

OVERVIEW OF NATURE BASED SOLUTIONS IN INNERFAVORITEN

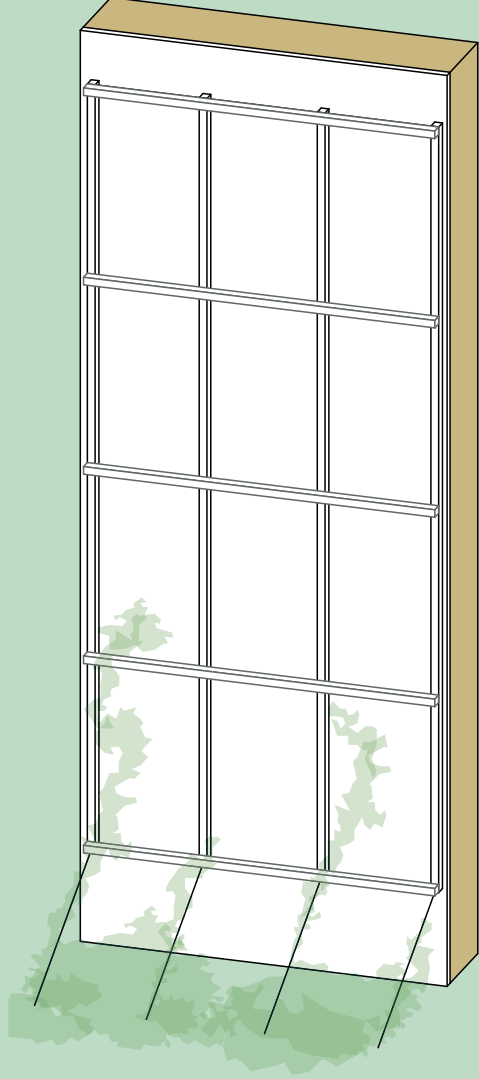
Climate adaptation, biodiversity and quality of public space in densely built-up urban areas

Housing inequalities and the green transition. Lea Riccarda Pammer | Nadia Raza | Vinzent Pechlarn. TU Wien, future.lab Research Center for New Social Housing. Winter semester 2025/26.

WHICH NATURE BASED SOLUTIONS EXIST...

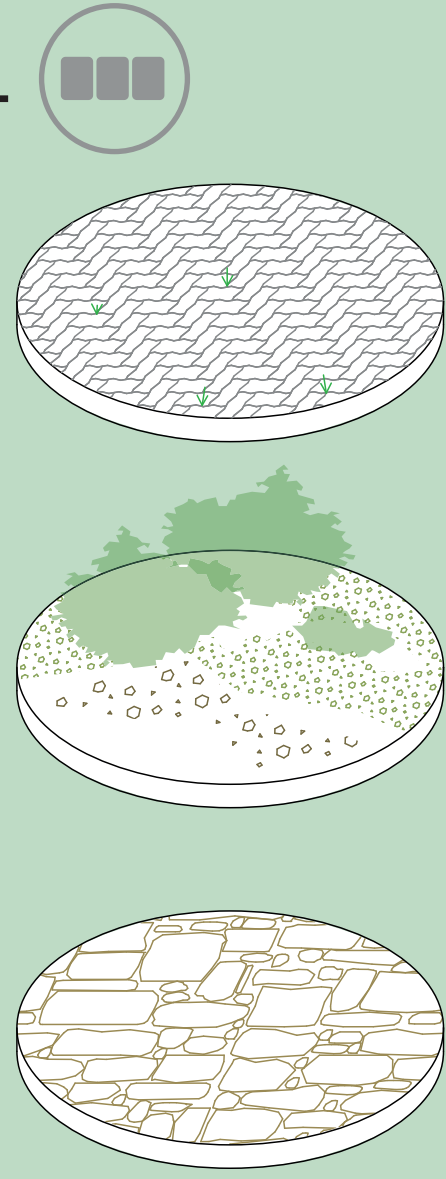
FACADE GREENING

Green facades help improve the microclimate and air quality. They also increase the building's heat protection and enhance the quality of life. By choosing the right plants, you can also contribute to biodiversity. Ground-based greenery is preferable as it requires less maintenance and water consumption. Greening can additionally be done on roofs as well, but it is more difficult to implement retrospectively.



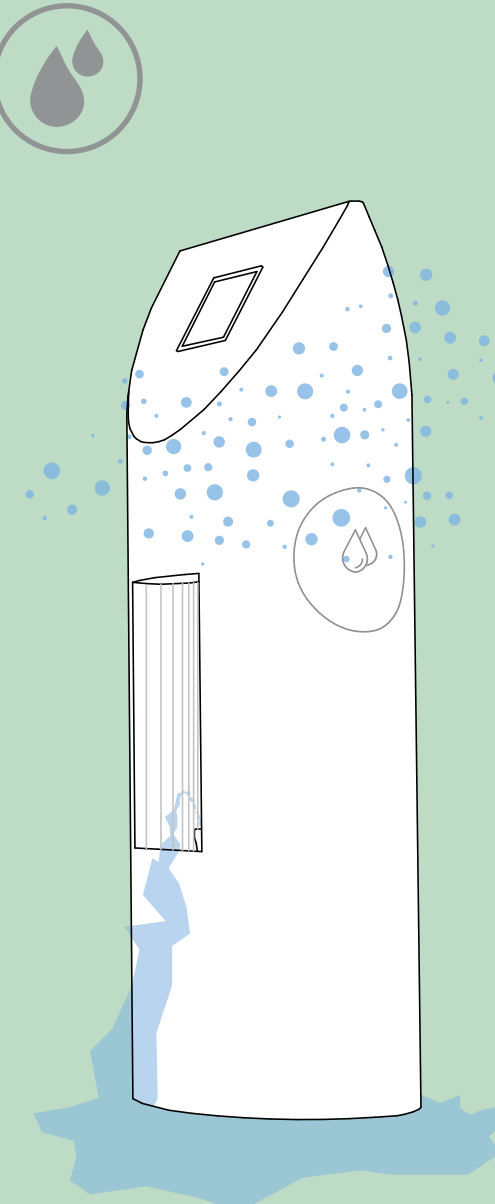
SOIL SEALING REVERSAL

Sealed surfaces store heat and prevent water from penetrating. Permeable floor coverings such as paving, gravel or soil provide greater climate resilience. Water seeps away, is stored in the ground and evaporates slowly. This improves rainwater management and flood protection and reduces urban overheating. Unsealing is an important part of the sponge city principle, that is implemented in urban areas for greater climate resistance.



BLUE INFRASTRUCTURE

Water, whether naturally occurring or used as a design element, can bring particular benefits in urban areas that are dealing with overheating as temperatures rise: large bodies of water cool the immediate surroundings, natural waterways provide habitats for animals and plants, misting water into the air contributes to a better microclimate, and drinking fountains can ensure the supply of drinking water in public spaces.



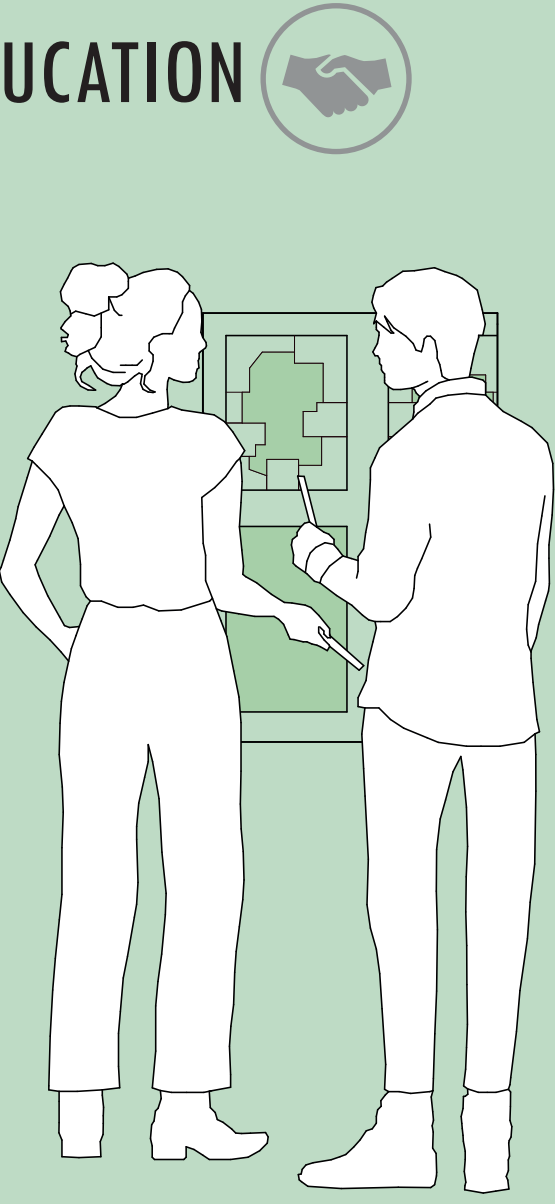
BIODIVERSITY PROMOTION

Biodiversity promotion aims to increase the diversity of plant and animal species in urban areas. Structurally rich, near-natural greening with native and climate-resilient species creates habitats for insects, birds and small animals. Unsealed surfaces, species-rich plantings and green facades and roofs act as ecological stepping stones. They can connect to green spaces that are used for leisure or sporting activities.

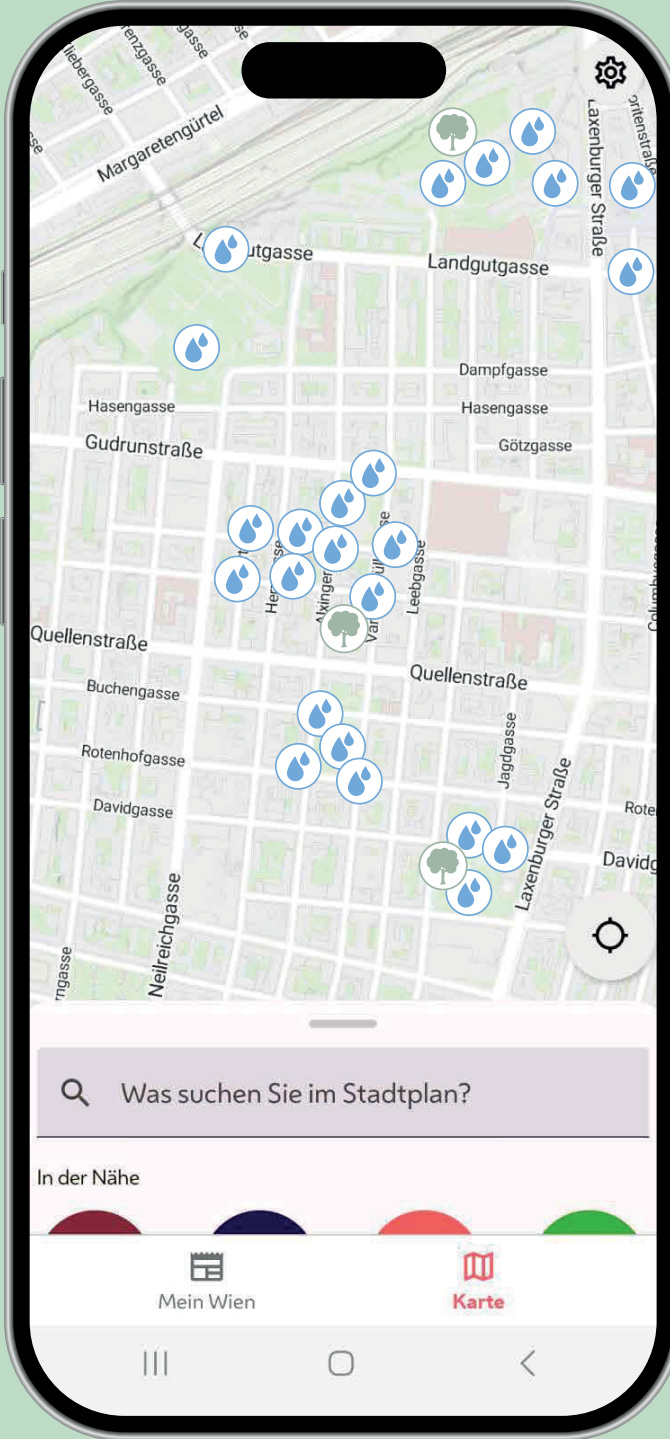


CO-CREATION AND EDUCATION

Residents are actively involved in the planning, implementation and maintenance of nature-based solutions. Local knowledge and needs are taken into account through participatory processes, workshops and shared spaces. Educational programmes promote understanding of ecological relationships and strengthen identification with the urban space. This increases acceptance, long-term use and maintenance of the measures.



