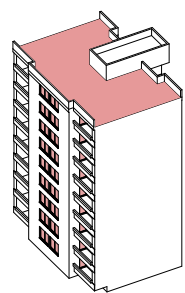
New variety of uses

Additional space is created between the old and the new building envelopes, which increases the range of uses for the flat and thus the opportunities for social interaction. When the façade is open, the winter garden can be used as a loggia; when closed, winter gardens offer additional living space for a large part of the year, as well as new (circular) routes within the flat. Rooms that were previously isolated from each other

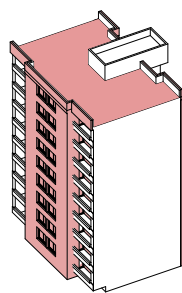
can be used together via the winter garden. The buildings are optimised for energy efficiency, while at the same time the opportunity is taken to design floor plans that are adapted to the future. The functioning and effects of this principle are explained in more detail in the following pages.



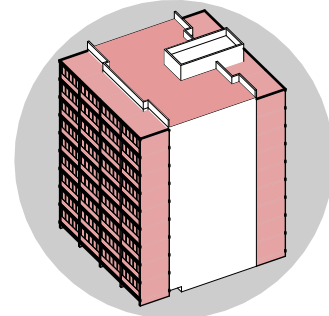
BUILDING



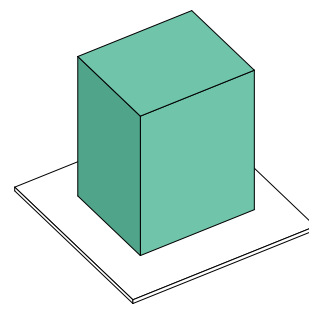
MINIMUM
REFURBISHMENT



FAÇADE
INSULATION



NEW SOLUTION
THE HABITABLE INSULATION



DEMOLITION
+ REPLACEMENT

Bottom left: Revised options for dealing with unrenovated residential buildings in large housing estates
Top left: Wooden shelf principle for the realisation of "habitable insulation"
Right: Exemplary flat design after refurbishment with a winter garden façade, model

The new spaces
can be used in
numerous ways:
Loggia, playroom,
dining area, ...



Comfortable Living

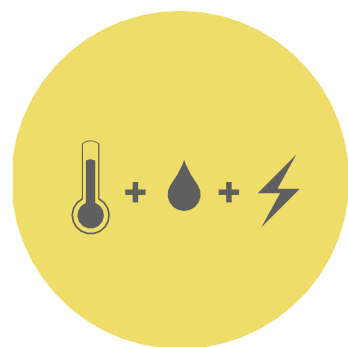
Neuperlach's residential buildings have major deficiencies in terms of their energy consumption. Heat is lost through exterior walls that have little or no insulation. Refurbishment is necessary to reduce heating demand, conserve (fossil resources and lower residents' heating costs.

The shelf - a buffer for every season

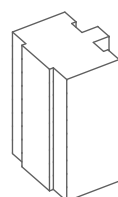
The timber shelf with the new building envelope acts as a thermal buffer zone. Solar radiation heats the air in this intermediate space, providing additional thermal insulation in winter. The single-pane glazing saves money and resources. In summer, the buffer zone shades the building, and opening the façade allows it to function as a loggia.

Proven energy savings potential

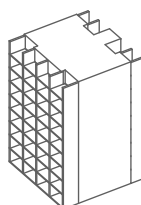
The simulation of the energy demand over the course of the year, which comprises heating, hot water and electricity, confirms the effectiveness of the buffer zone. Compared to the existing building, 48 % of the heating energy is saved. This surpasses the savings of a conventional façade renovation with an insulation composite system and window replacements by 10 %. In comparison, a new building saves up to 62 % heating energy compared to the unrenovated existing building. The simulation shows not only that there is an urgent need for energetic renewal, but also that there is considerable potential for savings.



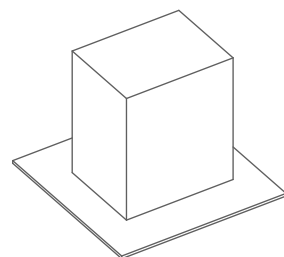
FACADE INSULATION



SHELF



NEW BUILDING



Left: Comparing the energy costs of different options for the representative building in Neuperlach
Right: Flat after refurbishment with the "wooden shelf", example design, model

The winter gardens are thermal buffer zones, providing warmth in winter and shaded spaces in summer.



Reducing the ecological footprint

The operating energy is the largest factor in a building's carbon footprint - but not the only one. Other key measures to reduce CO₂ impact are the preservation and continued utilisation of existing buildings and the use of renewable building materials. As much CO₂ as possible is thus stored and as little as possible released during production.

