HIDDEN TREASURES

>Invisible Building Blocks of Sustainable City

Biotope City Wienerberg

IBA WIEN Neues soziales Wohnen

Für die Stadt Wien

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Content

Foreword

Finally! Climate adaptation measures in cities are on everyone's lips, and the willingness to implement the available know-how in a targeted and effective manner is increasing rapidly. However, it must be borne in mind that urban development and urban transformation processes will continue to extend over a considerable period of time, from urban planning configuration to actual construction, and that immediate action can often only take effect after several years.

It is therefore essential to be able to draw on concrete empirical values and proven solutions as quickly as possible. Biotope City Wienerberg fulfills this role for Vienna in many ways and with remarkable commitment and also provides proof that dense development, effective greening, and a high level of subsidized housing are compatible.

The measures used in this process were well-coordinated and integrated with a complex overall concept that will only be superficially apparent at first glance. Thus, although the building blocks of greening will be visible soon after settlement: large trees with a trunk circumference of up to 35 cm grown from the beginning, courtyards and roof areas prepared for garden use, as well as greened facades, loggias, and balconies with plant troughs already integrated structurally will come with a visibly high greening factor.

However, many of the measures, which represent a significant advance over conventional planning, additionally consist in process design and coordination as well as in technical or structural innovations that will not be visible to the naked eye after completion. These invisible building blocks, the „hidden treasures," make a significant contribution to cooling the entire settlement and its surroundings: effectiveness simulations already at the time of the urban design configuration, generous green spaces between the residential buildings that are not underslung, measures for rainwater management on the roof surfaces but also in the public space, bat nesting boxes integrated into the buildings to increase biodiversity, as well as the processes for accompanying community building and communicating the topic to residents are to be made visible and understandable in this publication. These contributions, which are not visible to the naked eye, neither to residents nor to visitors of Biotope City, are symbolized on the following pages by the treasure chest.

By making the **„Hidden Treasures"** visible, this publication aims to contribute to making the interrelationships of the individual measures comprehensible – and it desires to encourage imitation and further development.

Kurt Hofstetter and Amila Širbegović
IBA_Vienna 2022 – New Social Housing

Climate Change: Urban Planning in Uncharted Territory

Population Growth and Climate Change
The framework conditions for urban planning have changed dramatically in recent decades. Cities are currently dealing with worldwide developments that have now assumed almost dramatic dimensions: the global population explosion, 90 % of which is taking place in cities and metropolitan areas, global warming that is rising faster than suspected just a few years ago, significantly increased urban pollution, a dramatic decline in biodiversity, and, finally, the consumption of natural resources, which, according to the OECD, will double by 2060.

These tendencies have long been noticeable in European cities as well. They are affecting the quality of life through a sharp increase in hot days and tropical nights, an increase in deaths due to particulate pollution, flooding during long-lasting heavy rain events that overload the sewage system, and through storms and tornadoes of unprecedented strength that can tear off entire roofs. Trends that, according to all forecasts, will intensify in the future.

Measures must therefore be taken urgently to mitigate these developments. This applies particularly to planning and building, especially since the substantial influx of people into the cities also results in a high demand for construction.

For Vienna, this means that the population forecast predicts an increase from the current 1.87 million to 2 million by 2027. At the same time, the predicted average temperature increase in the Alpine region is twice as high as the global average. The city is therefore faced with the task of both creating housing for newly arriving people, especially in the lower-income sector, and at least securing, but if possible – in view of the circumstances that have now already arisen – improving the living conditions of its residents as a whole.

Space Area as a Scarce Good
The blue-green infrastructure of the city (i.e., parks, roadside greenery, etc. as well as the water bodies with their accompanying green structures) represents a central contribution to reducing the urban heat effect. However, open and green spaces are in direct competition for space with housing due to population growth. Thus, in addition to the various positive functions of the blue-green urban infrastructure, it is necessary to show its importance for the urban climate and strengthen the instruments that help to implement and permanently secure green and open spaces. If – as is usually the case – construction activity is carried out at the expense of existing green and open spaces without however ensuring sufficient open space qualities in the surrounding area and a corresponding compensation, this means a reduction in the quality of life, climate resilience, and ecological functionality at the neighborhood as well as the district level. Measures can include creating new open spaces, quality improvements in existing ones (e.g., increasing the quality of stay, upgrading the planting), an improvement in accessibility (keyword open space connectivity), and ensuring extensive greening measures in new construction.

For the development of the area around the former Coca-Cola site, this meant from the very beginning that the goal was to achieve a high density of development while at the same time improving the quality of life despite the changed conditions mentioned above. With the planning of the new development area according to the Biotope City model, the city, developers, architects, and landscape architects ventured into new territory: a neighborhood was to be created that would offer affordable housing in a densely built-up area and at the same time be climate-sensitive by integrating flora and fauna to a high degree, thus proving to be environmentally compatible and sustainable.

Heat and drought in the summer months are becoming more frequent.

© Michael Schick

Evaporation: On hot days, „spray showers" provide cooling in Vienna.

© Wiener Wasser, C. Fürthner

Common Goals

Everyone Makes a Contribution!
A first „treasure" that will remain invisible in the built city in the future is a building block that was and is fundamental to the success of the Biotope City approach: cooperation with a common goal!
The impulse of the visionaries Harry Glück and Helga Fassbinder was enthusiastically taken up by Rüdiger Lainer, who became the driving force behind the implementation and the provider of ideas and design in the concrete urban planning. They succeeded in engaging participants at all stages of the planning, design, and construction process for the objective of a Biotope City: the participants in the first cooperative procedure, the architects who joined in the design phase, the experts, coordinators, magistrate's employees, and above all the developers, and finally also the contractors and their employees in the construction phase. They were all united by the guiding idea of a Biotope City, and they were all ready to pull together to meet the ambitious goals and build a sustainable city, inspired by the „spirit of Biotope City," as it could be heard.
They all brought and continue to bring their contributions to this challenging endeavor, according to their tasks and with full use of all their possibilities – and this not only concerning the future climate resilience of the new urban quarter and limited to the planning and realization process but also in social terms and in terms of the continuous phase of use after the residents have moved in: with the common spaces and facilities of the micro axis and the jointly developed innovative greening concepts, implemented and maintained throughout the project, the developers take joint responsibility for the neighborhood.

How is Vienna Dealing with Climate Change?

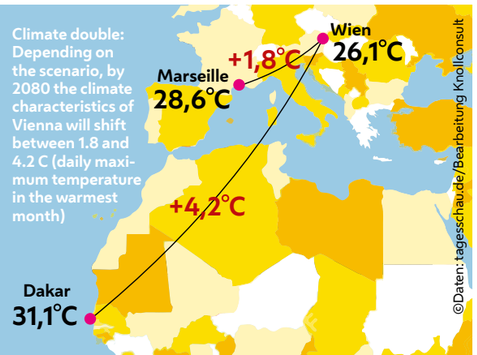
Adaptation to climate change has always been seen in Vienna as part of its climate protection policy and thus as a necessary and equivalent supplement to the climate protection program (KLIP, KLIP II). This allows synergies between climate protection and climate change adaptation to be exploited, and possible counteracting overlaps, such as in the coverage of future cooling requirements, can be identified at an early stage.