HEAT MAP AND „COOLES WIEN“

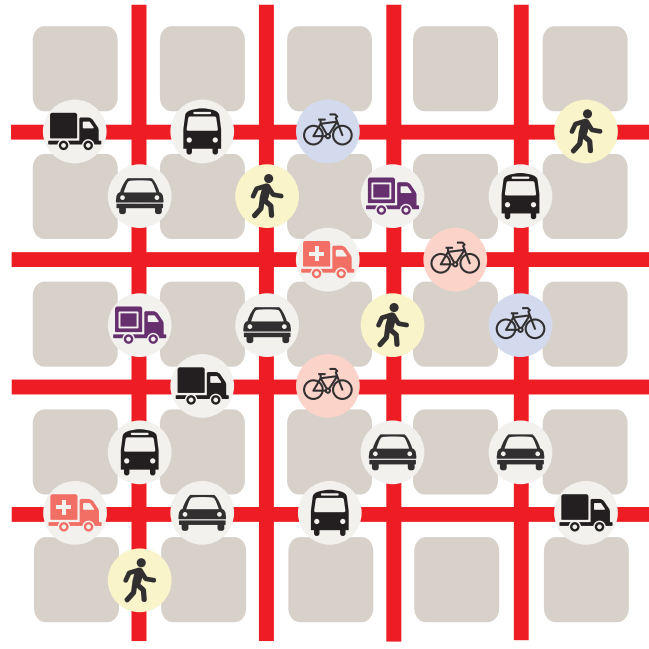


The urban heat map shows the spatial distribution of heat stress in the Vienna city area. Particularly densely built-up and heavily sealed areas with little greenery have elevated temperatures and are identified as heat hotspots. The heat map serves as an important basis for programs such as „Cooles Wien“ and for further location-specific analyses such as the microclimate analysis at Quellenplatz.

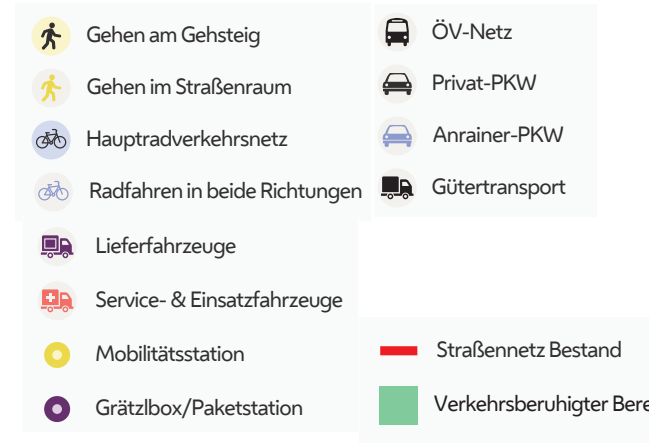
„Cooles Wien“ is a municipal program to combat heat islands in Vienna. It highlights places and measure to provide cooling on hot days, from drinking fountains and “summer sprinklers” to mist showers, water features and “cool zones” (cool indoor spaces for vulnerable people). The initiative is part of Vienna’s heat action plan to adopt to rising temperatures and contributes to improving the urban microclimate and health care.



Ausgangssituation



Supergrätzl



SUPERGRÄTZEL

1. Traffic

Motorised traffic is diverted — cars are kept on the main roads (access to homes and service vehicles will still be permitted). This creates space for pedestrians and cyclists, encounters and improve quality of life.

2. Greenery and climate adaptation

New trees, shrubs and green spaces were planted. Cooling measures (e.g. lighter-coloured paving, water features, misting systems) improve the microclimate, especially during heat waves.

3. Open space design

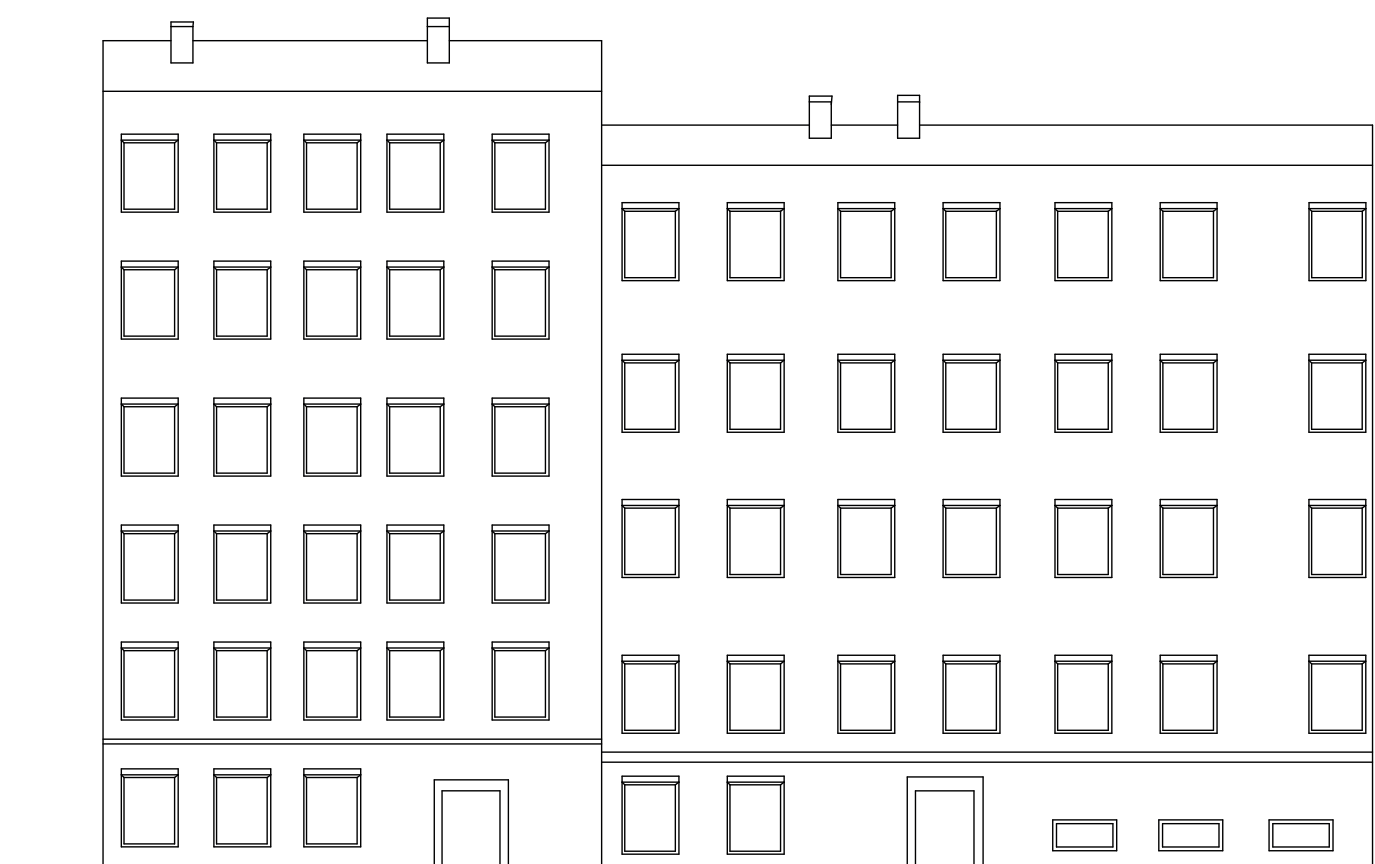
Wider pavements, seating, play and recreation areas transform the street into an urban living room where people can meet, relax, play or linger. Pedestrian zones provide safe and attractive meeting places.

4. Safety and active mobility

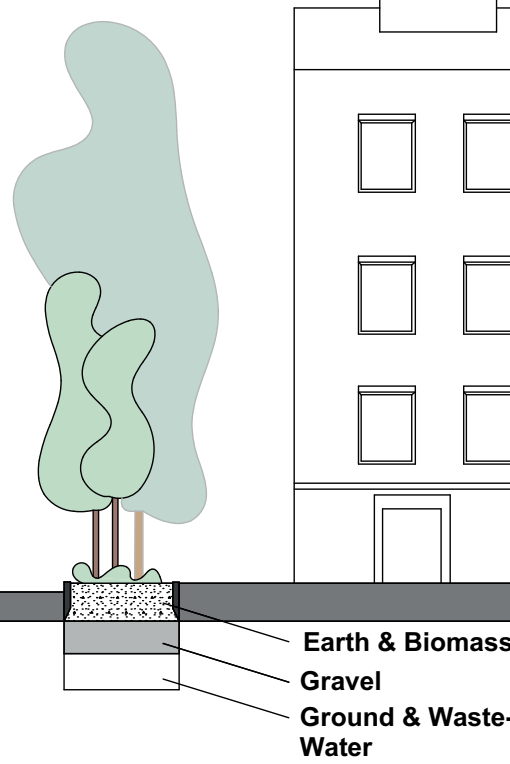
Less traffic means greater road safety, especially for pedestrians, children and older people. Cycling is encouraged through new cycle paths and better conditions in the neighbourhood.

5. Citizen participation and social identification

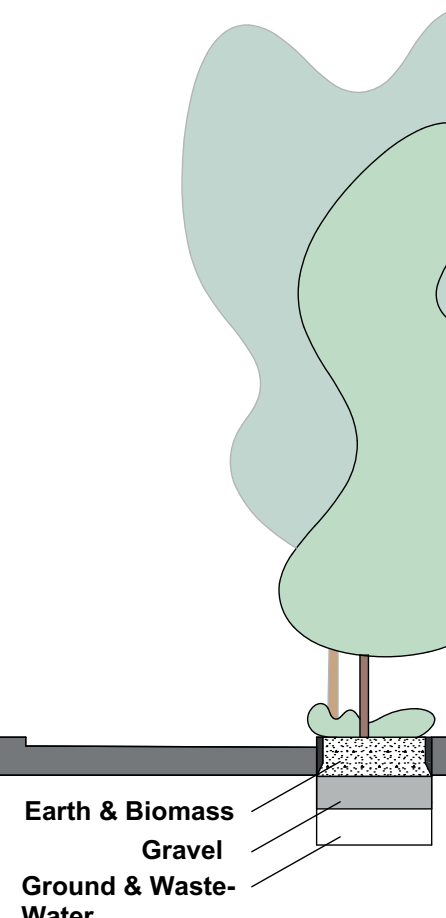
From the beginning, residents were involved in the planning and try outs, their wishes and ideas were taken into account. Participation has increased people’s identification with their neighbourhood.



"SUPER GRÄTZL"
Section "Erlachstraße"



Dual infiltration zones



Shadow elements & green zone

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...IN INNERFAVORITEN?



1 BUCHENGRÜN



Implementation: 2022
Partners: Wiener Wohnen
At Buchengasse 137, ground-based facade greening was implemented in three areas. The criteria for adding green facades onto existing buildings of Wiener Wohnen are: south west-facing facade, no shading; at least 1m distance from windows, balconies, metal cladding and artwork; substructure required; residential complex with existing green spaces.

2 JUGENDTREFF ARTHABERBAD



Implementation: 2022
Partners: Verein Wiener Jugendzentren
The young people built raised beds and seating areas and installed them in front of the youth centre. The project focused on teaching gardening skills, urban biodiversity and craftsmanship.