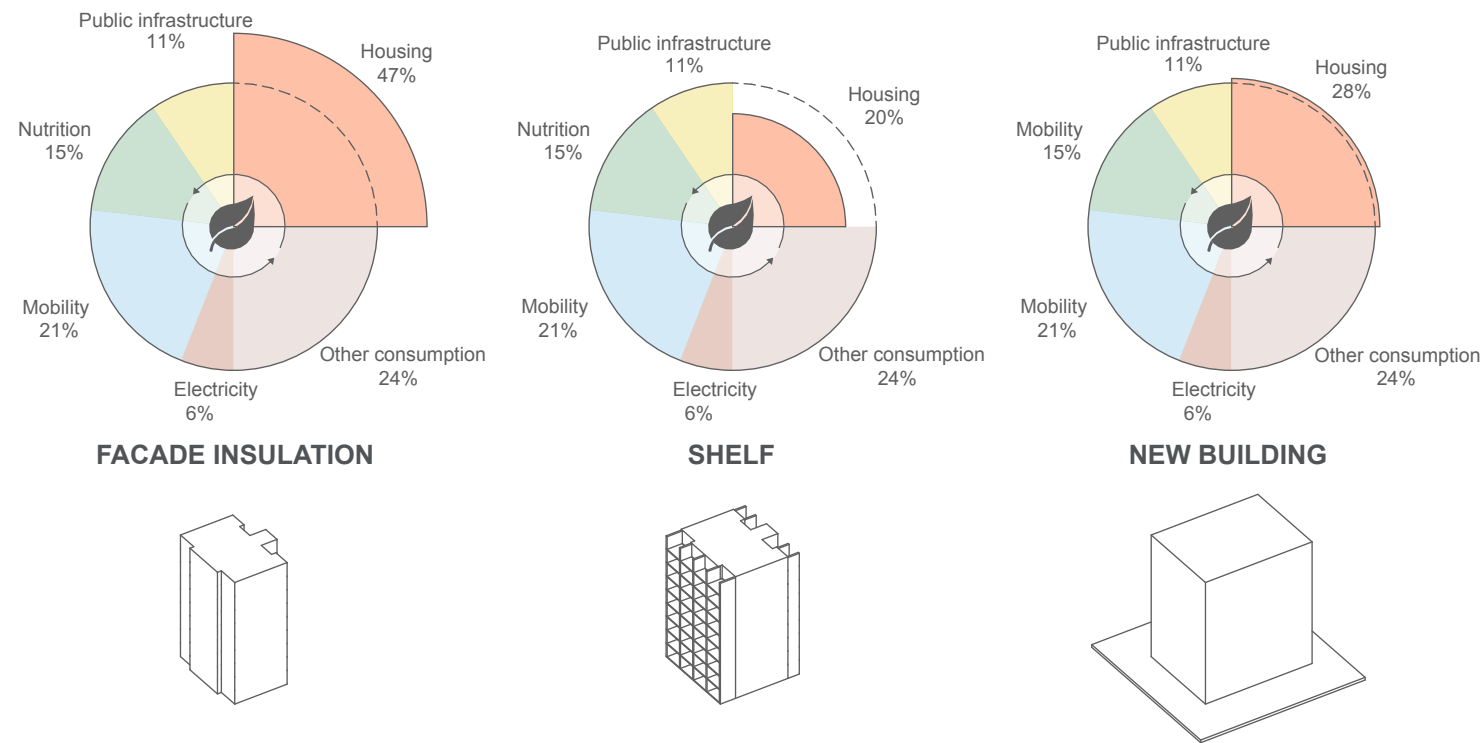
Photovoltaics as additional energy potential

Despite these measures, the life cycle of a building cannot be completely climate-neutral without additional solar harvest-ing. To calculate the positive effect of using PV on the façade or roof, the alternative forms of electricity generation must also be considered. To simplify our analysis, we have excluded this factor, knowing that this additional buffer can be positively im-

plemented if required. To simplify the abstract CO₂ balancing, we have illustrated the effects on the personal footprint of the individual residents. The aim of the investigation was thus also to increase the number of potential residents and thus the area efficiency.

Meeting the CO₂ budget goals

All measures together can reduce the per capita CO₂ load to such an extent that housing takes up less than 25 % of the personal CO₂ budget of two tonnes of CO₂ equivalents per year. The winter garden solution therefore undercuts the per capita CO₂ budget of a replacement building by 8 %, through savings on demolition costs and energy for new construction.



Left: Comparing the ecological footprint of different options for the representative building in Neuperlach
Right: Added green building envelope in timber construction, example design

Refurbishment in Neuperlach is urgently needed so that every resident can reduce their personal ecological footprint.

Whether it's a reading corner, a sewing room, a balcony or a greenhouse – the residents make their own choices for how to use the buffer zone.

Flats for flexible use

In order to ensure the long-term durability of residential buildings in large housing estates, flexible floor plans must be created that adapt to the needs of the residents. The aim is to offer living space for a variety of living concepts: Families of different sizes and ages, couples, flat-sharing communities, single individuals.

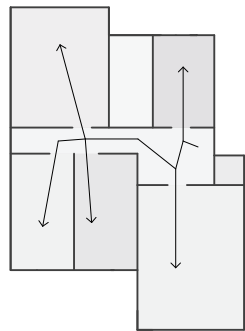
Multiple ways to interpret the floorplan

The spaces created within the wooden shelf allow for different categorisations of individual rooms. Small rooms, such as the typical children's rooms of 9 m² that are common in Neuperlach, receive an upgrade through the buffer room. The new spaces can be used as joint areas, while the option of separa-

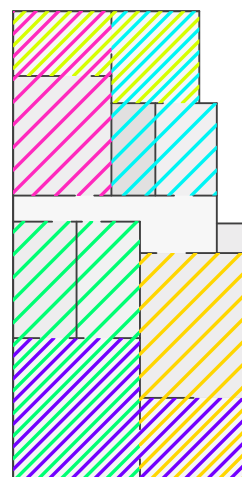
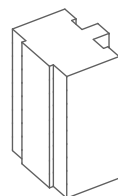
te private rooms is retained. The spaces can be interpreted in flexible ways, and the traditional attribution of room utilisation is dissolved.

Longer life cycle through appropriation

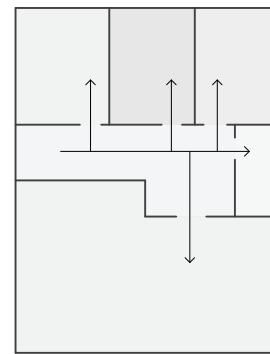
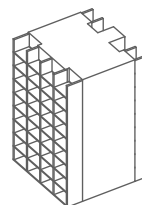
The flat adapts to the needs of the residents. Access through several doors per room allows for different spatial associations. The open flow can still be divided into individual rooms by closing the doors. From old buildings from the 1900s, whose room sequences function similarly, we have learned that the life cycle of such buildings is significantly longer. The flexible usability of floor plans extends the life cycle of the residential buildings in Neuperlach.