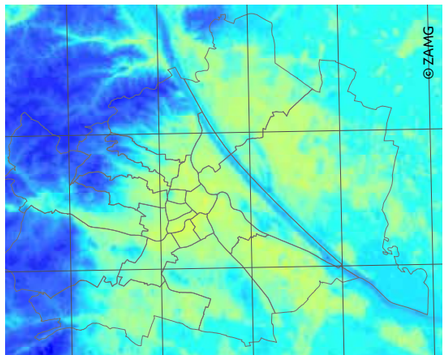
Consequences of Climate Change for Vienna
In recent decades, climate change has also led to a change in climatic conditions in Vienna. For example, Vienna's average annual temperature has already increased by about 2 C over the last four decades. Heat waves, heavy rain events, and dry periods have increased. Studies predict a further warming of up to 4 C by 2080 and a particularly significant increase in days with temperatures above 25 C. For the city and its inhabitants, this means a slow shift of Vienna's climate characteristics towards the south (see figure). According to climate research, Vienna is among the top 5 European cities most affected by climate change, along with Rome, Athens, Zagreb, and Zurich. Heatwaves in particular will occur especially frequently in Vienna.

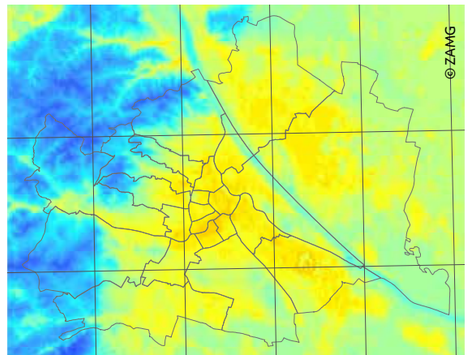
Planning Instruments of the City of Vienna
The city of Vienna is bracing itself for a warmer future and the associated tasks. Due to its long planning horizon, urban planning in particular is already challenged today to cope with the changed conditions in future decades. In order to answer climate-relevant questions, the City of Vienna provides planners with two essential bases or instruments: the climate function or climate assessment map, which provides information on the current climatic functions in the entire urban area, and the Urban Heat Islands Strategy Plan Vienna, which describes methods and strategies as well as concrete measures for adaptation to climate change. In addition, studies as well as binding specialized concepts of the City of Vienna on the topic of green and open space (early green, specialized concept for green and open space, specialized concept for public space, etc.) provide guidelines and methods for a sufficient and high-quality green infrastructure, which is of great importance especially in the light of strong population growth and advancing construction activity.

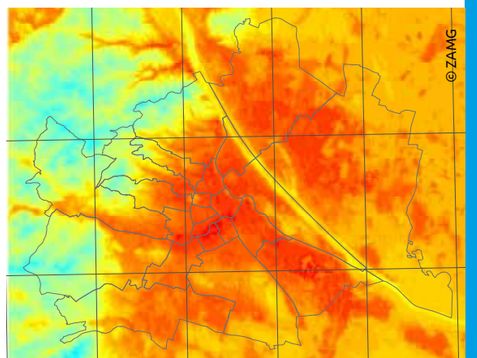
Climate Function Map
The climate function map shows an area-wide, detailed representation of the thermal and dynamic conditions of the actual climatic state for the area of the city of Vienna. The climatopes delineated in the climate function map (forest climate, water body climate, urban climate, inner-city climate, etc.) describe units with similar microclimatic characteristics. The map also shows the main ventilation functions (air-guiding paths, night mountain wind, cold air runoff, etc.). The climate function map is an essential input variable, especially for the construction of new urban quarters and for the estimation of the impacts of smaller construction projects and open space planning.

UHI STRAT
The Urban Heat Islands-Strategy Plan Vienna (UHI STRAT) describes different possibilities to avoid urban heat islands. It contains detailed information on the effectiveness of the individual measures on the climate in the city and the neighborhoods. In addition, the strategy plan provides information on the advantages and possible hurdles in the implementation of measures as well as the expected effort for construction and maintenance. The UHI STRAT was developed under the leadership of the Vienna Environmental Protection Department (MA 22) together with BOKU Vienna and numerous specialized departments of the City of Vienna.









Climate simulations for Vienna: Development and forecast number of annual summer days (maximum temperature ≥ 25°C) (from left to right) 1971–2000, 2021–2050, 2071–2100

Scale summer days per year

10	60
15	65
20	70
25	75
30	80
35	85
40	90
45	95
50	100
55	105
60	110
65	115
	120

Urban Heat Island Strategic Plan Vienna

The Fields of Action

1. Building Knowledge and Competencies
- Awareness of the population
- Awareness of the planners
- Preparation of guidelines for dealing with or preventing urban overheating

2. Acting Strategically and with Foresight
- Measures effective in the long term
- Early consideration in the planning process

3. Setting Concrete Measures
- Local or building-related measures
- Individual buildings, streets, green and open spaces
- Incentives for private individuals (incentive program)

Download UHI Strategic Plan, City of Vienna:

The Project Biotope City Wienerberg

The new neigbourhood in Vienna-Favoriten is located on the approximately 5.4-hectare former „Coca-Cola-Areal" on the Wienerberg and was designed, planned, and built according to the principles of „Biotope City" (page 12). The project is a continuation and contemporary implementation of the intentions of the work of architect Harry Glück, who was responsible for numerous innovative residential buildings in recent decades. In the course of initial considerations for the future development of the Coca-Cola site, architect Glück contacted the Biotope City Foundation with the aim of implementing this model of future-oriented, urban living and housing in Vienna. The methodical approach complements previous advanced procedures and techniques in planning and building and partially replaces them with innovative approaches of intelligent cooperation between humans and technology with flora and fauna.

Future Questions and Answers of Nature
The renaturation of the dense city, i.e., restoration of near-natural habitats, is the goal: the city becomes part of nature. The regenerative mechanisms of nature are used as instruments to cope with climate change. In addition to the local climatic and ecological effects, this means an increase in well-being and an improvement in coexistence through an active approach to flora and fauna. The former, almost completely sealed industrial area becomes a sustainable urban district.

One Neigbourhood – Many Tasks
Beyond the quantitative and qualitative satisfaction of housing needs, the project Biotope City Wienerberg serves as an urban laboratory, research space, and field of experimentation to develop innovative offerings, to analyze the coexistence in the green city of the future as a social space, and to promote the development of the city, and to develop the procedures and planning processes to meet the high requirements.
The area is designed for a mix of uses in many respects. In addition to the different types of housing on offer (freely financed/subsidized, rental/ownership, various apartment sizes, SMART apartments, apartments for people with special needs, assisted apartments), the neighborhood offers community spaces, mixed green and open spaces, a school, and a kindergarten. In this context, only the condominiums are freely financed, while all rental apartments are built within the framework of social housing. Various community facilities, for example in the area of sports and fitness, can be used by all. In addition, swimming pools are located on the roofs of the buildings with rental apartments in the social sector.

"The most essential innate needs of man by virtue of his tribal conditioning, i.e., his biological disposition and preconditions, are: the need for contact with nature, for sociability, for open views, for proximity to water, for opportunities for physical activity, for creative activity (even of the simplest kind), for significance, orientation, and identification, and for connectedness with a territory, a ‚turf' of its own."