3 LILA4GREEN

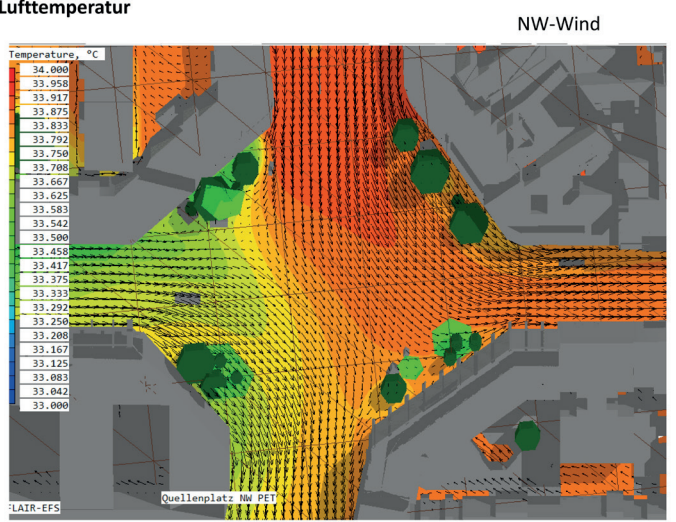
Running: 2018-21
Partners: AIT, TU Wien, PlanSinn, Weatherpark, GREX, GRÜNSTATTGRAU
A neighbourhood-based research and participation project in the Quellenstraße area. The aim was to analyse the potential of nature-based solutions in densely built-up existing neighbourhoods. Climate and spatial analyses as well as participatory formats with residents were used to develop transferable strategies for greening, unsealing and water management

4 SUPERGRÄTZEL



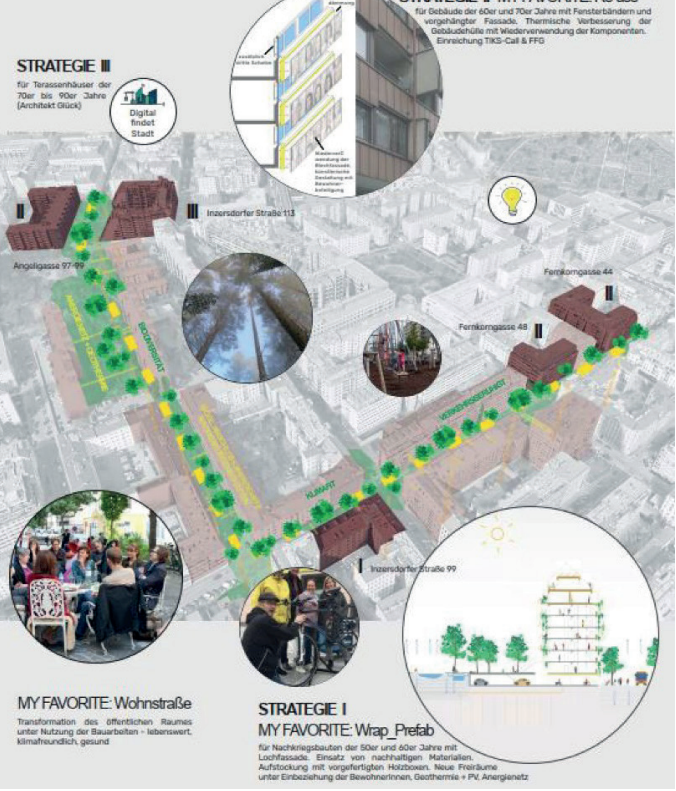
Built: 2024
Partners: MA 18, MA 19, MA 28
Following the example of the superblock, in Barcelona, four streets around a school were made traffic-free. The new open space design includes 62 new trees, plant beds, light-coloured flooring, water features, seating and shading elements. Due to the involvement of local residents in the run-up, project was well received.

5 QUELLENPLATZ



Researched: 2021-23, not realized
Partners: WleNeu+, MA 19, MA 28, Bezirksvorstehung 10, GB*Ost, MA 25
The Quellenplatz was identified as a heat hotspot and examined as part of a microclimate analysis. In addition, citizen surveys were conducted to determine usage needs. They showed lots of differing needs for restaurant owners, residents and bypassers. Measures such as tree planting according to the sponge city principle and water features to improve the microclimate were proposed. The measures were not implemented.

6 MY FAVORITE

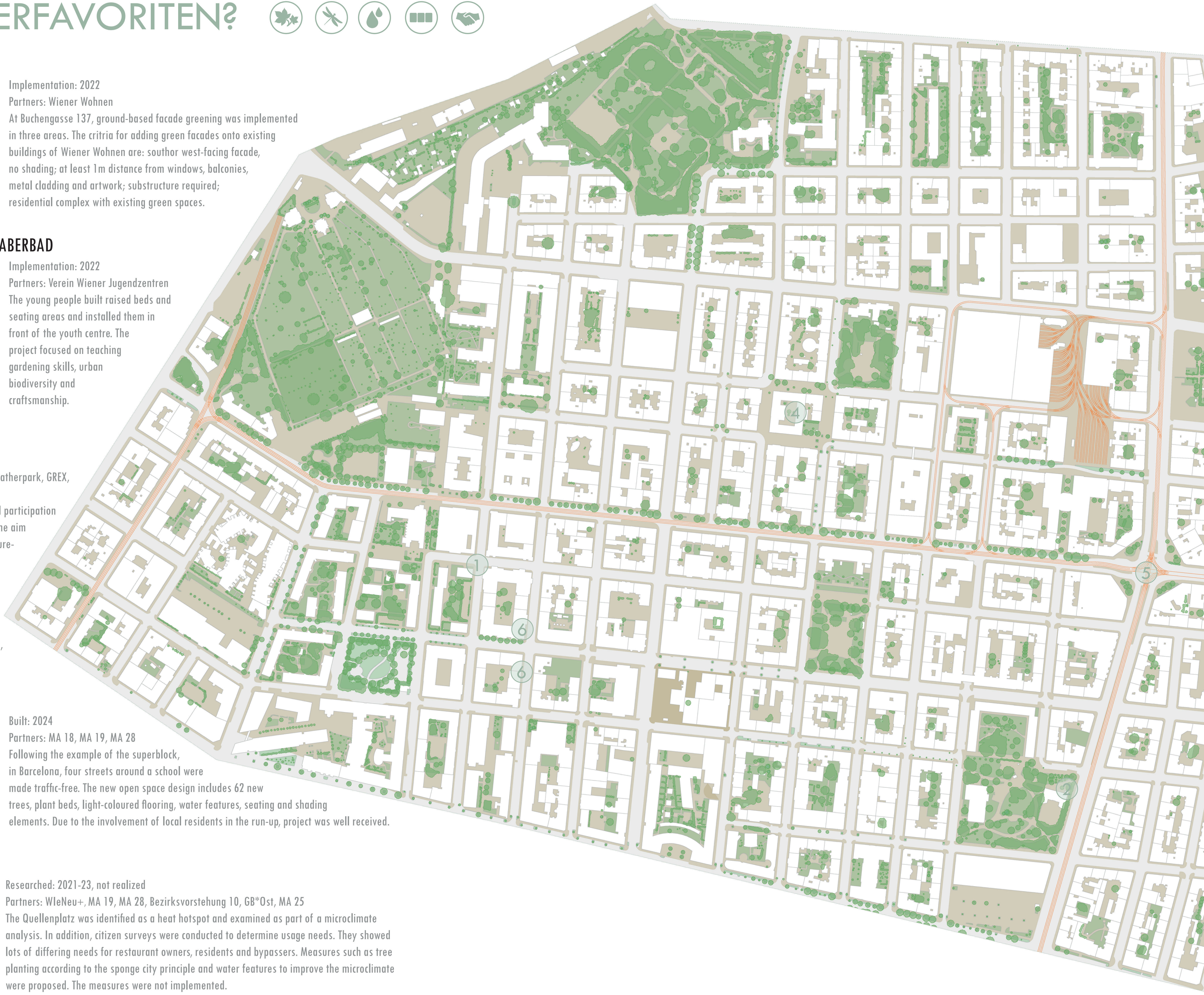


Researched: 2021-23
Partners: Räume für Menschen Architektur, GESIBA, Wien Energie
A study on sustainable urban transformation in Favoriten Existing properties in the WieNeu+ area were selected for research into renovation and energy solutions. Five GESIBA properties were selected, two of them directly in the Innerfacoriten: Fernkorngasse 44 and 48. The study analysed the possibility of innovative, circular renovation, sustainable energy supply based on an anergy network and the design of public space in connection with the renovation projects. The study shows that non-profit developers can be pioneers thanks to their scalability and interest in innovative renovation concepts. Financing is a challenge. In order to overcome potential hurdles, it is important to identify synergies and exploit them, which may involve partners from different sectors.

7 G' MISCHTER BLOCK



Built: 2021-24
Partners: Avaris (private developer)
With ground-level green facades and a green roof, the new building contributes to a better microclimate. A combination of technology was implimented: a heat pump combined with geothermal energy and photovoltaics and cooling via concrete core activation. There is public use on the ground floor in the form of a nursery school, while the rest of the building is a mix of residential and office space.



GREEN GENTRIFICATION

Positive effects

- __Cooling & climate resilience
- __More greenery & quality of life
- __Health & biodiversity

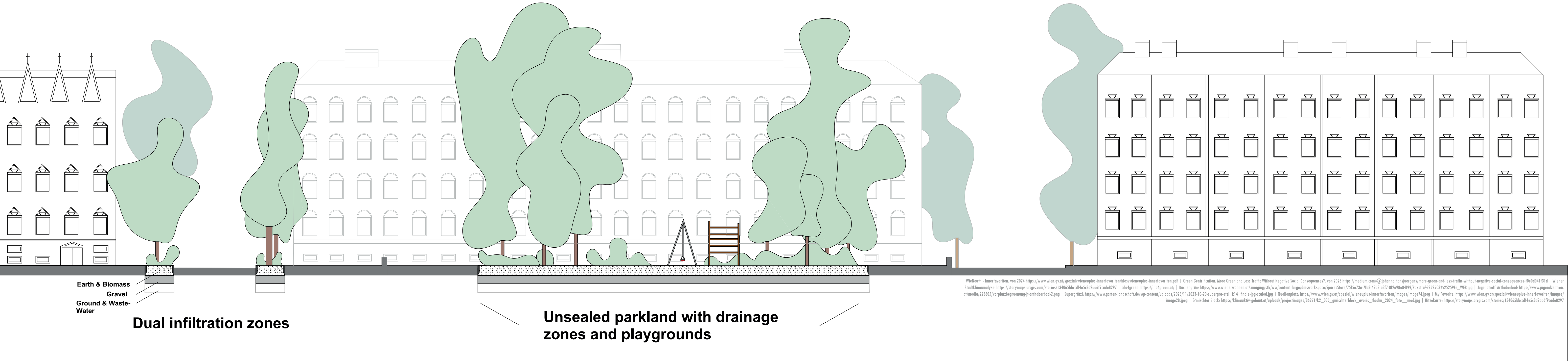
Social risks

- __Upgrading of the neighbourhood
- __Attractiveness for higher incomes
- __Potential for displacement

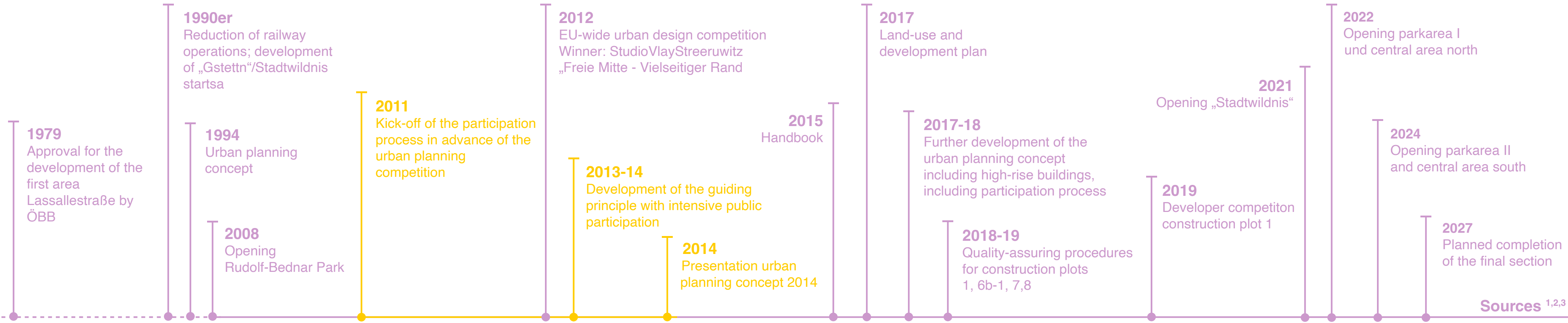
Counter measures

- __Rent controll
- __Realization on city-owned land
- __Participation
- __Monitoring