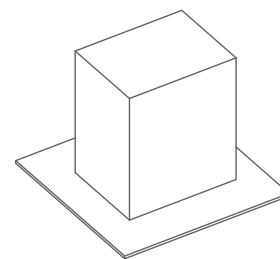
FACADE INSULATION



SHELF



NEW BUILDING



Left: Comparing the different usage and flexibility of flats for the representative building in Neuperlach
Right: Flat after refurbishment with the "timber shelf", example design, model photo



A versatile and affordable package

The previous investigations have shown that, with appropriate adaptations, the existing building stock can fulfil current ecological standards and future demands for flexibility. But how do we deal with the lack of accessibility? And how can such interventions in the existing building stock be financed without imposing rent increases on residents? How can we expand the housing mix, for example by adding age-appropriate one- and two-bedroom flats?

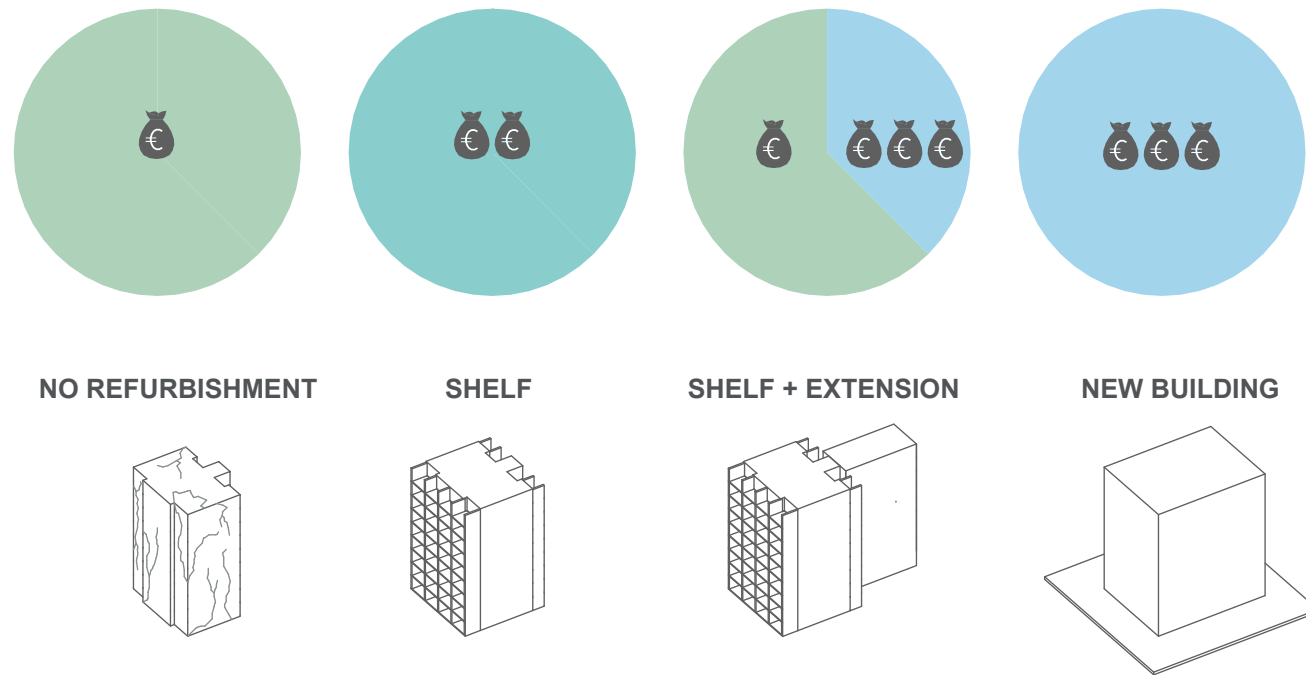
A newly built extension as problem solver

Not all deficits can be remedied by adapting the existing building. As part of the overall package, an extension is therefore useful to compensate for the deficiencies in the existing building that cannot be solved by the winter garden façade.