© Hertha Hurnaus

Harry Glück, Architect

Schriften zur Architektur für Menschen, Vienna 2018

Facts and Figures – The New Neighbourhood at a Glance

On 5.4 ha of total area there are:
- approx. 990 apartments
- of which approx. 600 in the social rental sector
- 1 school, 1 kindergarten
- 2 swimming pools
- about 250 trees
- 8,900 m² meadow areas
- 930 m² perennial areas
- 13,600 m² green roofing
- 2,200 m² facade greening
- 760 m² retention pond
- 2,000 m² children/youth playgrounds
- 600 m² community gardens
- 3,850 m² ground floor gardens
- 420 bike parking spaces
- 1,720 m² common rooms
- approx. 20,000 m² of commercial space
- 152 hotel rooms

Costs
The estimates for the costs of the greening measures are around € 37.7 per m² of floor area. This is about 2.5 % of the estimated total construction costs. On the other hand, there is an invaluable added value for the sustainability and quality of life in the neighborhood. The annual maintenance costs amount to only about € 2.13 per m² of floor area (taking into account the maintenance services provided by the residents for the apartment-related troughs).

Landscape architecture Biotope City Wienerberg:
Masterplan open space/preliminary design: Auböck + Kárász Landscape Architects
Design, detail, and implementation planning open residential space and public areas: Knollconsult Umweltplanung ZT GmbH
Design, detail, and implementation planning school: Carla Lo Landschaftsarchitektur

Biotope City: The Dense City as Nature

The mission statement „Biotope City“ was created in 2002 by the German-Dutch urban planner Helga Fassbinder, presented at an international conference of the same name at the TU Eindhoven, and has since been propagated by the Dutch Biotope City Foundation.

The mission statement addresses the integration of nature into the city as a strategy for mitigating the effects of climate change. „Biotope City“ as a term already signals it: This mission statement assumes a mutual win-win situation in the coexistence of humans and nature even in densely developed areas. High density and urbanity are not seen as opposites to nature; instead, appropriate planning in the dense city creates space for flora and fauna at the same time, enabling a healthy living climate and contributing to climate resilience.

Biotope City is the sustainable city of a humane, environmentally sound society. A city, dense and extremely green, which has a different, new beauty than the one we – trained in modernity – are used to: a sustainable response to the challenges of climate change and heterogeneity of the population for a healthy coexistence in the city.

The Biotope City model offers a new platform for cooperation between various disciplines, from urban planning, architecture, and landscape architecture to ecology and vegetation technology. The central practical approach can be described with the slogan: a green skin for the city!

The merits of leafy greens are well known: Leafy greens produce breathable air, lower hot summer temperatures, regulate humidity, clean the air by attracting particulate matter, help delay water runoff when it rains, and last but not least, are good for stabilizing and enhancing biodiversity. In short, leafy greens are by far the most beneficial means of mitigating climate change and environmental impacts. In addition, looking at leafy greens is good for the soul; it promotes healing processes and alleviates depressive moods, as has been widely scientifically proven.

This means using nature wisely to complement and enhance the effects of technical and social solutions.

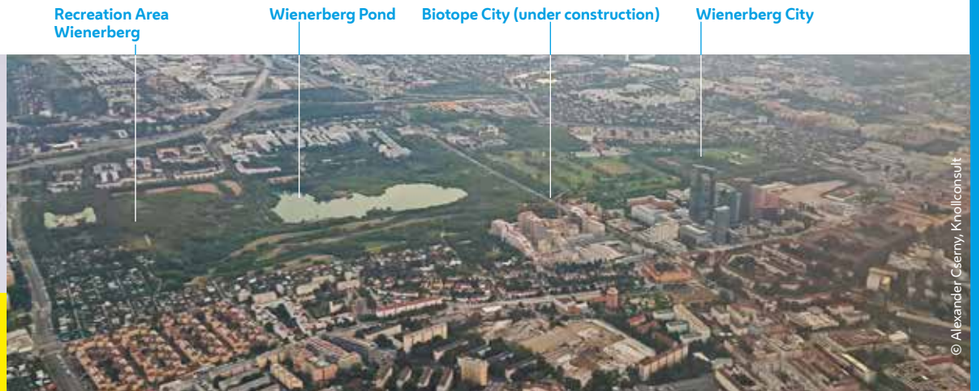
The Biotope City concept is based on three key principles:

1. Renaturation of the city – not through lower density (a la garden city), but rather the dense city itself becomes nature – through intensive greening and habitat offers to the fauna: the city becomes the place of a conscious cohabitation of humans, flora, and fauna.
2. The regenerative mechanisms of nature are used in interaction with viable as well as advanced techniques of construction to mitigate climate change and environmental degradation: cooperation with nature for a climate-resilient urban living environment.
3. The experience of nature and the possibility of active interaction with nature contributes to healthy living conditions and the well-being of residents, which provides suitable conditions for a stable, pleasant neighborhood.

Conclusion: a win-win situation for people, plants, and animals!

"People must develop a modus vivendi in dense cities that offers survival not only to them but equally to a rich flora and fauna. It can only be done together. We have to find the mode of a win-win situation: the dense and at the same time green city, the Biotope City. In this way, we can use the regenerative mechanisms of nature as instruments for coping with climate change and pollution. Then we will have a double gain at the same time: in actively managing nature, we also achieve an increase in residents' well-being and social stabilization."

Helga Fassbinder,
Biotope City Foundation



Mission Statement Biotope City

What does it mean

1. Urban **climate regulation through plants**: temperature reduction through trees, shrubs, perennials, meadow areas (extensive and intensive), and roof and vertical greening, and thus increase of thermal well-being in open space as well as energy cost savings through shading and thermal protection of building structures
2. Optimization of the **wind field** for the microclimate
3. **Water retention** through infiltrating surfaces and drainage of surface water into the adjacent green areas
4. **Storage of precipitation water** leafy green and roots, rain gardens, ponds, cisterns
5. **Fine dust and pollutant absorption** by plants
6. Contribution to the CO_2 balance: **fixation of CO_2** by plants
7. **Compensation of sealing** through greening measures
8. Enrichment of **biodiversity**
9. Outdoor **exercise and meeting space for residents**, especially children and the elderly, neighborhood contacts.
10. **Experience of nature** as an essential part of life with its positive effects on mental harmony and healing

The Biotope City as a Think Tank and Urban Laboratory

The Biotope City Wienerberg has attracted strong academic interest from its very beginning. With the decision to build the neigbourhood according to the Biotope City criteria, it was clear that the latest findings and methods would be implemented, with state-of-the-art technologies and with interaction that can have high exemplary effects for future urban development projects.

Simulations and Certification
During the development of the Biotope City Wienerberg, great attention was paid to climate adaptation from the very beginning. With the help of microclimatic simulations and analyses, the open spaces were optimized in this respect. Due to the open space equipment and the vegetation used, the temperature has been significantly reduced. Simulations carried out by „Green4Cities," a company specializing in urban green infrastructure, impressively demonstrate the positive effects of greening. They showed that Biotope City acts like a natural urban climate system: The air body flowing through the neighborhood is cooled by 1.8°C and thus also produces a cooling effect for the immediate surroundings. Due to the extraordinary microclimatic effect, the Biotope City Wienerberg was awarded the GREENPASS® GOLD certificate.