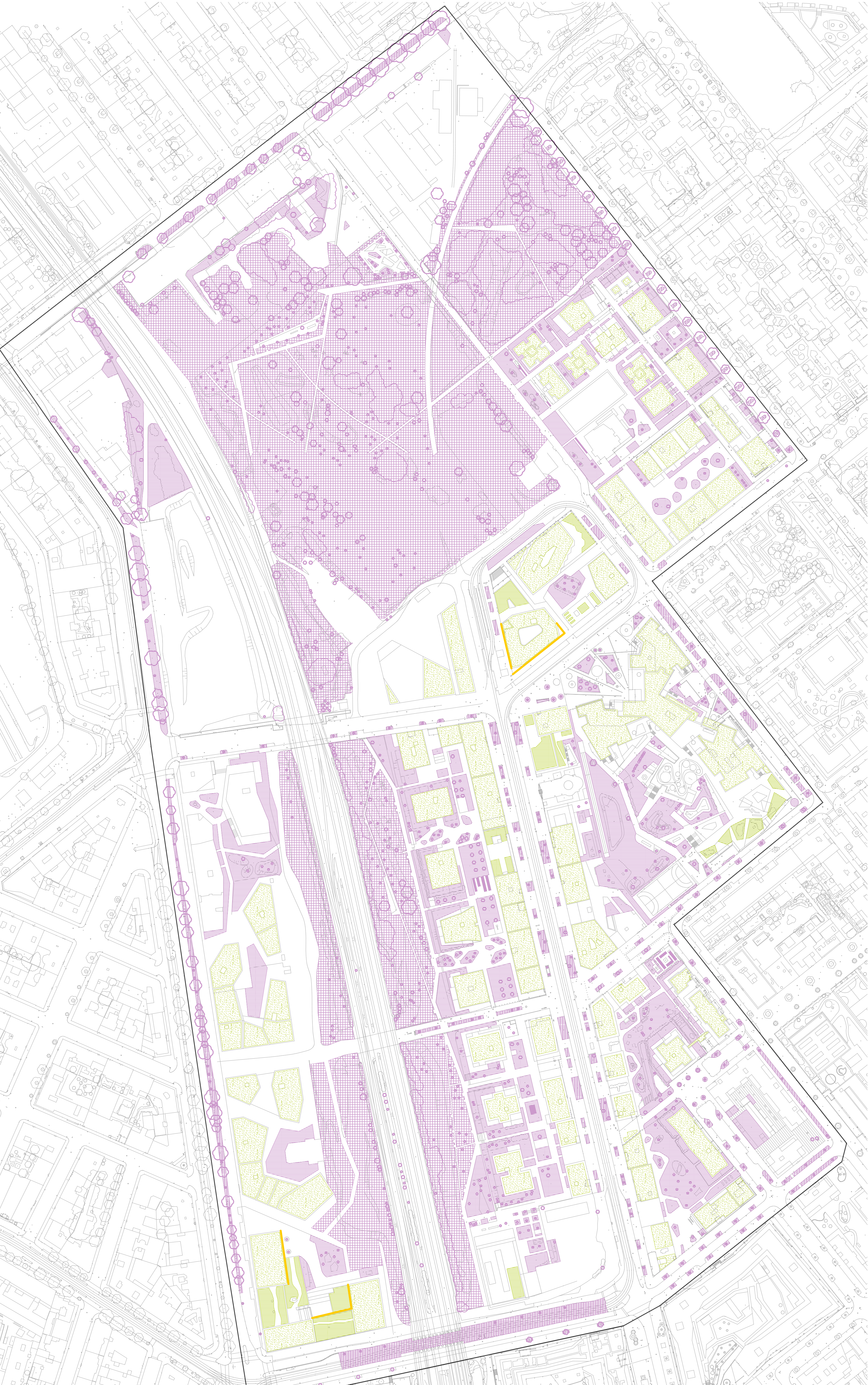
-> Ecological improvements can generate upward pressure on property values despite a regulated housing market. Studies on the Supergrätzl Favoriten neighbourhood point to potential gentrification effects if social aspects are not included in the planning. Different Actors can impliment counter measures to minimize this effect. Especially te city of Vienna can take control by the leverage of regulation and subsidies.



WHO TAKES *CARE* OF THE GREEN?



„Essential: How can a soft boundary be created at the same time—one that establishes a filter between semi-public and public space even without the use of fences?“¹



base map: Stadt Wien

facade

Facades
These are managed partly by the residents' association and partly by professional gardeners, depending largely on the specific building.

roof

usable mostly intensive green

extensive green (solar panels)

Building greening (green roofs)
extensive green roofs mainly for cooling and rainwater retention green roofs with solar panels, also known as biosolar roofs, combine vegetation with photovoltaic (PV) systems on rooftops ¹

Rooftop parks
shared green roofs
sometimes combined with façades greening on the same building
example: Franziska Löw Park is a rooftop park on a former garage, intensively planted and publicly accessible, functioning as a small neighbourhood park and extension of the local open-space network ^{2,4}

public park

public park (Freie Mitte)

street greenery

housing association (front garden)

„garteln ums eck“

Freie Mitte
The area is designed for natural succession with minimal maintenance and self-directed development. Access is provided via wooden boardwalks, with around 320 new trees planted and 180 existing ones preserved. Pruning takes place only when necessary for safety, complemented by climate-adapted and windbreak plantings in exposed locations, such as near the old water tower at the start of the park promenade. ^{1,2}

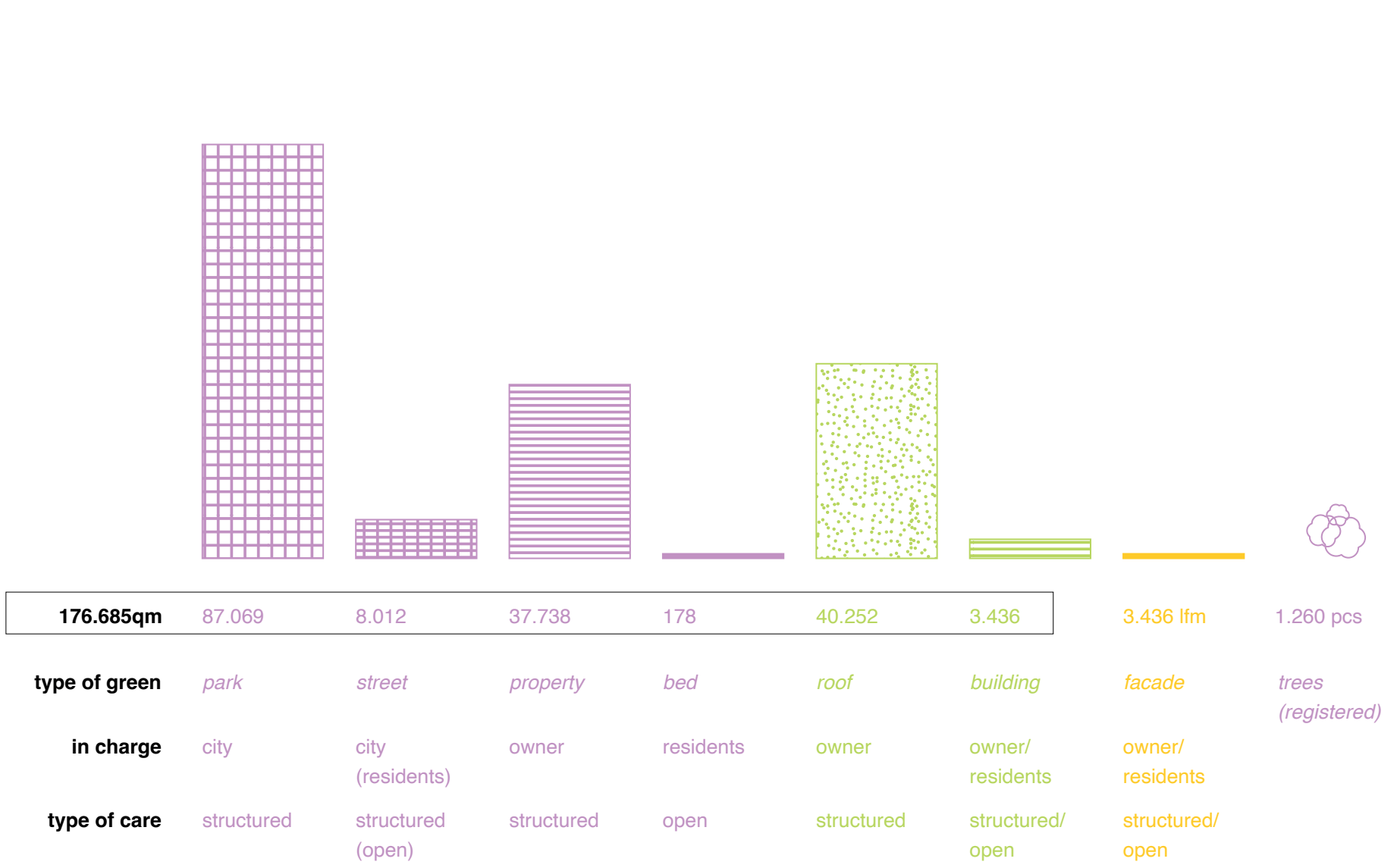
Front Yard Zones
The area forms a soft transition between urban space and green landscape, featuring generous forecourts and dense, edible plantings with fruit trees accessible to residents. Community gardens provide shared spaces for growing food and social interaction. ¹

“Garteln ums Eck”
encourages residents to adopt small planting areas along the street, especially around tree pits, creating flowering strips that support bees and butterflies. ⁴