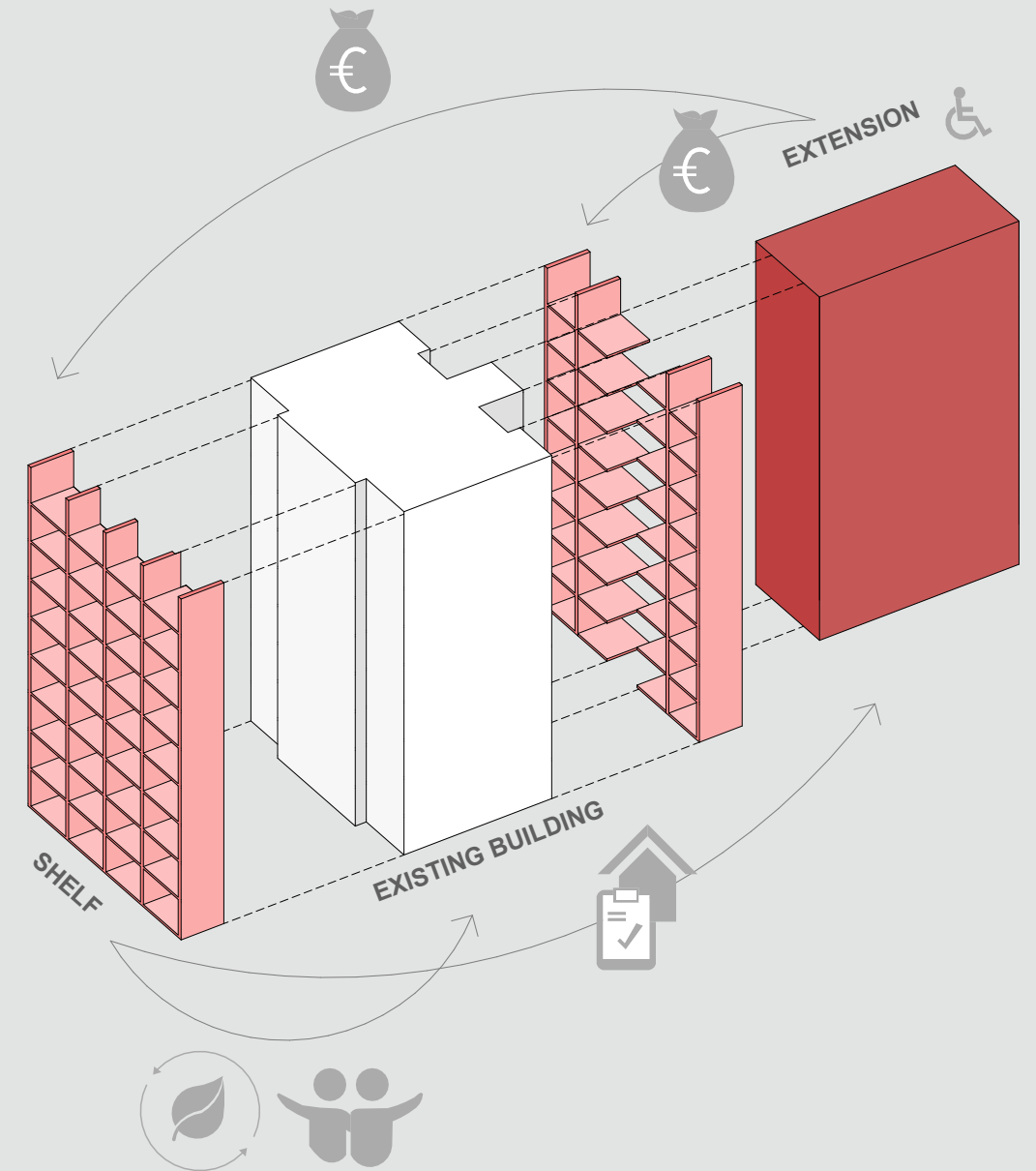
Accessibility – Affordability – Housing diversification

On the one hand, an extension can cross-finance the costs of the refurbishment of the existing building and the shelf through new rentable space without increasing the rent in the existing building. On the other, the preservation of the existing building creates a foundation for discussing new building laws that can be used to create barrier-free flats in the extension. Previous studies (“Neuperlach ist schön” have shown that this addition can be integrated well into urban development plans.

The model shows that rents do not have to be increased if the costs are offset by additional space. The combination of refurbishment and densification also enables a socially desirable and diverse mix of residents.



Left: Comparing the rent levels of different options for the representative building in Neuperlach
Right: Concept drawing of the proposed economic model



A socially acceptable refurbishment of the building stock is possible and would enable the construction of many additional flats.

Economically sensible

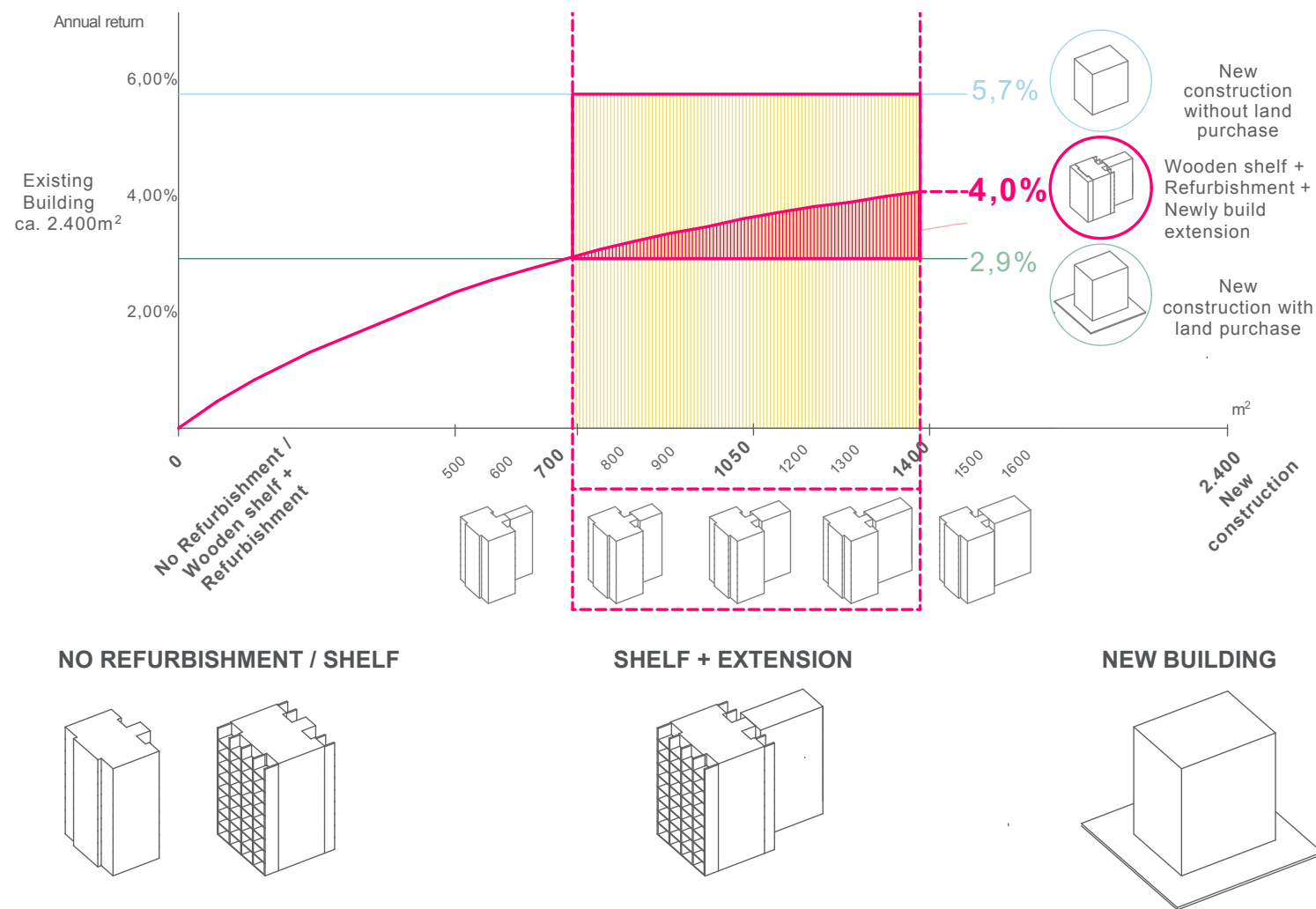
The central concern is to implement the measures without increasing rents for the existing residents while ensuring that the owners realise economically viable returns. This can be achieved by adding a new extension to the existing stairwell.