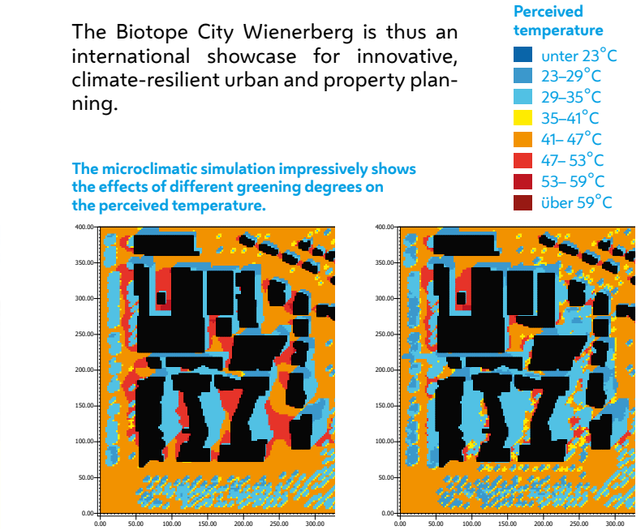
The Biotope City Wienerberg is thus an international showcase for innovative, climate-resilient urban and property planning.

"The scientific monitoring of this first urban planning project with the guiding principle of Biotope City by a multidisciplinary research team led by the University of Natural Resources and Applied Life Sciences was a particularly fortunate circumstance. Since new ground was broken with the concretization and implementation of the measures in many cases, the expert knowledge gathered here proved to be extremely helpful. The experiences and conclusions, summarized in a guideline, will help pave the way for future Biotope City projects."

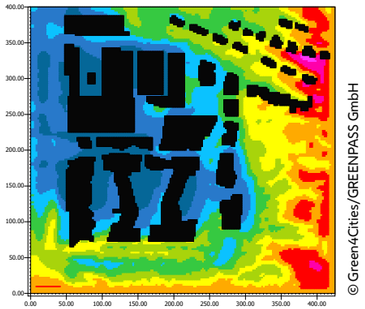
The research team

Scientific Monitoring
Quality assurance and the generation of transferable, generalizable experience is another unique feature of Biotope City. Learning from practice to develop strategies and methods for future projects gives the Biotope City Wienerberg project a model character. In order to learn from the experience for future neighborhoods, the development of the district is scientifically accompanied by an interdisciplinary team of researchers under the leadership of the Institute of Landscape Planning of BOKU Vienna (within the project „Biotope City – Construction Manual for the Green City of the Future") and the Biotope City Foundation.
The scientific monitoring analyzes the prerequisites, methods, and techniques for developing dense, socially sustainable, inclusive, and green urban neighborhoods and, based on this, makes recommendations for the construction of other new residential neighborhoods. The performance of green-blue infrastructure – i.e., trees, planting or water areas – and their contribution to the quality of life, biodiversity, climate change adaptation, or coexistence are also the focus of the research.

The microclimatic simulation impressively shows the effects of different greening degrees on the perceived temperature.



Cooling effect of the Biotope City on the air temperature of the environment



Contents and First Conclusions from the Research Project

- The monitoring of the planning and implementation process of the Biotope City Wienerberg shows that in principle all Biotope City criteria can be implemented to develop green and climate-resilient urban districts.
- However, the master plan with the quality catalog alone (see page 19) does not guarantee the implementation of the mission statement. However, the joint mission statement creates a robust identification framework and a clear goal.
- Cross-site coordination is key to the successful development of Biotope City neighborhoods.
- Increased coordination between architecture and landscape architecture – especially in relation to building greening – is necessary.
- A prerequisite is an operationalization and detailing of the criteria from the master plan with the quality catalog adapted to the respective planning and implementation phase.
- The coordination and harmonization of the interfaces in the planning and implementation process are necessary for quality assurance. In order to take the architectural, social, and ecological qualities into account accordingly, an interdisciplinary „support group" is recommended for future projects.
- This monitoring group should – as the research work also shows – support the implementation of the measures by providing ongoing and accompanying advice and documentation. This requires the timely provision of all relevant information from the planning and implementation teams
- Quantifying the performance of urban green infrastructure – such as through microclimatic simulations or the green and open space factor – supports the implementation of measures.

Design and Construction of Biotope City

The innovative character of Biotope City Wienerberg is evident not only in what is built but also in the structure of the planning process and the handling of the construction. The department for Urban District Planning and Land Use (MA 21) was the lead agency in the planning process and defined the agreed qualities with the help of the zoning and development plan and the urban development agreement with the developers. MA 21 is also responsible for monitoring compliance with this agreement.

Cooperative and Integral Planning Process

After the preliminary studies by the Glück & Partner office and contacting the Biotope City Foundation, the work of an interdisciplinary planning team began in 2013. There was a group of planning experts who covered the fields of urban planning, architecture, open space planning, social neighborhood development and participation, mobility and traffic, engineering biology as well as landscaping and an evaluation group with members of the city administration, construction technology and spatial planning, district leaders, and developers. In the course of several expert workshops and reflection phases, urban planning approaches were developed and the main statements for the urban planning master plan were derived from them.

"The city of the future needs to be dense, but it also needs its inhabitants to be in touch with nature and to have a cooling response to global warming. That is what we have been pursuing since the first Biotope City project idea."

© Wien Süd

Walter Koch, Wien-Süd

The goal of the process was to define the urban planning guiding principle with the ecological criteria of Biotope City to such an extent that it can be brought to implementation.

Master Plan with Quality Catalog

The master plan served to sharpen and concretize the considerations of the cooperative planning process and resulted in a binding catalog that ensured the qualities of a Biotope City for the further development, planning, and implementation steps. Processed contents were social, urban planning, and architectural principles, open space, organizational quality assurance, an innovative mobility concept, and a differentiated examination of urban sociological aspects. The master qualities ultimately became part of the urban planning agreement between the City of Vienna and the developers.

Quality Assurance Across Building Sites

In order to ensure the implementation of the quality catalog, the overall project coordination was commissioned with quality assurance across all construction sites for both the planning and execution phases. As the central interface between the developers, the City of Vienna, the planners and the contractors, it constantly monitors the qualities in the various areas (green space, architecture, social issues, etc.) and ensures that they are taken into account. A traffic light system was introduced as an aid and communication tool to make it easy to see where action was required. Regular reporting to the City of Vienna (Municipal Department 21) and corresponding coordination meetings served the ongoing evaluation and control of compliance with the urban development contract.

Urban Mining: The Site as a Resource Depot

The construction industry uses 70 % of all raw materials in the material flow in Austria and is at the same time responsible for 70% of the waste generated. For Biotope City Wienerberg, the aim was to exploit the possibilities of the former industrial site for the recovery of building materials by processing the demolition material. After the analysis of the materials, the planning of the construction site logistics, and the start of the demolition work, the material was classified according to grain size and area of application and used on the construction site as technical fill material, as road substructure, and as drainage and gabion material. A total of around 30,000 tons of demolition material was processed. This meant that there was no need for waste to be removed or for construction materials to be transported to the site. On-site processing, using mobile crushing and screening equipment, enabled further potential savings to be exploited, with a 90-percent reduction in CO_2 emissions and a 50-percent reduction in processing costs.

As part of a „social urban mining" project, manual dismantling of insulation panels by disadvantaged people in the labor market helped to prevent a further 450 tons of waste.

Biotope City construction site in spring 2019

© Stiftung Biotope City

Shared Soil

In keeping with the Biotope City guideline of „natural open spaces with earth cores to provide a nature experience," the urban mining approach supports the goal of building a resilient habitat adapted to the consequences of climate change. The area was previously completely sealed with its base area of 50,000 m².