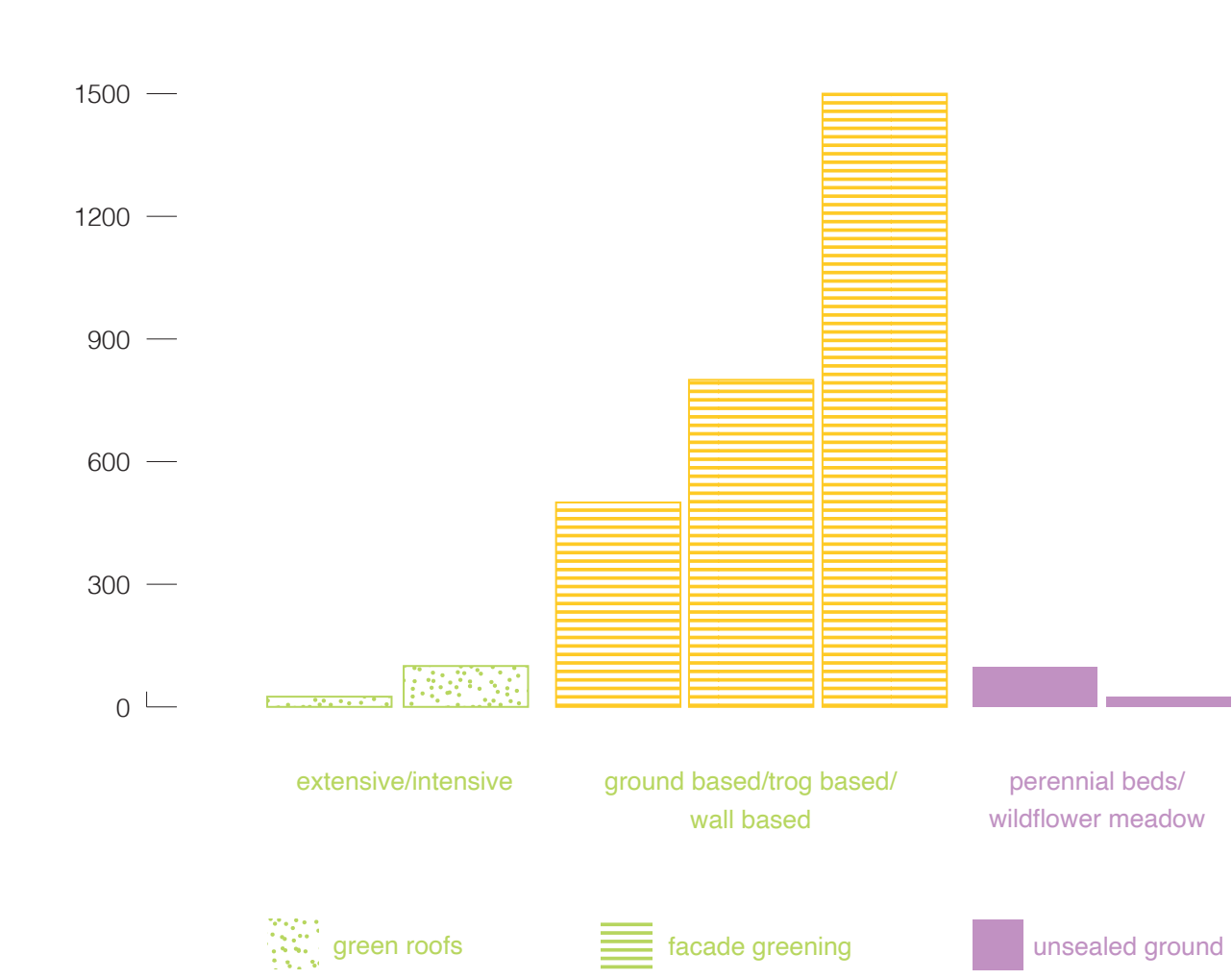
Nature-based solutions at Nordbahnhof



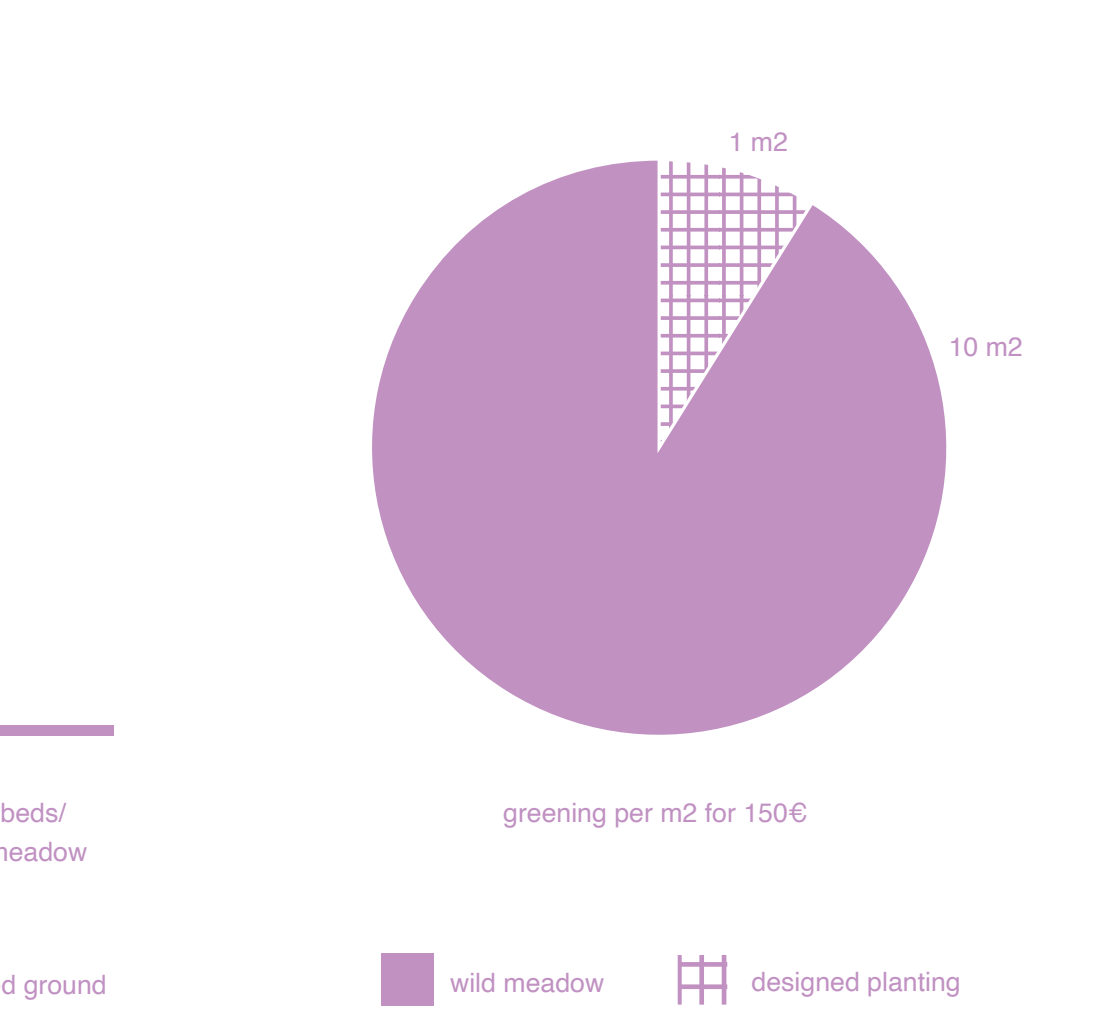
Share of green space in m² ¹⁰



Prices for Nature-Based-Solutions in Euro ⁵



Price comparison wild meadow and desinged planting in Euro¹



Residents' perspective ^{6,7,8,9}



THE IMPLEMENTATION GAP

of energy-efficient retrofits on the example of Innerfavoriten

Neighbourhood profile Inner-favoriten



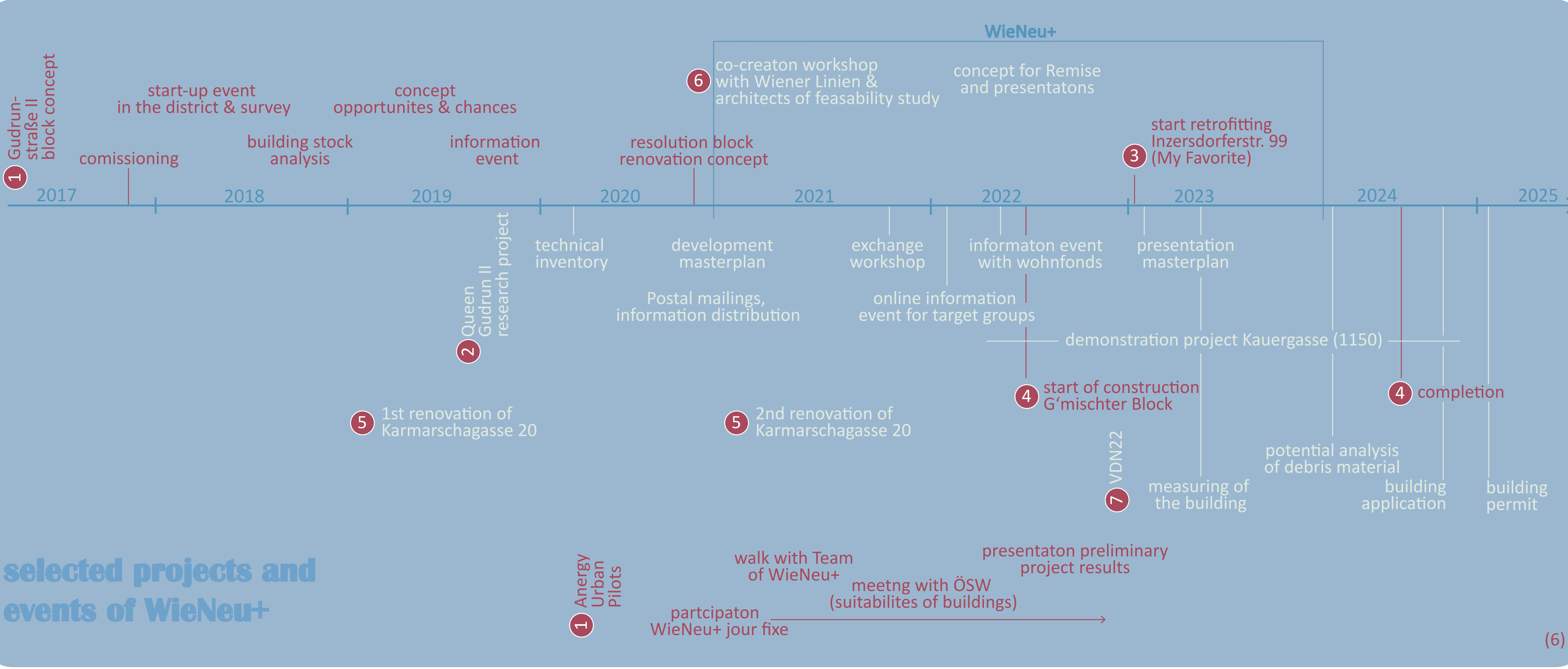
Energy-efficient retrofitting is a key component of the green transition, reducing carbon emissions while addressing energy poverty and heat vulnerability in dense urban areas. In Innerfavoriten, several initiatives (like Gudrunstraße II block renovation concept or projects within WieNeu+) have provided concrete recommendations and support for upgrading older housing stock, yet implementation has remained minimal. Here we investigate why and analyse the events and conditions in Innerfavoriten.

35.000 inhabitants
many non-Austrian

pre-war buildings
sub-standard-housing

high citizen
density

mixed ownership
structures



selected projects and events of WieNeu+

Legend:

- Mixed building age - mainly before 1961
- Before 1945
- 1961-1980
- Gemeindebau
- 1945-1960
- Residential
- Gemeindebau
- Commercial
- Public buildings
- Transportation

Adapted from MA 18 - Refarat Raumanalysen und Stadtsoziologie: Gebietstypen 2021



- Block renovation concept Gudrunstraße II**
concept & analysis but no implementation
amount of different landlords
funding for financing for private owners
concept & analysis
- Queen Gudrun II**
concept & analysis but no implementation
commitment of different actors
heterogeneous building structures
- My Favorite**
study but no implementation
financing because of „Wohungsgemeinnützigkeitsgesetz“
scaling potential and commitment of low-profit housing owners
- G'mischter Block (Mixed Block)**
new building
- ÖSW Neilreichgasse 9 & Karmaschgasse 20**
implemented
difficult to finance because of laws
use of AI for heating systemes
low-profit housing owner
- Favoriten tram depot (Remise)**
concept & analysis but no implementation
long coordinaton process & time horizon
austerity measures by city of Vienna
- VDN22 - pilot project recyclability-oriented refurbishment**
in implementation
additional costs associated with the circular economy
integral planning
- AnergieUrban lighthouse projects**
analysis & research
key players who can drive projects forward
lack of framework for mandatory installation of a central heating system

Pictures taken from Google Earth



Ex. 1



Ex. 2



Ex. 3



Ex. 4



THE IMPLEMENTATION GAP

of energy-efficient retrofits - obstacles & drivers

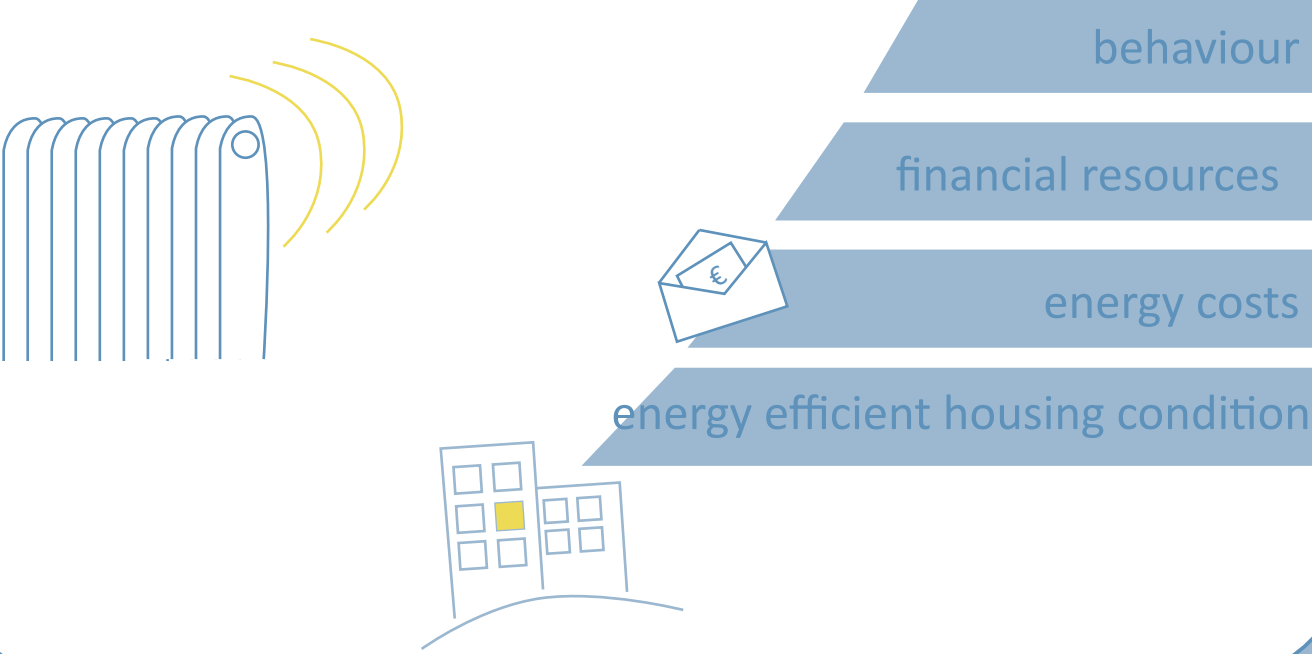
why energy-efficient retrofits matter - socially & ecologically

Energy poverty describes a situation in which households are unable or insufficiently able to meet their energy needs and basic living and health standards with the resources available to them.

8% of households in Vienna state that in 2023 they will not be able to keep their homes adequately warm (1)

24% of households without Austrian citizenship state in 2022 that they cannot keep their homes adequately warm (2)

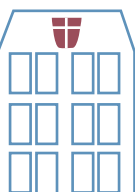

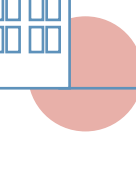
The main causes of energy poverty are energy-inefficient housing conditions, high energy prices and low incomes – behaviour plays a minor role.



