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(Un)Sustainable neighborhood:
urban transformation of the industrial area at Pohulianka Forest Park in Lviv, Ukraine

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Ass.Prof. Dipl.-Ing. Dr.techn. Dr.h.c. Andreas Hofer

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von Anasztazia Hujvan
01528203

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(Un)Sustainable neighborhood:
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The city of Lviv is one of the most economically developed regions of Ukraine, nevertheless there are weaknesses, that directly influence the quality of life and future developments. The most crucial aspect is public transport and lack of relations between urban design, institutions, planners, developers and users. Political instability makes the situation even more complicated. This causes unpredictable urban asperities, which are becoming a real challenge to deal with.
In 2021, the City Council approved key documents that determine the sustainable direction of the city's development: IDC LVIV 2030, Integrated Development Concept and Sustainable Urban Mobility Plan for Lviv. IDC LVIV 2030 became an influential step for the acknowledgment of urban planning and its importance, from both the city council and inhabitants and questions the previous master plan as the basis for the future development of the city. The Integrated Development Concept includes overriding and complex aspects: Spacial development strategy, Image of the city's future and Sectoral strategies. The area at Pohulianka Forest Park was intentionally chosen for my diploma thesis, because it is highlighted in the Integrated Development Concept as an area that is close to the city center, has good access to public transportation, and is inefficiently used. 30 ha territory is currently a mixture of abandoned industrial buildings from 1950s, small businesses and the new housing, which investors develop in every peace of land they can get. It is located between busy Zelena(Green) street and huge Forest Park Pohulianka in the northeastern part of Lviv.
The main goal is to show the importance of urban planning and consideration of the site in its entirety, as well as to show the potentials and values of the chosen area, both at the city and the neighborhood scale.

(Un)Nachhaltiges Quartier:
städtebauliche Transformation des Industriegebiets am Pohulianka Waldpark in Lviv, Ukraine

Die Stadt Lemberg ist eine der wirtschaftlich am meisten entwickelten Regionen der Ukraine, dennoch gibt es Schwachstellen, die sich direkt auf die Lebensqualität und zukünftige Entwicklungen auswirken. Der wichtigsten Aspekten sind der öffentliche Verkehr und die mangelnden Beziehungen zwischen Stadtplanung, Institutionen, PlanernInnen, EntwicklerInnen und NutzerInnen.
Die politische Instabilität macht die Situation noch komplizierter. Im Jahr 2021 verabschiedete der Stadtrat wichtige Dokumente, die die nachhaltige Richtung der Stadtentwicklung bestimmen: IDC LVIV 2030(Integriertes Entwicklungskonzept), und Plan für nachhaltige urbane Mobilität für Lviv. Das IDC LVIV 2030 wurde zu einem einflussreichen Schritt für die Anerkennung der Stadtplanung und ihrer Bedeutung, sowohl seitens der Stadtverwaltung als auch der EinwohnerInnen, und stellt den bisherigen Masterplan als Grundlage für die künftige Entwicklung der Stadt in Frage. Das Integrierte Entwicklungskonzept beinhaltet übergeordnete und komplexe Aspekte: Räumliche Entwicklungsstrategie, Zukunftsbild der Stadt und sektorale Strategien.
Das Quartier «Pohulianka» habe ich bewusst für meine Diplomarbeit ausgewählt, weil es im Integrierten Entwicklungskonzept als ein Areal hervorgehoben wurde, das nahe am Stadtzentrum liegt, einen guten Zugang zu öffentlichen Verkehrsmitteln hat und ineffizient genutzt wird.
Das 30 ha große Quartier ist derzeit eine Mischung aus verlassenen Industriegebäuden aus den 1950er Jahren, kleinen Unternehmen und neuen Wohngebäuden, die von InvestorInnen entwickeln werden. Es liegt zwischen der belebten Zelena(Grüne)-Straße und dem riesigen Waldpark «Pohulyanka» im nordöstlichen Teil von Lviv.
Das Hauptziel meines Entwurf besteht darin, die Bedeutung der Stadtplanung und die Berücksichtigung des Areales in seiner Gesamtheit sowie die Potenziale und Werte des Quartiers sowohl auf städtischer Ebene als auch in der Nachbarschaft aufzuzeigen.

Acknowledgement

I am very thankful for the chance to study at the Vienna University of Technology. These years made not only an architect of me, but also gave so much to my personality.

I am very thankful to each professor I have met and could get knowledge from, especially big thanks to Andreas Hofer, who gave me so much understanding of the city and because of whom I have deepest love to urban planning.

Thanks to my family, boyfriend and friends for their support.

And a special thanks to my mother Larysa, who is no longer with us, but is still the biggest support for me in making our dreams come true...