The goal of creating natural soil cores and vegetation areas led to interlinking with the neighboring „Wildgarten" construction site. In the course of the construction work there, 20,000 m³ of naturally grown topsoil was excavated and stored. Instead of the usual landfilling, it is planned that the material will be used in both projects. Due to the short distance between the two construction projects (< 5 km), this cross-site recycling saves landfill volume and transport trips.

The naturally grown topsoil is not only to be used for backfilling and terrain modeling in the open space. The production of high-quality planting and soil substrates is also planned. Together with partners from the University of Natural Resources and Applied Life Sciences, research is being conducted into the production of on-site substrates.

Urban Planning and Architecture

Biotope City from Scratch
The considerations in the construction of a Biotope City do not begin with the architecture and landscape architecture. Ecological, climatic, natural, and sociological factors were already included in the urban planning scale, i.e., in the master planning and the development of the corresponding specifications. In the development of the urban planning approach, proven principles of architect Harry Glück – highest residential quality with high density and economic affordability – were taken up and further developed with current findings in the field of social and ecological district development (Biotope City model), with Rüdiger Lainer playing a pioneering and structuring role as an „influencer."

Micro Axis
The central element in the urban design is the urban „micro axis," which extends over several building sites in the neighborhood. Along this axis, community facilities for fitness, sports, events, and activity rooms for all generations are arranged.

Green "Residential Fingers"
Starting from the urban micro axis or partially penetrating it, four north-south running building sequences with three landscaped green spaces in between form the basic structure of the quarter. These open spaces, flowing from south to north, protrude like green fingers from the neighboring Wienerberg recreation area into the neighborhood, thus integrating the Biotope City into the landscape.

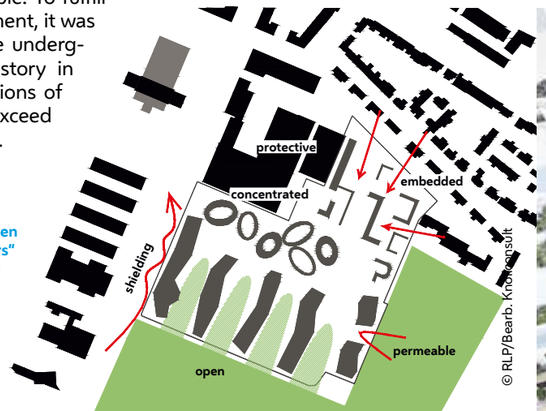
Smallest Possible Footprint
The areas between the buildings, especially in the construction areas south of the micro axis, are designed as attractive, varied, intensively planted park areas. A prerequisite for this was that the areas be underbuilt as little as possible in order to preserve extensive earth bodies.

The goal then is to create „true green spaces" – ecologically, hydrologically, vegetatively fully functional areas with an earth core corresponding to the natural site conditions. The key is to keep the „footprint" of the buildings as small as possible. To fulfill the Biotope City mission statement, it was therefore decided to make the underground parking garages multi-story in order to not allow the dimensions of the underground garages to exceed the boundaries of the buildings.


© RLP

"Developing a sensual and meaningful piece of the city was a common aspiration. The superimposition of different dimensions and spatial sequences creates the necessary diversity. The southern greenbelt continues between the large, kinked greened volumes, and the microzone is a complex, small-scale urban space with vibrant ground floors and diverse activities."

Rüdiger Lainer, Architect



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Urban design: green „residential fingers" as a connection to the surrounding landscape area

Specifications for the Architecture
The architectural guidelines for Biotope City are building structures with ecologically and economically favorable geometry, which allow for economic volumes with high social value.

The building concept based on "Glück's principles" ensures affordable housing. Cost savings are achieved, for example, through the intelligent use of synergies such as the reduction of staircases in building areas connected by structures, through the use of servitudes of neighboring developers, through the rational use of elevator systems to reduce energy and construction costs, as well as through efficient apartment typologies, e.g., large, usable individual open spaces, flexibility and variability, closet spaces, etc.
A wide range of housing models and versatile residential concepts ensure a lively, socially mixed neighborhood.

The "living ground floor," especially along the micro axis, is equipped with communal, development, and appropriation spaces for general use as a concrete added value of the housing program. In addition, there are community facilities, e.g., for fitness, sports, events, rooftop swimming pools, and activity spaces for children and youth.


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Master Qualities

In the urban development contract between the City of Vienna and the developers, the following qualities, among others, were agreed upon:

Urban Planning
- Joint urban development concept with a binding master plan
- Superficial car-free facility
- Site-wide generous attractive green spaces/ urban spaces with diversity and intensity of use
- Planning of basement floors across building sites, construction site logistics, ecological building materials, supply concept, overall technical concept (use of sustainable energy potentials)
- Coordinated construction process

Architecture
- Ecological and economical building structures and geometries with high social value
- Range of housing models
- Efficient housing typologies
- Lively ground floor zone
- Community facilities

Free Space
- Extensive, attractive green spaces
- Building greenery, diversely designed, intensively planted
- Use of large trees
- Greened open spaces per residential unit also as thermal buffer zones
- Intensive planting on the building structures
- Use of ecological materials
- Rainwater management
- Diverse vegetation ecology types
- Retention pond as a transition to the landscape conservation area
- Habitats for various animal species

Green and Open Space as the Key to a Climate-adapted City

Greening as a Central Element of the Biotope City
The main tool for implementing Biotope City is the comprehensive greening of buildings and outdoor spaces. Greening provides a natural mechanism in mitigating a range of the consequences of climate change. Through the comprehensive greening measures, the following effects are achieved at the same time:

- Reduction of midsummer temperatures and thus reduction of heat days
- Rainwater retention and thus relief of the sewage systems
- Reduction of environmental pollution (particulate matter, noise) and a related reduction of health damage
- Reduction of CO_2 emissions
- Enhance biodiversity through appropriate selection of diverse native, semi-natural, and climate-resilient plants and nesting opportunities for animals and insects
- Positive health, psychosocial, and socio-spatial effects

"Our contribution to Biotope City in Vienna began with the content preparations for the cooperative procedure, and we formulated the preliminary design on the basis of the essential criteria of urban ecology. Now the task is to design a near-natural living environment for the residents with these qualities! In such a complex procedure, the vital dialogue of all participants is necessary and effective for the construction process."


© Auböck + Kárász

Maria Auböck, Auböck + Kárász Landscape Architects

Master Plan and Preliminary Design
The specification for achieving these synergy effects were the master qualities from the design process (see page 19). Based on this, the master plan for open space was developed by the office of Auböck + Kárász. For the preliminary design, the open spaces were further concretized accordingly, both for the north-south running landscape features and the more urban areas of the micro axis and neighborhood square or the northeastern part of the site.

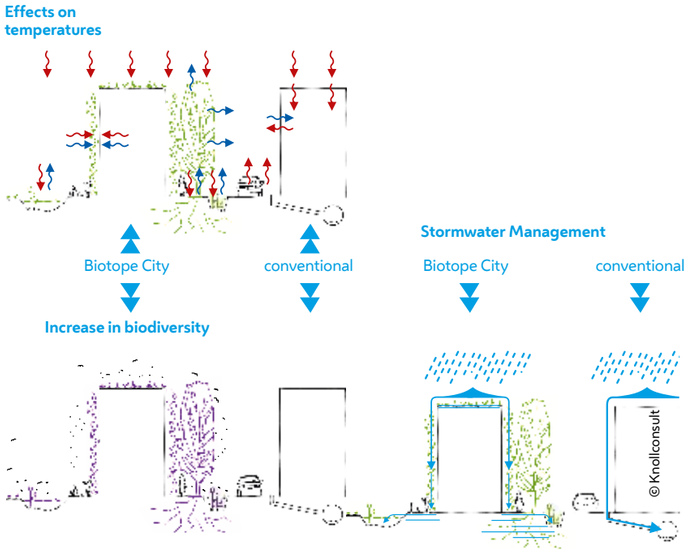
Coherent Free Space
Already in the design phase, no distinction was made in the planning between the public open spaces and the open spaces of the building plots. Instead, the open space of Biotope City is seen as a coherent system across all building plots without boundaries and design differences.