Obtaining building rights vs. buying a greenfield site

The key factor is avoiding the purchase of land that would otherwise be necessary for a new building on a greenfield site. The model uses land value gains based on the current Munich land value tables. Additional savings are achieved because the ex-

tension (up to approx. 60 % of the existing volume) can be built directly onto the existing stairwell.

The chart shows that combining the value increase and the construction costs for extension and refurbishment yields a range for the extension size of 40 % to 60 % of the existing building volume. The return for this is higher than that for social housing construction on greenfield sites (calculated with subsidies from the City of Munich) and is therefore profitable from an economic point of view.



Left: Comparing the profitability of different options for the representative building in Neuperlach
Right: Existing building with barrier-free extensions, example design, model

»Property entails obligations. Its use shall also serve the public good.«
Art 14 (2) German Constitution



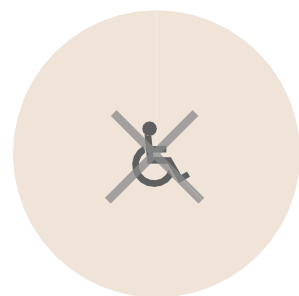
Enabling barrier-free living

Lack of accessibility in Neuperlach

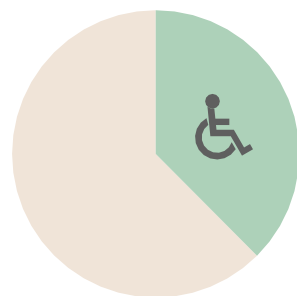
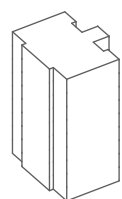
A serious problem with the existing buildings in Neuperlach is that there are only few barrier-free flats. The existing typology in Neuperlach is characterised, among other things, by a stairwell on the façade. In many cases, the lift has an intermediate landing, meaning that the residents must walk either up or down half a storey to their flats. Replacing the stairwells to ensure barrier-free access to the flats would not only be immensely expensive but also disproportionately resource-intensive. Furthermore, the interior of the flats cannot be converted to be barrier-free. Sufficiently large door openings, adequate manoeuvring space and threshold-free room transitions cannot be created at a reasonable cost.

Utilising the characteristics of the existing building

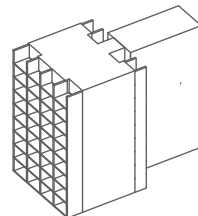
To enable cost-effective barrier-free living close to home, an extension to the existing stairwells is a suitable option. The most efficient solution for this extension is to place the newly built floors at the level of the intermediate landings and thus at the existing lift exits. With wheelchair-accessible floor plans in the extension, barrier-free flats are made available, at the rate of one barrier-free apartment for every two existing flats.



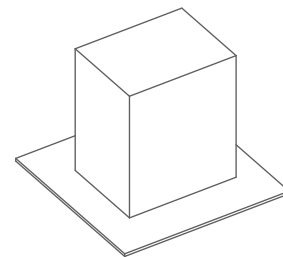
FACADE INSULATION



SHELF + EXTENSION



NEW BUILDING



One in five people in Neuperlach is over 65 years old – more than the Munich average. However, there are far too few barrier-free flats.



Left: Comparing the level of accessibility in different options for the representative building in Neuperlach
Right: Flat after refurbishment with the "timber shelf", example design, model