Energetic retrofits can be a great solution to prevent energy poverty, BUT capital investments in building stock are one of the main reasons of **displacements**

Displacements and general „green“ upgrading because of retrofits can be called **energetic gentrification** (3) and if done wrong, expensive apartments are being done under the guise of sustainability.

POSSIBLE APPROACHES TO SOLUTION:

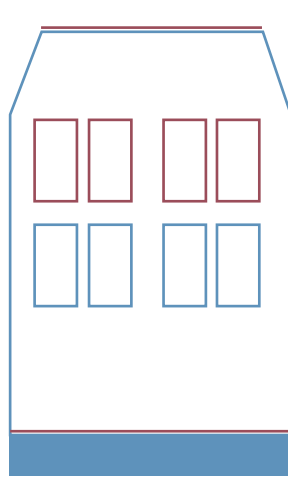
-  Strengthen & promote Gemeindebau and low-profit housing.
-  Establish cost-based rent and maintenance and improvement contribution to enable long-time planning.
-  Keep funding and establishing good infrastructure and social aid in the neighbourhood.



of global greenhouse gas emissions originate from the building sector therefore energy-efficient retrofits are indispensable to reach climate goals (4).

66%

of apartment buildings in Vienna are not retrofitted, and are heated by gas or oil (5).

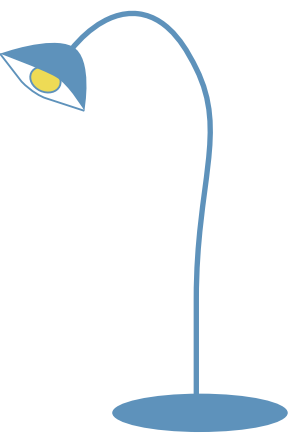


exchange windows

facade, roof & basement ceiling insulation

change to non-fossil heating system

reduction in heating requirements of up to 90%



Why implementations fail...

Strong tenant protection limits access to dwellings for large-scale renovation works and complicates implementation. In the private rental sector, fixed-term contracts increase pressure on tenants and raise the risk of displacement and conflict during retrofit processes.

Legal constraints within tenancy and condominium law hinder retrofit measures, especially in multi-unit buildings. Decision-making processes in homeowners' associations and mandatory consent requirements for interventions such as heating system changes, photovoltaic installations significantly slow down.

Retrofitting can be constrained by a combination of temporal, social, financial and legal barriers



Retrofitting requires long-term planning and implementation, while funding programmes are often short-term and time-limited. This mismatch, combined with a fluctuating national funding landscape, creates uncertainty and reduces planning security for comprehensive renovation strategies.



Strict rent caps and cost-based rent regulations restrict the ability to pass on renovation costs in both private and social housing. At the same time, insufficient financial reserves for deep decarbonisation measures result in a strong dependence on public subsidies.



Obstacles



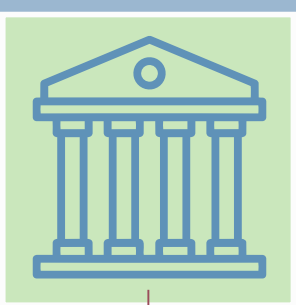
What helps...

Municipal housing and limited-profit housing providers act as large-scale property owners, enabling economies of scale for retrofitting and energy transition. Centrally managed housing stocks support coordinated and area-wide renovation measures.

supported by a combination of institutional and policy drivers, ownership and structural advantages, and strong technical and social know-how



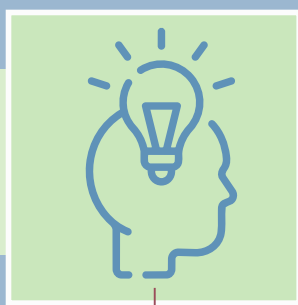
Drivers



Vienna benefits from long-established institutions for urban renewal and building renovation. Existing funding schemes are continuously adapted to support decarbonisation, such as the WieNeu+ programme building on decades of retrofit experience.



Strong technical, financial and social expertise exists in the implementation of building retrofits, including tenant communication and funding management. A long-standing culture of affordable housing ensures that renovation measures are designed with social protection in mind.



DESIGNING THE CITY OF TOMORROW: THREE KEY STRATEGIES FOR SUSTAINABLE URBAN DEVELOPMENT IN NORDBAHNVIERTEL

DENSIFICATION

= increase of population, land use and buildings per area by building closer and higher

TYPICAL STEPS

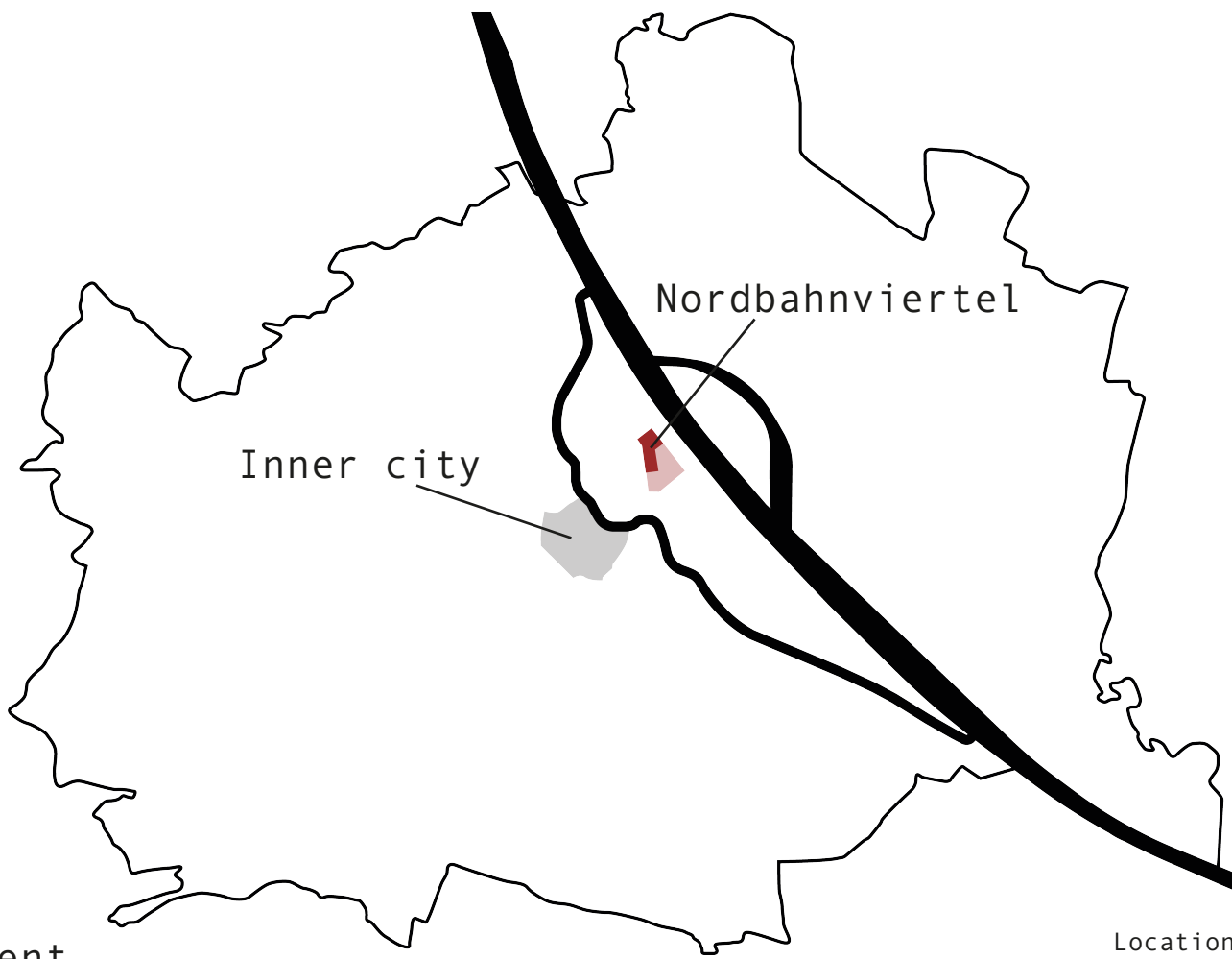
- _infill: building in gaps and open spaces between existing areas
- _redevelopment of existing areas
- _mixed-use areas

OUTCOMES

- _efficient land-use
- _shorter distances
- _car independence
- _vibrant urban life
- _mixed-use areas
- _increased housing

CHALLENGES

- _loss of green and open space
- _higher (living) costs
- _noises, crowds, less privacy
- _high pressure on infrastructure
- _driver for urban climate change



HISTORY

1900

major role for Vienna as a cargo and passenger railway hub, support for industrial growth because of connection to eastern Europe



1994

presentation of first guideline for dense housing development of the area by the city Vienna



2014

publishing of development guideline "Freie Mitte - Vielseitiger Rand": core planning concept with green/open space, density at the edge, mixed use



2019

first move-ins of residents



AFTER 1945

gradual decrease of railway activities, development of abandoned areas and brown areas

2013

beginning of comprehensive participatory planning process, by involving residents, experts, city authorities, stakeholders through workshops, public dialogues and Grätzl-Cafés

2018

constructions since 2000s but start of major construction phase along Bruno-Marek-Allee

TODAY

constructions are almost finished, beginning of planning new area Nordwestbahnhofviertel

VISUALIZATION OF THE 3 KEY STRATEGIES

1. URBAN DENSITY

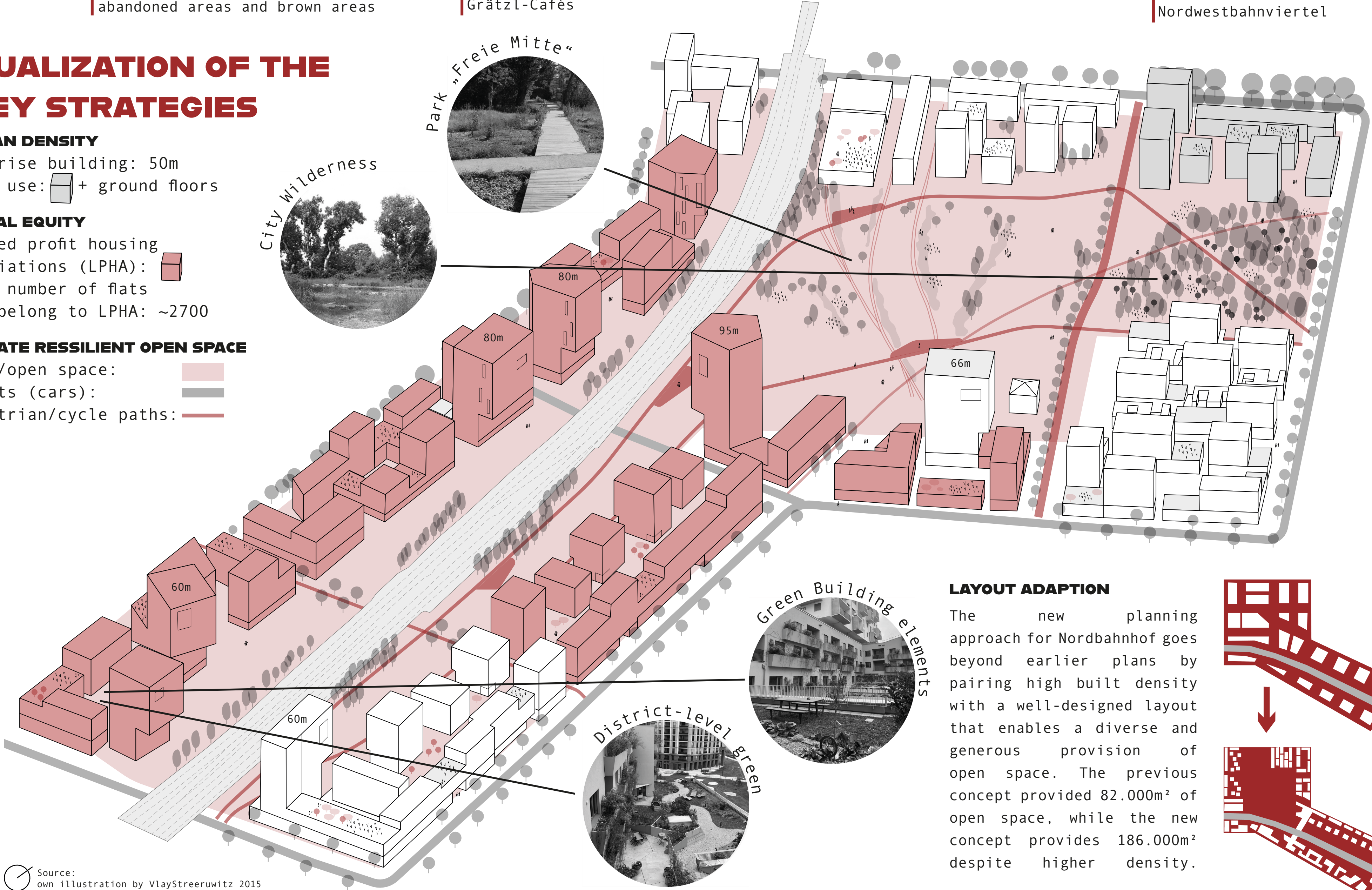
- _high rise building: 50m
- _mixed use: + ground floors