View into the landscape strip, center


© Schreiner Kastler

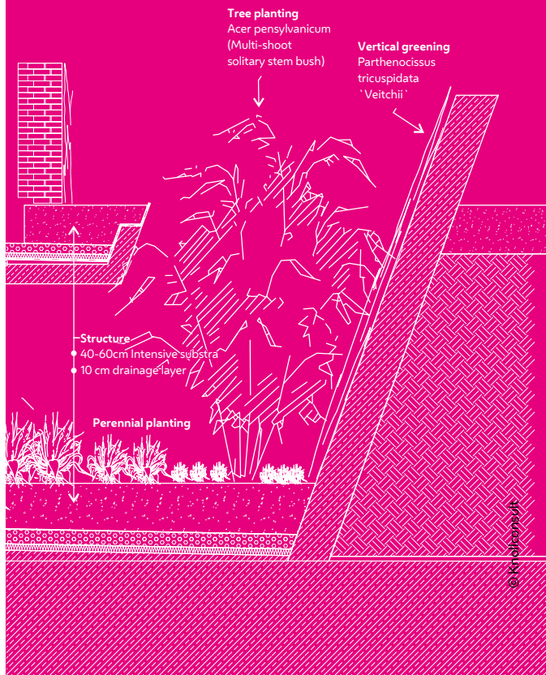
Key elements of the open space design include diverse greening with native species, different vegetation ecology types and habitats for different animal species, and the planting of large trees to provide shade. Near-natural meadow areas, the use of all the planting opportunities, community gardens, rooftop gardens, tenant and owner gardens, and the best possible use of rainwater are also part of the concept.

Coordinated Planning and Implementation
In order to ensure the specified qualities, the detailed and implementation planning of both the public and site-related areas was placed in the hands of a single planning office (Knollconsult Umweltplanung ZT GmbH), thus also considerably simplifying the necessary coordination activities between the developers and their impacts.



Sunken Gardens

Plant where you can!
In Biotope City, the planting potential of a city is fully exploited. On the building sites 1/2 and 3 there are planted atria and ventilation shafts. There are several variants, for example, a central climbing plant on a climbing frame (Aristolochia macrophylla with 8–10 m growth height) or planting bamboo (Phyllostachys bissetii) with a growth height of 5–7 m. Attention must be paid to the compatibility of the measures with fire protection.



Green and Open Space as a Contribution to Rainwater Management

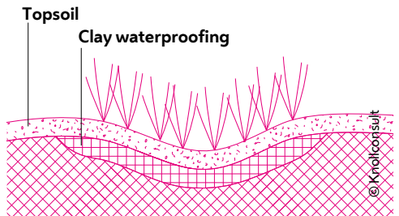
The Biotope City site is located on the southern slope of the Wienerberg. The very fine-grained to cohesive subsoil there hardly allows any infiltration of surface water. It was recognized early on that it was neither technically feasible nor economically viable to drain each building site separately, and thus a solution had to be developed that would fit across all building sites.
In line with the Biotope City model, technical measures are used to keep the rainwater on the site and allow it to evaporate. A system of retention, infiltration/evaporation, and discharge into the nearby Wienerberg pond was developed to process the rainwater

Increase of Water Storage Capacity
Natural soil cores and particular soil substrates increase the water storage capacity in the soil and thus also the resilience of the settlement area with regard to climate change impacts such as global warming or heavy rainfall events. The green areas of the Biotope City were therefore designed in such a way that, using suitable structures and substrates, an appropriate seepage capacity is ensured with a high water storage capacity at the same time. A significant contribution to this is also made by the roof surfaces, all of which are at least extensively, and in some cases intensively, greened. These measures keep the rainwater mainly on site, making it available to plants and thus allowing it to evaporate on site with the corresponding local cooling effect.

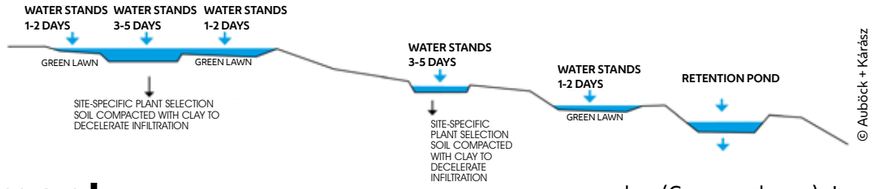
Drainage of the Surfaces
The surface drainage of the public footpaths (drivable paths, sidewalks, squares, etc.) and the asphalt and paved surfaces (sidewalks) in the west, central and east landscaped areas takes place into the adjacent green areas (tree grates, shrub and meadow areas) by means of appropriate gradient design.

Seepage Surfaces Micro Axis
To this end, a system of planted seepage areas with special substrates was created in the micro axis to rapidly absorb and store large quantities of surface rainwater (see text box on page 23 „Sponge City“).

Infiltration Landscape Features
In the meadow areas of the landscape strips, infiltration is realized with a system of infiltration troughs. These either have a seepage-capable lawn base layer or are designed as temporary „water lenses.“ The deeper points of these lenses are lined in terms of area (1-5 m²) with clay obtained on site 30 cm thick to allow the accumulation of water and the temporary formation of puddles. Duckweed will be planted with flower turf mixture as well as shade



Duckweed: scheme and planting



Scheme duckweed

sedge (Carex umbrosa). In addition, woody and perennial plantings in the landscaped areas will also be provided with special substrates with high storage capacity. Swales carry water from the buildings and surrounding areas to the lenticels.

Retention
Excess roof surface water not held by the green roofs of the eastern building lots and their slope water will be directed into the newly constructed retention pond; the roof surfaces of the remaining building lots will be drained into the Wienerberg pond via rainwater collection channels.

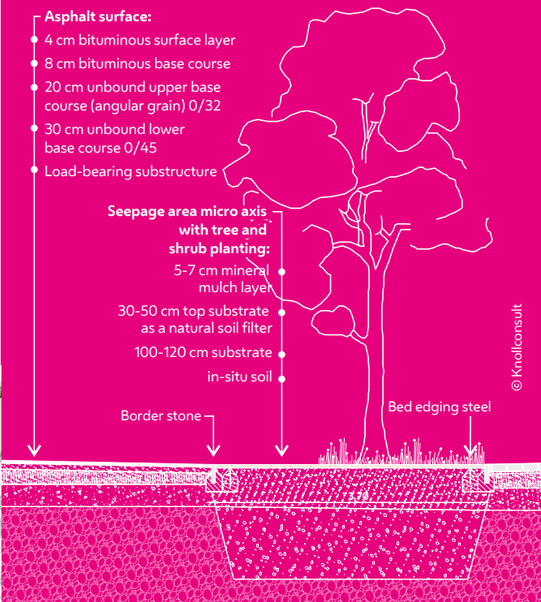
The retention pond is located southeast of the project site. The pond is used to retain drainage and excess rainwater from the eastern part of the project site. The retention pond with a size of approx. 760 m² and a water volume of approx. 900 m³ will be constructed as a near-natural pond with an extensive regeneration zone. The waterproofing to the subsoil is carried out with a clay sealing layer.