It's all in the mix

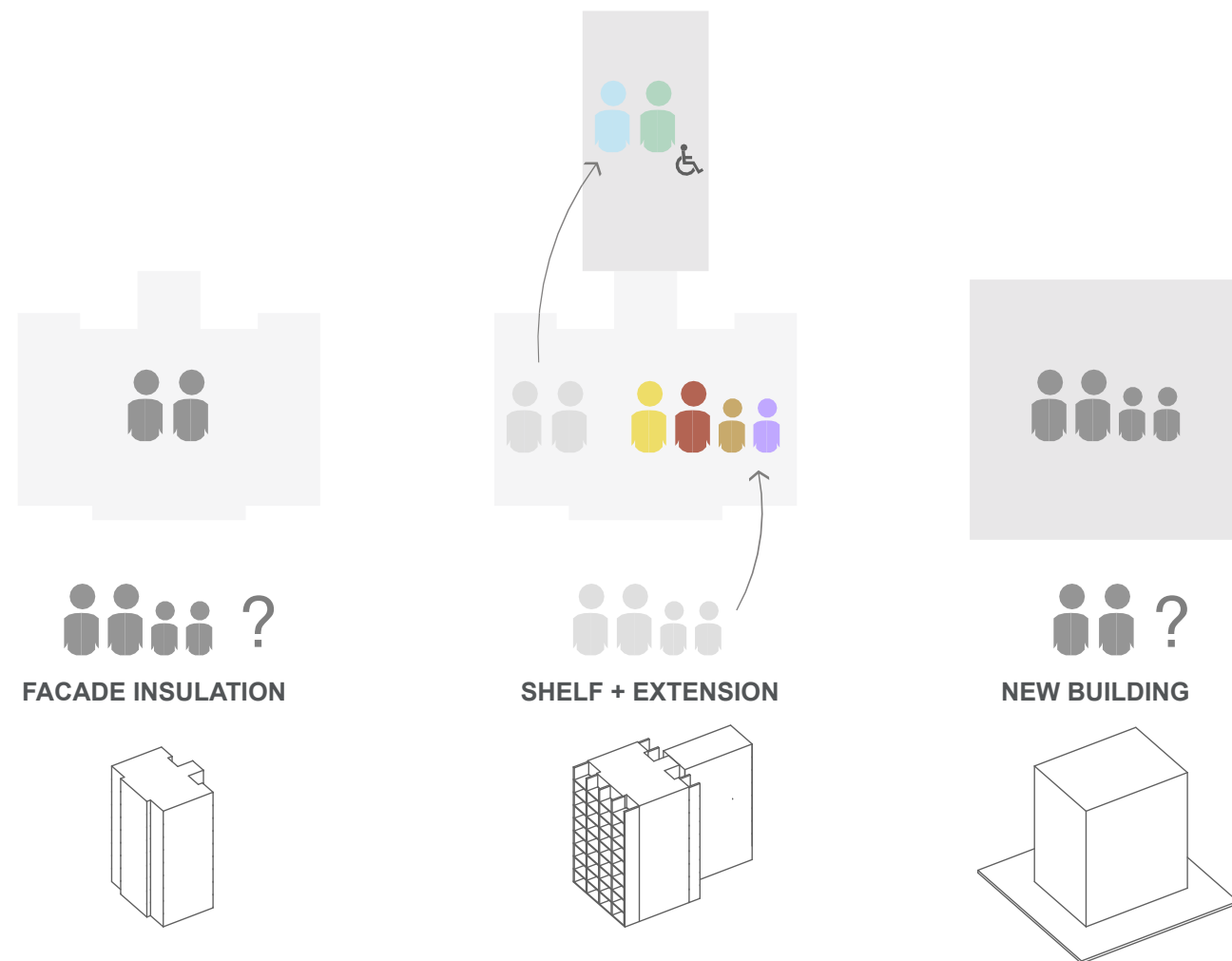
Over the course of a lifetime, home requirements change several times: a student has different housing needs than a family, a family needs more space than a pensioner. The building stock analysed in Neuperlach largely consists of flats with three rooms or more and is therefore unsuited to many living situations.

A mix of flats results in a mix of residents

The newly built extension provides an opportunity to expand the residential stock with one- and two-bedroom flats. The housing on offer is therefore better suited to the needs of the residents and promotes social mixing of the local population.

Moving without uprooting

People who are rooted in Neuperlach, who have lived there for decades and wish to stay there, but who are living in a flat that is possibly too large for them due to their changed circumstances, can move to a barrier-free newly built flat at the same location with little effort. This option must be combined with apartment-swap and subsidy programmes to keep the rents of existing flats low. This action would free up the larger flats for people in life phases in which they need more space.



Left: Comparing the resident mix in different options for the representative building in Neuperlach
Right: Flat after refurbishment, example design, model

Moving without uprooting –
Moving to an accessible flat just a corridor away.



Persuasive

The results of our NEB Action should make it possible for all stakeholders to participate in the discussion regarding the future of Neuperlach. There are many different perspectives on the topic of redevelopment, which are briefly reflected here.

The building itself

The building itself has no voice, but its structure essentially defines the rules for what forms of refurbishment are both sensible and possible. After 60 years, there is considerable pressure toward renovation and modernisation for the majority of buildings.

Current residents

Affordable housing is the residents' top priority. Refurbishment should not lead to displacement for financial reasons. In addition to the positive aspects that make Neu-perlach a neighbourhood with a high level of life satisfaction, there are negative aspects that need to be addressed (lack of spaces for non-consumer interactions, too few small and barrier-free flats). Socially acceptable refurbishment measures are required, as are apartment-swap and subsidy programmes to maintain existing rents.

Owners

The owners essentially have a vested economic interest in ensuring the long-term continued operation of the buildings. This requires an appropriate return on investment. The necessary investment must be cost-effective. In the case of buildings, this can be achieved through higher utilisation, for example.

Future residents

What are the long-term forecasts for population development and what needs will arise? We are assuming a society that increasingly lives in fluctuating, diverse communities. Our flexible housing concepts can respond to this more effectively than can the chamber-like floor plans of the existing housing stock.

Lawyers

Many legal questions remain unanswered, ranging from building law to historic preservation, fire protection to subsidy guidelines. A generalisable proposal must free itself from these requirements to the extent that it must first and foremost establish a generally valid ability to act, laying the foundation for the specific concretisation of individual cases.

NEBourhoods

In the course of the project, many possible links emerged to other NEBourhoods ideas. The inclusion of wildlife in the façade design, or the integration of solar panels on the winter gardens, for example – there are many ways to make refurbishment even more attractive.

Environment

Every development action must be sustainable. The impact on people not directly affected must be taken into account and balanced against the interests of other stakeholders – because climate change affects everyone.

Culture

The question of "beauty" raised in the NEB Compass, or – to put it more broadly – the cultural positioning of our living environment, is a key factor that influences our well-being. How do we as human beings establish our bearings among all the architectural legacies and in the face of so many challenges? Art and culture provide answers to this question. Architecture creates images that enable a shared vision – a shared idea of how our future can succeed. The designs of "Redesigning Housing Structures" wish to contribute to this.