2. SOCIAL EQUITY

- _limited profit housing associations (LPHA):
- _total number of flats that belong to LPHA: ~2700

3. CLIMATE RESSILIENT OPEN SPACE

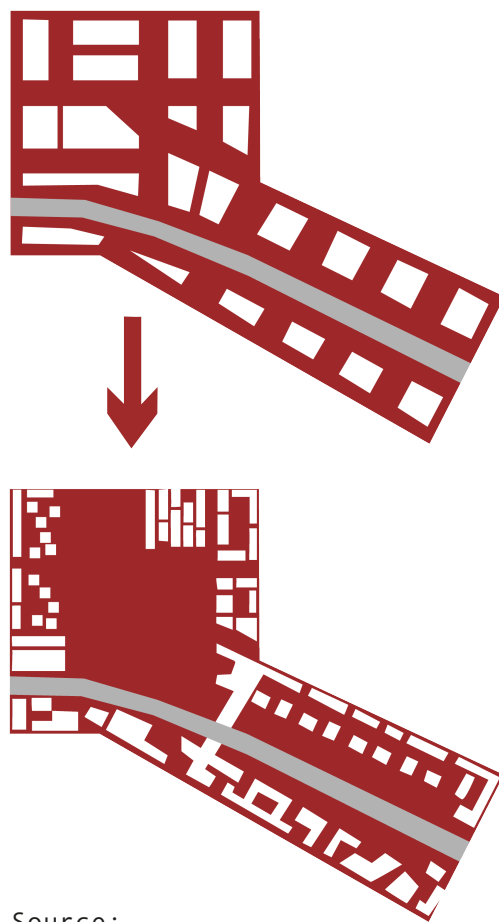
- _green/open space:
- _streets (cars):
- _pedestrian/cycle paths:



Source: own illustration by VlayStreeruwitz 2015

LAYOUT ADAPTION

The new planning approach for Nordbahnhof goes beyond earlier plans by pairing high built density with a well-designed layout that enables a diverse and generous provision of open space. The previous concept provided 82.000m² of open space, while the new concept provides 186.000m² despite higher density.

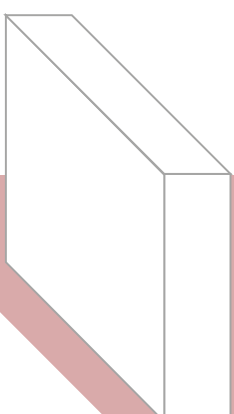


Source: own illustration by Magistrat Wien 2015

1. KEY STRATEGY: URBAN DENSITY AND COMPACTNESS

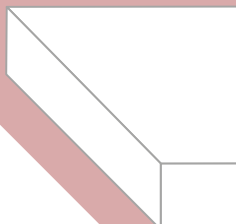
1. HIGH AND COMPACT

- _strong vertical accent, landmark
- _lots of open space remains, large shadows
- _clear edge at ground level, partly distant
- _strong contrast to the surroundings



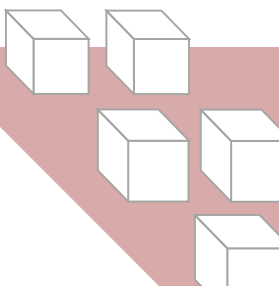
2. LOW AND SPREAD OUT

- _calm and grounded character
- _covers a large ground area, less open space
- _human scale, shorter shadows
- _squares and paths must be placed deliberately



3. DENSELY CLUSTERED

- _compact neighbourhood feel, short routes
- _more encounters, less privacy
- _comfortable scale, less light and views with small gaps
- _open spaces need clear structure and usable design



4. OPEN CENTRE

- _loose, landscape like character
- _more privacy, better ventilation and view corridors
- _longer routes, fewer spontaneous encounters
- _needs clear centres so community can form



Effects of different building forms and layouts with the same volume

Housing inequalities and the green transition
future.lab Center for New Social Housing
TU Wien | winter semester 2025/26
lecturers:
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Dr. Gerald Kössl
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Jara Zorzi [12502928]

Sources:
o.A.: https://www.arcguide.de/wp-content/uploads/T/A/TABORAMA-pressefoto_querkraft-hauesler.jpg [18.01.2026]
o.A.: <https://www.architectours.com/tour/vienna-nordbahnhof/> [18.01.2026]
Magistrat der Stadt Wien (2015): "Freie Mitte Vielseitiger Rand Handbuch"

Lin, Brenda, Jacqui Meyers, and Guy Barnett (2015): "Understanding the Potential Loss and Inequities of Green Space Distribution with Urban Densification." Urban Forestry & Urban Greening 14, no.4: 952-58.
Teller, Jacques (2021): "Regulating Urban Densification: What Factors Should Be Used?" Buildings and Cities 2, no. 1: 302-17.

2. KEY STRATEGY: SOCIAL EQUITY AND ECONOMIC SUSTAINABILITY / VIABILITY

SOCIAL JUSTICE AND ECOLOGICAL COMPATIBILITY

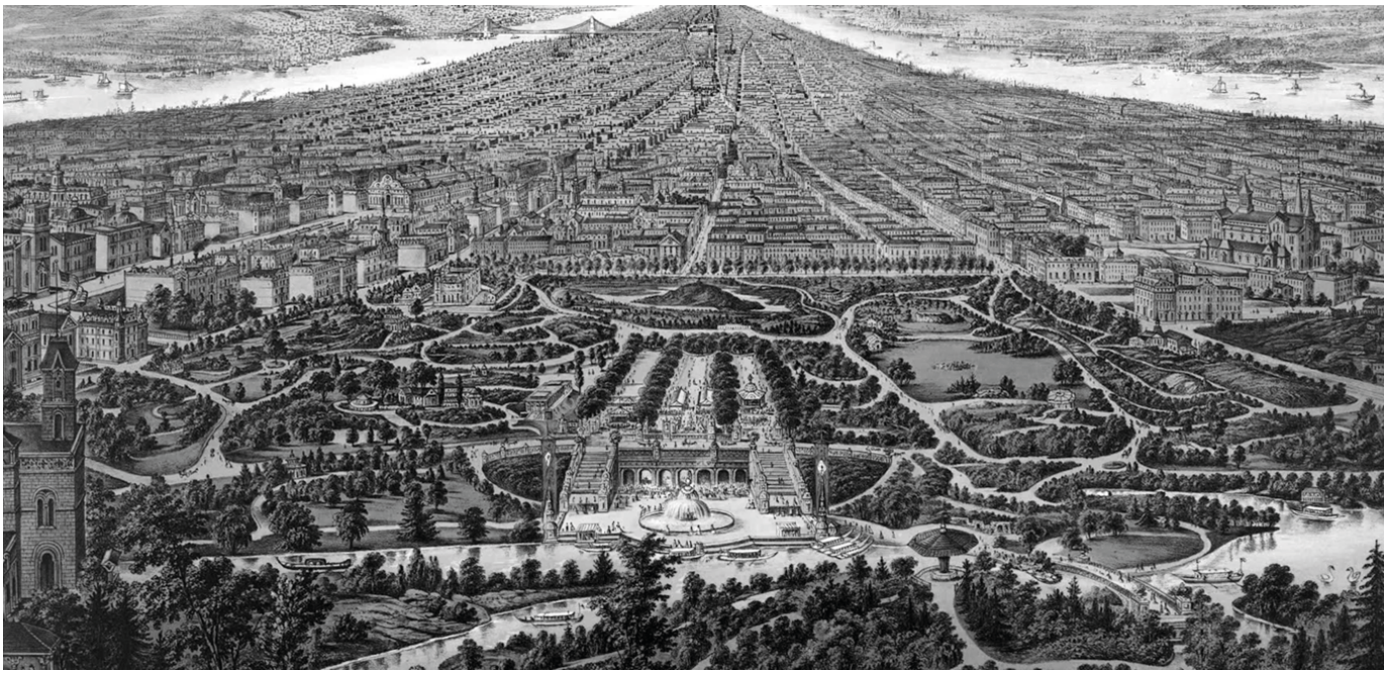
- _high proportion of subsidized housing
- _role of non-profit housing associations
- _rent control and subsidies (€6.35/m²)
- _mixed-use neighborhood structure
- _public transport connections
- _neighborhood square and urban edges
- _social infrastructure & public spaces
- _green spaces, playgrounds, community spaces
- _schools, daycare centers, local amenities
- _ensuring long-term affordability
- _stability of tenancies
- _creation of urban hubs
- _living + working + leisure
- _public transportation connections
- _neighborhood square and urban edges

ECOLOGICAL COMPATIBILITY AND BUILDING HEIGHT:

The sweet spot describes the building height at which construction costs, subsidies, and capped rents are bestbalanced. It istypicallybetween5and7stories.

COMPARISON OF AN URBAN PLANNING GESTURE:

Urban planning: Both projects utilize the same basic gesture: a central, generous green space surrounded by urban space. Social: Nordbahnhofviertel integrates social justice through subsidized housing; Central Park is a prime example of social exclusion due to the surrounding real estate market. Use: Nordbahnhofviertel is diverse and inclusive; Central Park's surroundings are exclusive and homogeneous.



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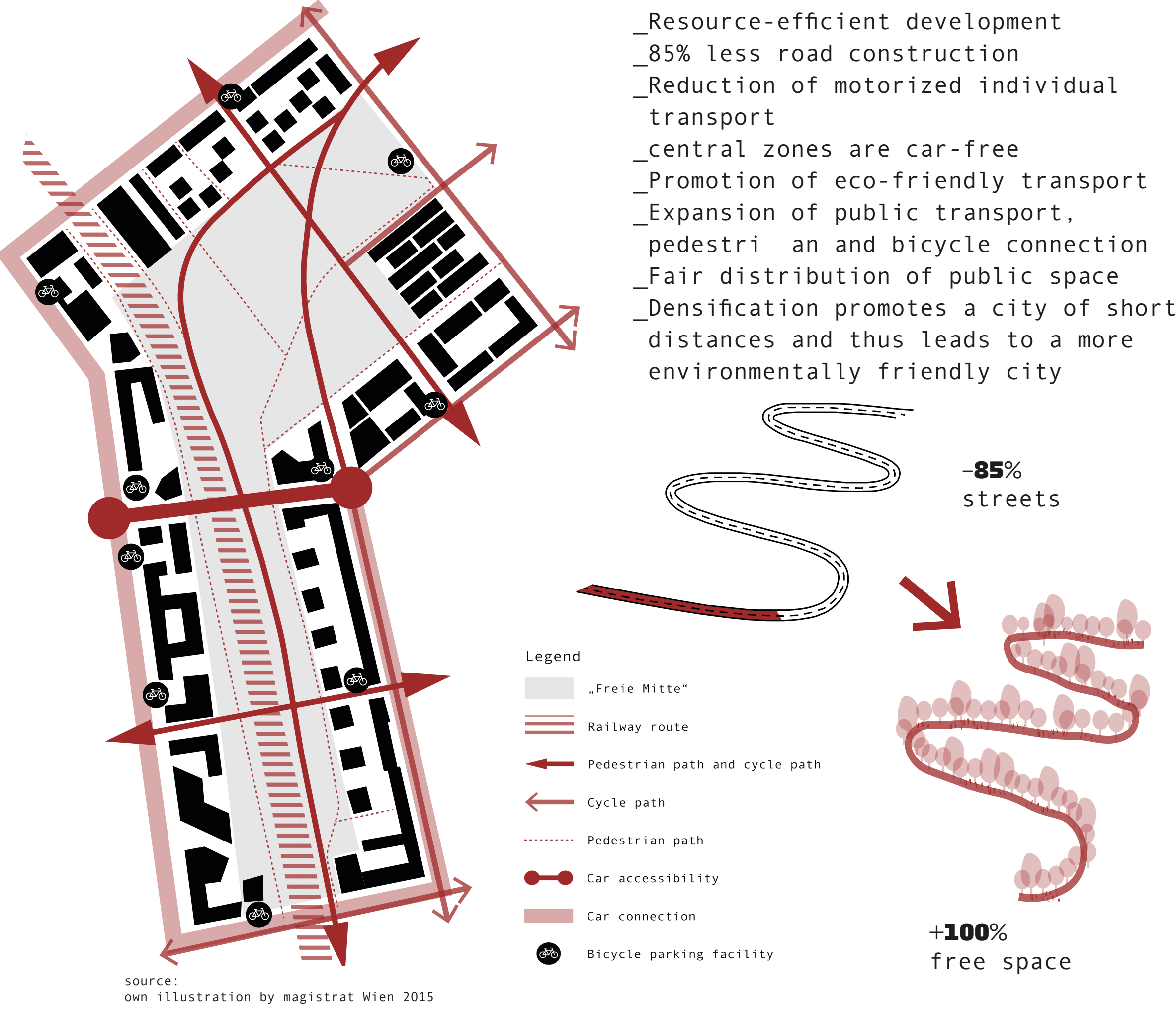