Wienerberg Pond Endowment
Excess water continues into a storm drain via an overflow structure to the Wienerberg pond located further south outside the project area.

System duckweed in landscape strip, center

Sponge City

Seepage Areas
In order to keep the precipitation water in place and to use it as much as possible, the Biotope City works according to the sponge city principle. To increase the infiltration capacity and reduce the need for irrigation, infiltration areas with tree and shrub plantings have been constructed along the micro axis. Not visible from above, the cross-section shows the special structure with which the water storage works: mineral mulch layer (5–7 cm), top substrate (30–50 cm) and bottom substrate (100–120 cm). The special substrate is highly capable of storing water (water capacity >35% by volume) and at the same time serves as a natural soil filter for retaining and breaking down inorganic and organic pollutants from the inflowing water.



Green and Open Space: Living Space City

It has long been undisputed that urban habitats often have a higher ecological functionality than agricultural structures – for example, in cleared agricultural landscapes in the urban hinterland. This is often reflected in higher species diversity. In addition to a diverse food supply, this is mainly due to the structural diversity in the built city: green spaces, water areas, ruderal sites in close succession with the urban rocky landscape of buildings of various types and geometries, even the street space is – depending on the equipment – habitat for plants and animals.

Biotope City Wienerberg takes up this functionality and optimizes it so that, for example, habitat is created specifically for endangered or protected species. Green spaces are designed to be particularly ecologically valuable, green roofs preserve habitat structures, and green space connections are ensured for the biotope network. The visionary goal is to build city while offsetting adverse impacts on site, and even end up with a plus in ecological functioning and biodiversity.

Design of the Green Areas
The green areas of the Biotope City are characterized by a unique structural diversity, the use of near-natural elements, and plant species typical of the site.

Natural Meadows
In each of the three landscaped areas and on the northern edge of the neighborhood, an extensive meadow was created as a succession area, thus creating dry, sunny sites as a habitat for many insect species and reptiles (e.g., the sand lizard). These meadows are extensively maintained and are mowed 1 to 2 times a year.
The species composition consists of robust native grasses and forbs with diverse plant shapes, sizes, and growth heights (composition: grasses: 44%, forbs: 56%).

Site-appropriate perennials such as yarrow (Achillea millefolium), mountain aster (Aster amellus), and lavender (Lavandula angustifolia) have been planted to supplement these. Shrub groups with privet, dwarf almond, and buckthorn further increase habitat diversity in these areas.

Perennial Areas, Grasses, Shrubs
Also distributed throughout the landscape are areas with extensive perennial and shrub plantings. Dynamic mixed shrub areas exhibit high biodiversity and require little maintenance. They are also found in part as underplanting for the tree discs and with the climbing plants of the facade greening.

No Conventional Lawns
All other meadow areas are designed as flower lawns. The flower lawn mixture was developed by the University of Natural Resources and Applied Life Sciences, is robust, more drought-resistant (due to deeper rooting) and less maintenance-intensive than conventional lawns, and also promotes fauna biodiversity due to the plant richness and flowering.

Biodiversity Areas
Other structural elements found in the landscape features are areas with habitat structures (see figure below). These include, for example, stone clearings and deadwood structures, which form suitable retreats for small mammals, reptiles, mollusks, and insects. Between the structures, the areas are planted, e.g., with forest honeysuckle (Aruncus dioicus).

Trees and shrubs
Last but not least, the large-crowned trees (see the draft for open space) as well as the numerous shrub groups form habitat and breeding opportunities for bird fauna.

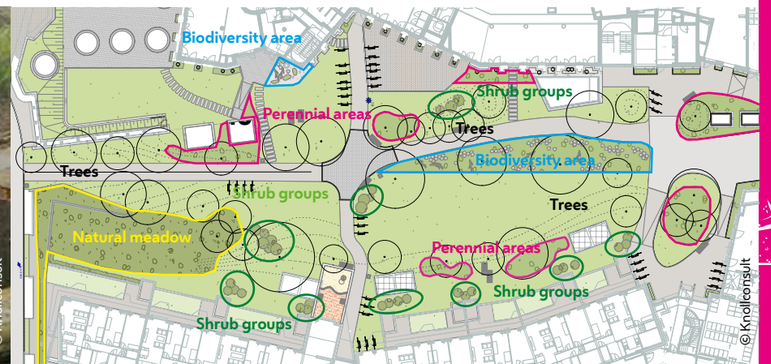
Natural meadow

Stone finishing

Wild shrub area

Deadwood pile

Distribution of habitat structures in the west landscape strip

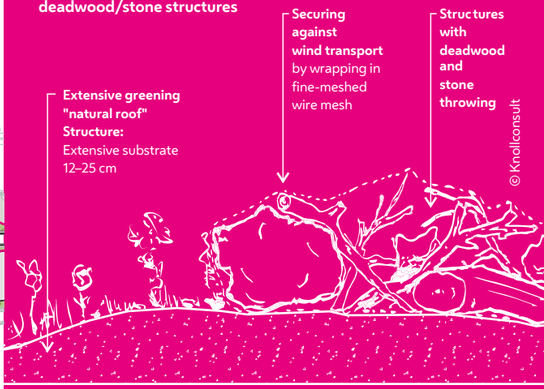


Life on the Roof

Not apparent to most, let alone accessible, probably the neighborhood's most diverse habitats are located on its extensive green roof areas, which have the following features:

- Design of the extensive green roof with variable fill of the roof substrate of 15-25 cm to increase the structural diversity
- Modeling favors the formation of puddles by creating water depressions
- Deadwood structures on the roof (approx. 80 x 160 cm) will be secured with wire mesh and/or stone fills
- Nesting aids for beneficial insects („insect hotel")

Structure green roof with deadwood/stone structures



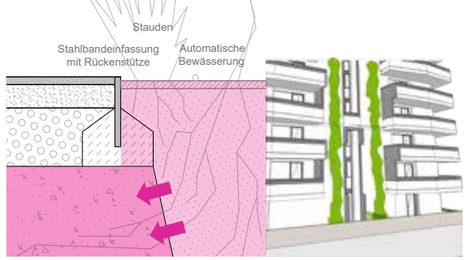
Green and Open space: Building Greening

One of the cornerstones of the Biotope City concept is to exploit as much planting potential as possible. A good part of this potential lies in the greening of facades, balconies, walls, and roof surfaces. In addition to ecological and local climatic aspects, green facades also play an important role in identification with the Biotope City concept. Balcony parapets, for example, serve as a starting point for strong, continuous, and representative facade greening with simple means. A large part of the greening is carried out from public open spaces in order to be able to ensure a basic structure. Sufficient watering of the planting areas or troughs is guaranteed on a permanent basis.

Vertical Greening
The greening of facades is carried out on all buildings and in very different ways, depending, for example, on architecture, orientation, plant selection, possible planting areas.

Where it is possible due to the siting of the buildings, built-over planting pits for climbing plants are constructed at the edge of the building. With their unique, build-over substrate, these ensure sufficient available root space. In the open, non-covered area they are equipped with a bulk mixture as an intensive substrate with high water storage capacity.