Shaping
our future
together lies
in our own
hands.

Right: Barrier at the entrance to a residential building in Neuperlach, 2023



Together

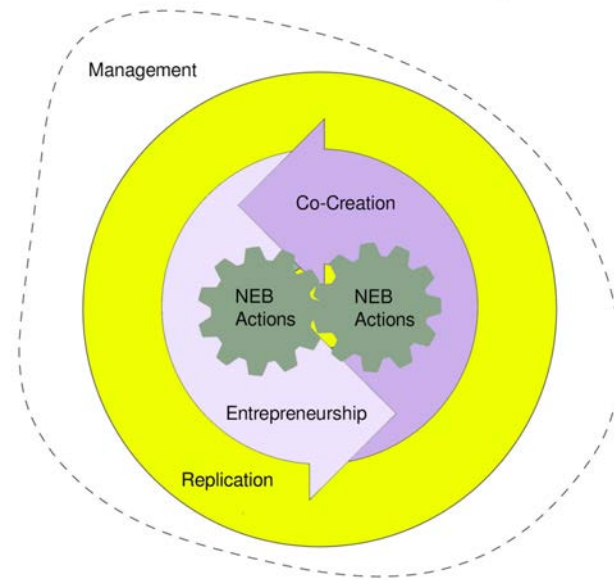
Creating NEBourhoods Together

Neuperlach was funded by the EU through 2025 as a light-house demonstrator for the New European Bauhaus to ensure climate-friendly, inclusive and beautiful living and working in the district. Together with citizens, creatives and researchers, ideas were developed in and for Neuperlach, start-ups were founded and projects were realised that improve the quality of life, simplify everyday living and contribute to climate protection. The focus lay on public spaces, attractive living, energy communities and local mobility as well as youth culture, nutrition, circularity and biodiversity. A MakerSpace in Neuperlach invited people to experiment and try things out, start-ups tested their solutions on site. Together, we planned the future of Neuperlach: beautiful, sustainable and inclusive!

Project course

This NEB Action took 21 months to complete. At the Technical University of Munich, Stefan Gruhne, Mascha Zach and Prof. Andreas Hild from the Chair of Architectural Design, Rebuilding and Conservation as well as Simon Pytlik and Prof. Thomas Auer from the Chair of Building Technology and Climate Responsive Design were involved. Caroline Dietlmeier and Prof. Andreas Müsseler from the Ostbayerische Technische Hochschule Regensburg (Chair of Design, Construction and Realisation) completed the team. The NEB Action was professionally supported by the B&O Group in the field of construction technology and construction costs. The voices and opinions of the stakeholders were included in discussions.

In addition, the work results of student projects were presented for discussion and the range of implementation options was examined through the students' contributions. As part of the



NEB Action and in collaboration with the NEBourhoods Transition Hub, architect Enrica Ferrucci (ichbaumit) developed the WohnWeisheiten workshop format, which allowed Neuperlach residents to present their housing biography in a playful way.

Spreading the word

A key milestone was an exhibition at the Kulturhaus Neuperlach in September 2024, curated by Enrica Ferrucci. An approx. 9-minute documentary film, produced by Prof. Andreas Kretzer, illustrates the potential of the project idea by presenting footage of large-format models. The film, which is easy to disseminate throughout Europe, is supplemented by a brochure that explains the most important content in a simple way. Following the end of the project, a published report will serve as a guide for municipalities and other decision-makers throughout Europe facing similar challenges to Neuperlach.



Creating NEBourhoods Together: Designing beautiful, environmentally friendly and future-proof neighbourhoods together

A new culture of renewal in Neuperlach

Every change must build on what already exists. This means that whenever we want to change something, we must start with what we already have. The larger and more extensive our inventory is, the more important it is. Our building stock is humanity's largest and most extensive artefact.

If we want to continue to use this artefact, the city, we will have to develop it. We will have to modernise it, adapt it to new needs, and bring it into the future. We must change our cities precisely to the extent to which we ourselves are changing. This development will only work as a joint effort and requires proposals to discuss, evaluate and develop. "Redesigning Housing Structures" proposes a way the transformation of a neighbourhood could succeed. This proposal attempts to

address ecological, structural, economic, architectural and – perhaps most importantly – social issues and to consider them in a balanced way.

"Redesigning Housing Structures" describes a possible development step for large housing estates using the example of Neuperlach: The process of *renewing the city* has been practised for centuries, adapting the city to new challenges. Preservation is not an option.

The challenges we face today are met with options for action – if only to point out the dangers of inaction. Development is only possible if we discuss and weigh up proposals such as "Redesigning Housing Structures".



Left: Residential buildings in Neuperlach, model
Right: Theodor-Heuss-Platz Neuperlach, 2023



There is new magic
in every beginning.