http://agenceter.de/project/freie-mitte-nordbahnhof-wien

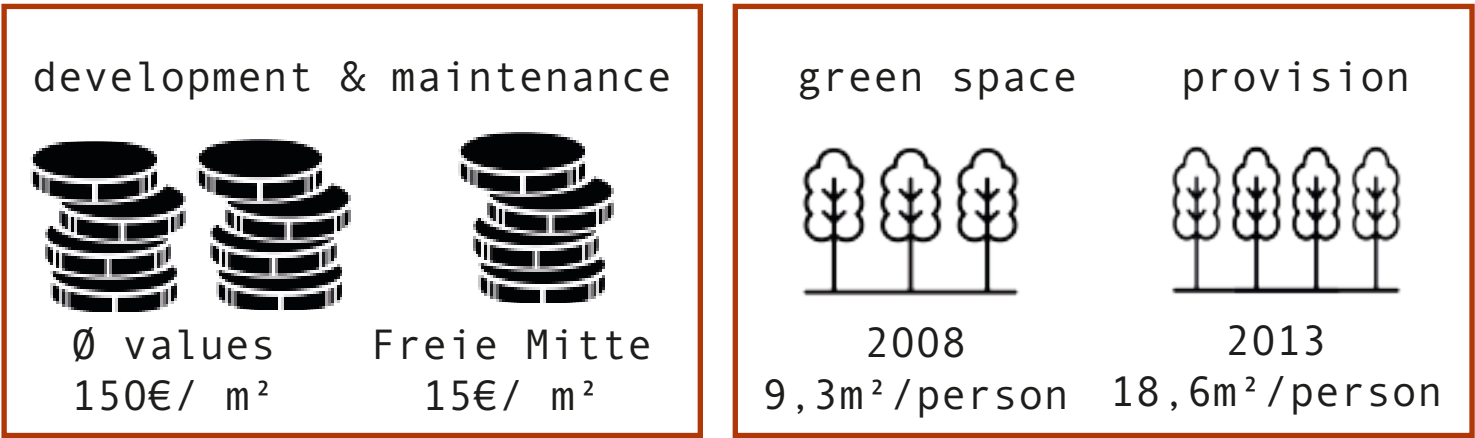
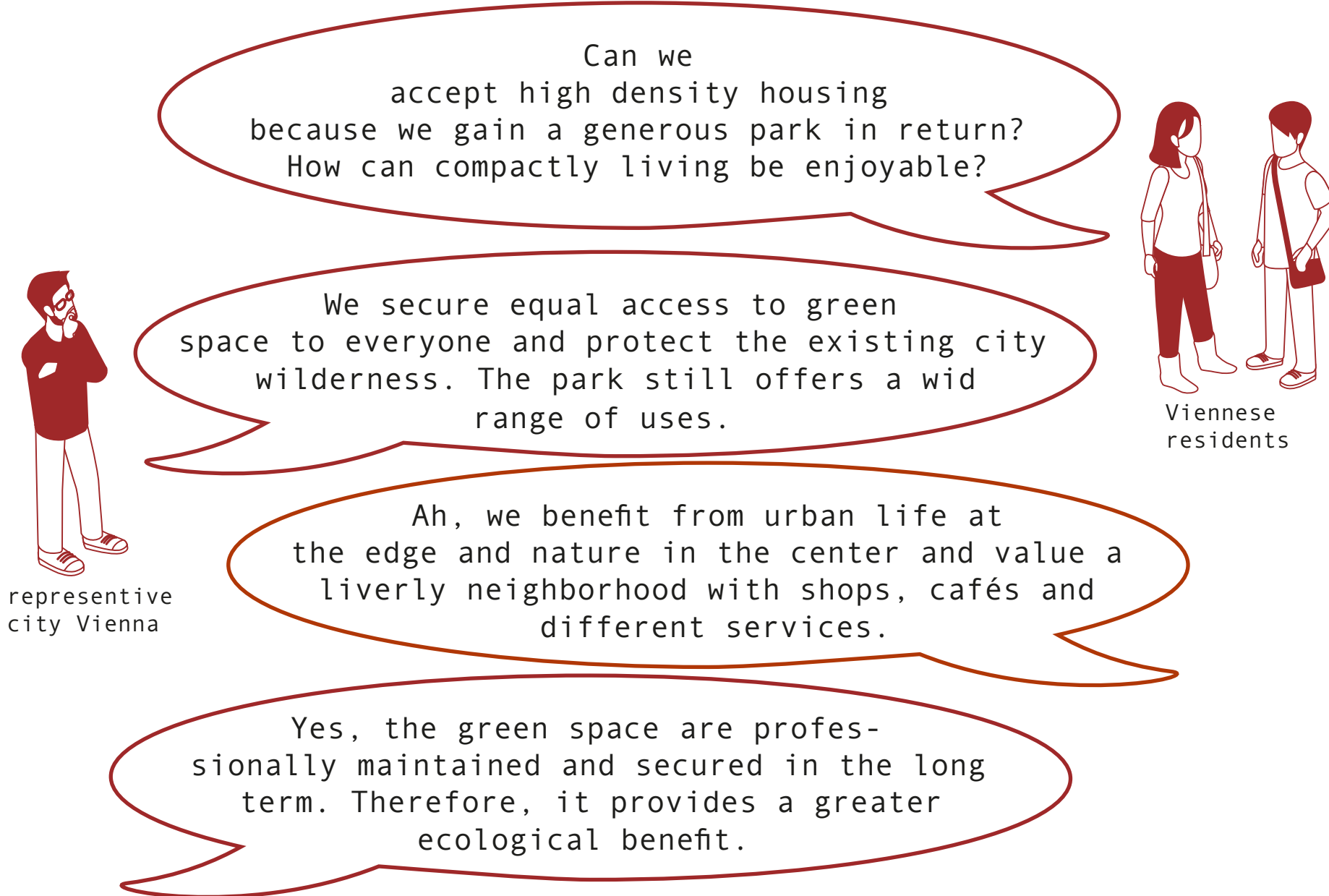
THE SAME URBAN PLANNING IDEA CAN LEAD TO VERY DIFFERENT SOCIAL REALITIES – FORM ALONE DOES NOT GUARANTEE SOCIAL JUSTICE; ONLY THE USAGE POLICY (E.G., SUBSIDIZED HOUSING) CREATES IT.

ASPECT	NORDBAHNVIERTEL	CENTRAL PARK, NEW YORK	BUILDING HEIGHT	MANUFACTURING COSTS €/M² WNF	TECHNICAL EFFORT	ECONOMY
urban planning gesture	central green space („Freie Mitte“) with urban edge	central green space in a dense urban area	2–4 floor	3.300–3.900 €	small amount (sometimes no lift)	low land use, high proportion of land costs
social dimension	subsidizes housing > social mixing	high real estate prices > social exclusivity	5–7 floor	4.000–4.500 €	moderate (1–2 lifts, standard technology)	best cost-benefit ratio
use	versatile: living, working, leisure	primarily luxury housing: homogeneous use	8–10 floor	4.600–4.900 €	high (more lifts, fire protection)	borderline
goal/effect	integration of green space, life and social justice	recreation in a public, but exclusive environment	>10 floor	5.000 € +	very high (high-rise standard)	mostly only special funding
central idea	„green heart“ as an urban and social center	„green heart“ as an urban center without social integ				

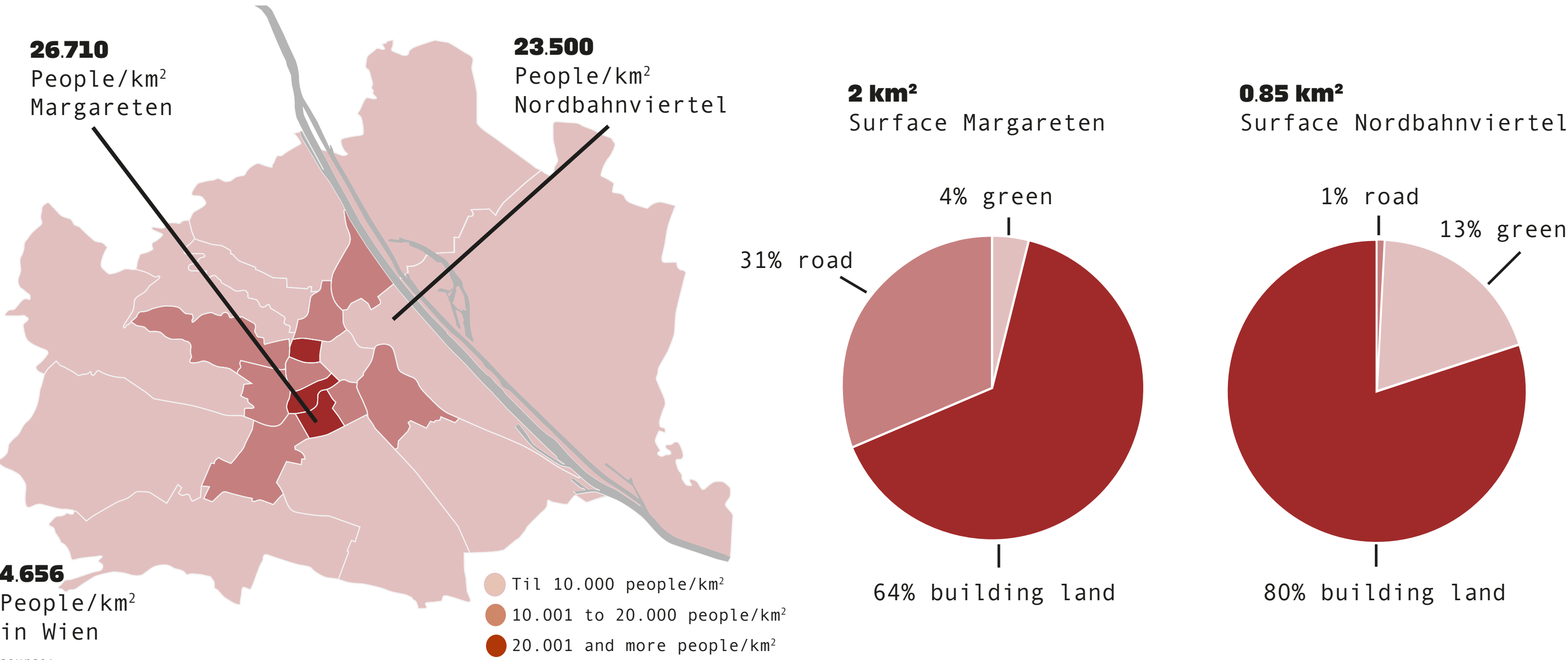
3. KEY STRATEGY: CLIMATE-RESILIENT OPEN SPACE



WHAT SPEAKS IN FAVOR OF THE URBAN DESIGN CONCEPT "VERSATILE EDGE – FREE CENTER" IN NORDBAHNVIERTEL?



COMPARISON GREEN SPACE BETWEEN NORDBAHNVIERTEL AND MARGARETEN



CONCLUSION

Nordbahnhofviertel shows that future-ready urban development is not achieved through a single measure, but through the interplay of key strategies: high density creates proximity and efficiency, yet it needs social fairness and economic viability to keep everyday life and housing affordable and stable. At the same time, climate-resilient open-space distribution becomes decisive for quality of life: more green and usable public space and less land devoted to traffic reduce heat stress, support biodiversity, and strengthen social encounter. When these three conditions are planned together, urban intensity becomes possible without trading off comfort, climate goals, or inclusion.