Where no ground-based facade greening is possible, generous plant troughs are installed at least on the balconies. This also gives residents the opportunity to design their own living space. The pre-planted and self-maintained plant troughs also support the residents' identification with the Biotope City concept and their neighborhood.



Vertical greening: covered planting pit for climbing plants

Striped planting, e.g., with Campsis radicans (climbing trumpet)

Domplatz 2017: Lebendiger, städtischer Ort der Begegnung vieler, sehr unterschiedlicher Nutzerinnen und Nutzer

Planting options for a stone backfill

Roof Surfaces
The green roof areas make a significant contribution to rainwater management. The extensive green roofs in particular contribute to biodiversity with their features (see „Life on the Roof," page 25). A grass-herb-sedum mixture with a structure height of 10-25 cm was selected as the structure, which enables a high evaporation capacity and high ecological value at moderate costs.

Further Measures
Beyond the roof surfaces and facades, other structures are also used for planting in Biotope City. Pergolas and partition walls covered with vegetation provide flowering accents and shady places. Even the fire smoke vents are partially equipped with green roofs.

Extensive green roof: example of a „natural roof"

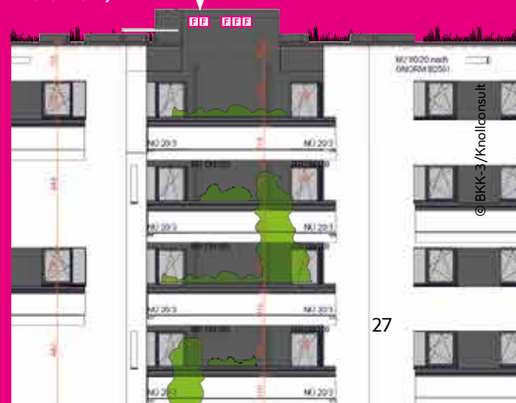
Modeling of the substrate for extensive greening

Visualization building site 5 (Zelda-Kaplan-Weg 5, Wien-Süd)

Habitat Building

All 22 bat species occurring in Vienna are strictly protected under the Vienna Nature Conservation Act. Eight of them are classified as priority species. Bats have their roosts in tree hollows, for example, but also in roof trusses, crevices of buildings and rock walls.
In the Biotope City, in coordination with the environmental protection authority (Municipal Department 22 of the City of Vienna), roosts are offered in the form of facade-integrated nesting boxes.

Integration of bat nesting boxes („F") on building site 10 (Hochh(in)aus, Wiener Heim)



Social and Community Matters

In addition to ecological, architectural, and economic sustainability, social sustainability has already been one of the criteria of the 4-pillar model in Vienna for ten years, according to which the quality of new construction projects is evaluated. The fulfillment of these criteria serves to evaluate the eligibility of projects for funding under the social housing program. To ensure social sustainability, settlement monitoring and neighborhood management have become increasingly important in recent years as a means of accompanying social processes. In Biotope City, too, these aspects were taken into account in the early planning phases.

Common Areas
A key structural element is the common areas along the micro axis, which were developed jointly by the developers and the neighborhood management and offer opportunities for engagement, interaction, and participation by residents, initiatives, and associations. Six different community rooms (between 100 and 560 m²) offer a total of around 1,700 m² of space for good neighborly relations. They are located on the ground floor and first floor of the micro axis and are available free of charge to all residents of Biotope City according to the „fair-use principle."

Neighborhood Management
From 2017 to 2021, the „Caritas Stadtteilarbeit" team commissioned by the consortium of developers with the neighborhood management was in exchange with the developers, the residents, the planners and experts from all areas, with neighbors, and with the municipality of the City of Vienna. The neighborhood management assumes an intermediary position, which aims to mediate between the parties involved.

The interdisciplinary team brings in experience from the fields of urban planning, architecture, social work, and art as well as cultural work. The field of action is located on the building site or in the neighborhood, but is embedded in a larger social and urban context – in the community.

The focal points of the neighborhood management's work are „rethinking social housing," „developing neighborhoods participatively," and „accompanying neighborhoods."

„Community spaces and open spaces, like the neighborhood and the city itself, are places of collectivity and individuality for everyone at the same time. In Biotope City Wienerberg, these places are exceptionally beautiful and uniquely diverse. We are happy to accompany the appropriation and use by the residents to a certain extent."

Tamara Schwarzmayr, Caritas Stadtteilarbeit

Site inspection with the neighborhood management team

Tasks of the Neighborhood Management Biotope City Wienerberg
The neighborhood management supports the processes of networking and empowerment among the residents and focuses on the development of self-supporting structures in the neighborhood from the very beginning. Through various activities, the involvement and commitment of residents as well as networking with other civil society actors are promoted and social participation in the neighborhood is strengthened.

The team also keeps an eye on the overarching (social) aspects and issues that a new urban area can bring with it or needs: It was involved in the conception of the cross-building site community spaces as well as in questions of mobility and has a focus on sustainable solutions in these areas. It informs, networks and is in contact with actors from the neighborhood, administration and science.

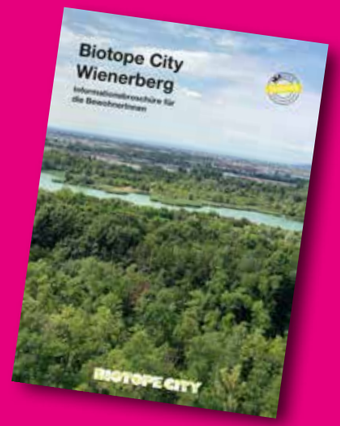
Community facilities of the Biotope City

Providing Guidance

The residents of Biotope City should bear more responsibility for their neighborhood than is usual in comparable residential neighborhoods. A sense of responsibility should be created and motivated to contribute to the unique character of Biotope City – especially by planting and maintaining the community gardens, their own green spaces, terraces, and balconies.

In order not to leave the new residents alone with this task, they are supported with know-how and practical experience in events, workshops, and with the help of a specially designed brochure.

The Biotope City brochure for residents was developed as part of the research project



Download Brochure for residents:

Life in the Biotope City

With the arrival of the first residents, a new phase begins: that of getting to know each other, discovering together, and appropriating.
In the start-up phase, neighborhood management still supports neighborhood networking and participation by opening up opportunities for it: spaces for exchange and co-creation, opportunities for empowerment, and knowledge exchange.
Ultimately, of course, it is the residents themselves who decisively shape the coexistence in their sense and according to their wishes and needs.

Living Together
All approaches and efforts tested and implemented in Biotope City – whether on the architectural, cultural-technical, landscape-planning or social level – aim to create a unique residential quarter characterized by a high quality of life and satisfaction for its residents. Life in Biotope City should be conscious, socially and ecologically responsible, communal, environmentally friendly – and thoroughly proud.

Identity
The various measures set with the clear main objective of „biotopes“ (habitat for people and nature), which already played a significant role long in advance through marketing and advertising of the apartments, will decisively shape the identity of the neighborhood together with the location and the surrounding landscape of the Wienerberg. Biotope City offers its residents a wide range of opportunities to develop and appropriate their neighborhood individually and make it their home. Whether at the traditional family picnic in the near-natural meadows, at the design of one's balcony plantings, harvesting in the community garden, or in the shade under one's favorite tree, all these experiences are experiences of nature and connect the residents all the more with their living space – their Biotope City.

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BIOTOPE CITY
Wienerberg

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