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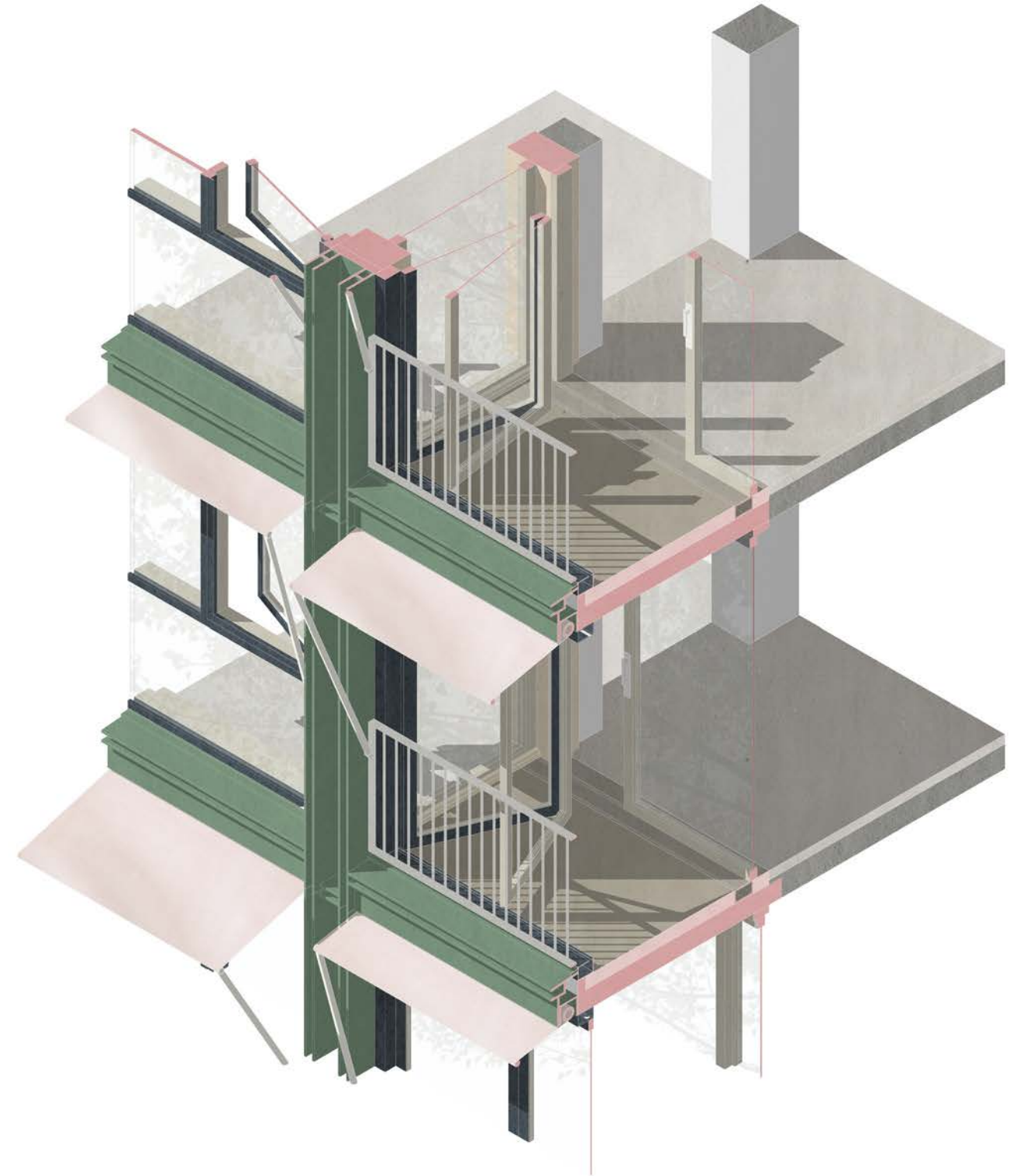
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We would like to thank all students involved:

Summer Semester 2024: Lilli Dolderer, Stephanie Fonseca Azzi, Nathan Gillet, Yutong He, Constantin Heid, Ann-Kathrin Höltkemeier, David Keller, Maximilian Kroth, Marie-Ange Mathevet, Rosanna Obermeder, Clarissa Posten, Sara Rajala, Jonas Teichmann, Lucia Tomasetti, Dennis Vershynin, Yunfei Wang, David Weiler, Peng Zhang

Winter Semester 2023/24: Mohamed Ahmed, Florian Brannmann, Sungho Choi, Valentin Erlmeier, Julia Fathmann, Aleksander Geisler, Raphael Großmann, Santiago Harfuch, Kamil Hofmann, Lilly Kandzia, Yanina Kholodova, Hadiel-Ornella Khuri, Theresa Klingler, Rodion Kosmin, Maya Krumova, Patric Kuttler, Judith Leonhard, Anna Lüßmann, Amelie Martin, Annabel Matzdorf, Rudi Meier, Carlos Meza Colin, Sebastian Orner, Lennart Reidelbach, Katrin Schneyer, Anna Schöfberger, Johanna Sigloch, Victoria Singleton, Darko Tushev, Philipp Unger, Selin Uyarlar, Philip Valkov, Pauline Wessel

Supervision: Barbara Brinkmann, Khaled Mostafa



Team

Alicia Albrecht, Thomas Auer, Caroline Dietlmeier, Stefan Gruhne, Andreas Hild, Celina Mandl, Andreas Müsseler, Simon Pytlik, Mascha Zach

Short film: Prof. Andreas Kretzer

Workshops and Exhibition: Enrica Ferrucci (ichbaumit)

Advisory support: B&O BAU



Right: Three-dimensional sectional drawing of the building envelope in timber construction, exemplary design

Imprint

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Technische Universität München

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Alicia Albrecht, Celina Mandl

Chair of Building Technology and Climate Responsive Design:

Prof. Thomas Auer, Simon Pytlik

Ostbayerische Technische Hochschule Regensburg

Chair of Design, Construction and Realisation:

Prof. Andreas Müsseler, Caroline Dietlmeier

“Creating NEBourhoods Together – designing beautiful, environmentally friendly and future-proof neighbourhoods together” is one of the six lighthouse demonstrators for the New European Bauhaus (NEB) of the European Union.

Duration: 1.10.2022–31.3.2025

Programme: Horizon Europe

Project No: 101080052

Funding by the European Union: € 5 million

Co-funding by the City of Munich: € 0.6 million

Views and opinions expressed are those of the author(s) only and do not necessarily reflect those of the European Union.

Neither the European Union nor the granting authority can be held responsible for them.

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Link to the short film »Wohnen Weiterbauen«
on <https://www.NEBourhoods.de>



Right: Initial frame of the film created as a part of the "Redesigning Housing Structures" NEB Action