1 Theoretical framework

2 Urban portrait of the city of Lviv

3

Pohulianka urban design project

Introduction

Preface:

Sustainable Planet

Nowadays, most people know how to live sustainable. To be on the leading position, your business must have a sustainability concept, whether it's the fashion industry or software development, it doesn't matter. The word «sustainable» is everywhere. Nevertheless there is a difference between knowledge and taking actions. In terms of urban development, it is clear that the construction site itself cannot be sustainable, as it is the largest producer of CO2 emissions. The built environment generates nearly 50% of annual global CO_2 Emissions, 23% of them are caused by just three materials – concrete, steel, and aluminum.
So what we can do and what we try to achieve as architects in design projects

WHY THE BUILT ENVIRONMENT?: https://architecture2030.org/why-the-building-sector/

is to be less «bad» and to fulfill very important aspects in urban design: environmental, economic and social sustainability (The Triple Bottom Line,p.20).
The growing world population, the war in Ukraine and climate change are the issues we have to deal with and do our best for future generations. The circumstances also give us a clear direction for development: we need to both reuse existing structures and build new, high quality, mixed-use affordable buildings that meet future needs of people and our planet.

In the framework of this thesis we will elaborate on different topics, that will help to understand the sustainable development goals (SDGs) and their achivements; the city of Lviv/Ukraine; and the complexity of urban design.

1

Theoretical framework

In this chapter we will go through the evolution of sustainability from an urban perspective. Historical facts and documents will help to get an overview of the process and the reasons for the emergence of sustainability as a concept. We will also get to «Old new concepts»: mixed use and productive city, which are at the top of the urban discussion these days. At the end, good practice projects will be introduced and analyzed under the aspect of sustainability: The Sonnwendviertel in Vienna and the Prinz-Eugen-Park in Munich.

Sustainable urban development

The concept of sustainability in urban planning emerged in the middle of 1970s.
Global discussion began after the publication of the Brundtland Report (Our Common Future) in 1987.
The first official notion of sustainability was defined as «development that meets the present need without compromising the ability of future generations to meet their own needs».(1)

1 Avi Friedman: Fundamentals of Sustainable Neighborhoods. Springer International Publishing. Switzerland, 2015

2 Brundtland Report(Our Common Future), 1987

3 Andre Sorensen, Peter J. Marcotullio, Jill Grant: Towards Sustainable Cities. Ashgate Publishing Limited. England, 2008

4 Florentina Astleithner: Das Leitbild „Nachhaltige Stadt". Wien, 1999

5 Green Paper on the Urban Environment, Commission of the European Communities, 1990.

6 United Nations Division for Sustainable Development: AGENDA 21. 1992

7 Charter of European Cities & Towns Towards Sustainability. Aalborg, Denmark, 1994

Starting point
The industrial revolution, population growth, pollution, high energy and resource consumption, oil crisis and natural disasters became a very strong foundation for the need of new thinking and new development direction. (2)
Functionalism with the Athens Charter (1993) and the development of the garden cities were no longer seen as a solution. The challenges and responsibilities of the cities had to be perceived.

At the global level, the intergovernmental organisations of the United Nations (UN) play a leading role in the partnership between countries on sustainability.
A variety of organisations have been established to promote sustainable development around the world.

When we analyze historical evolution of the sustainable development process, we can highlight a few documents that have an important influence in the context of urban planning: Brutland Report(1987), Green Paper on the Urban Environment(1990), Agenda 21(1992), Aalborg Charter(1994),

Brutland Report, 1987 (2)
1983 The United Nations established the World Commission on Environment and Development (WCED). The chairperson of the independent commission was former Norwegian Prime Minister Gro Harlem Brundtland..
The final report, «Brutland Report» or «Our Common Future», was published in 1987.
It became an impulse for international discussions on sustainable development: «... development that meets the present need without compromising the ability of future generations to meet their own needs».
An important theme of the report with regard to urban development are industrialised countries and their impact on the environment: high resources and energy consumption, pollution, growing population in the cities, poorly designed housing estates, mounting costs, poverty and lack of adequate infrastructure in developing countries, as well as importance of international cooperation.

The main concerns in the report are still relevant. They are especially challenging for developing countries, which face uncontrolled urban development, poverty, and a lack of adequate infrastructure. And for industrialized cities, there there are additional challenges: rising prices, unemployment, elderly and racial minorities, an urgent need for better housing. This also promoted women-oriented architecture and participatory processes.(3)
The compact city is seen as contribution to sustainability by many nations at this point.

Green Paper on the Urban Environment, 1990

The «Green Paper on the Urban Environment» is a result of 6 Conferences organized by Commission of The European Communities, that represents guidelines and principles for better urban development. The main idea was to build a denser and more diverse city within its boundaries, taking into account disused areas (industrial sites, railway tracks, docks, military facilities), integrating the existing building stock, and building an efficient public transport system and pedestrian infrastructure. This should reduce energy consumption and CO_2 Emissions, as well as demand for private transportation.(5) These principles embody the concept of «compact city», that became an answer to sustainability discussions in Europe. This also provoked criticism, because the compact form alone cannot be sustainable.(4)

Agenda 21, 1992

Agenda 21 became the first political document (not legally binding) that was signed by more than 170 countries and was intended to stimulate initiatives and support sustainable development.
The paper is divided into 4 chapters : Social and Economic Dimensions, Conservation and Management of Resources for Development, Strengthening the Role of Major Groups, Means of Implementation.
It contains a list of actions that need to be implemented to achieve the main objective, e.g. Chapter 7: Promote sustainable development of human settlements wich has eight programm areas, each of which has a basis for action - that shows the importance of the issue, Objective - a goal to be achieved by this action, Activities - a list of tasks that must be carried out by each country/city, and Means of implementation - what is needed in terms of costs, science, technology and human resources.(6)

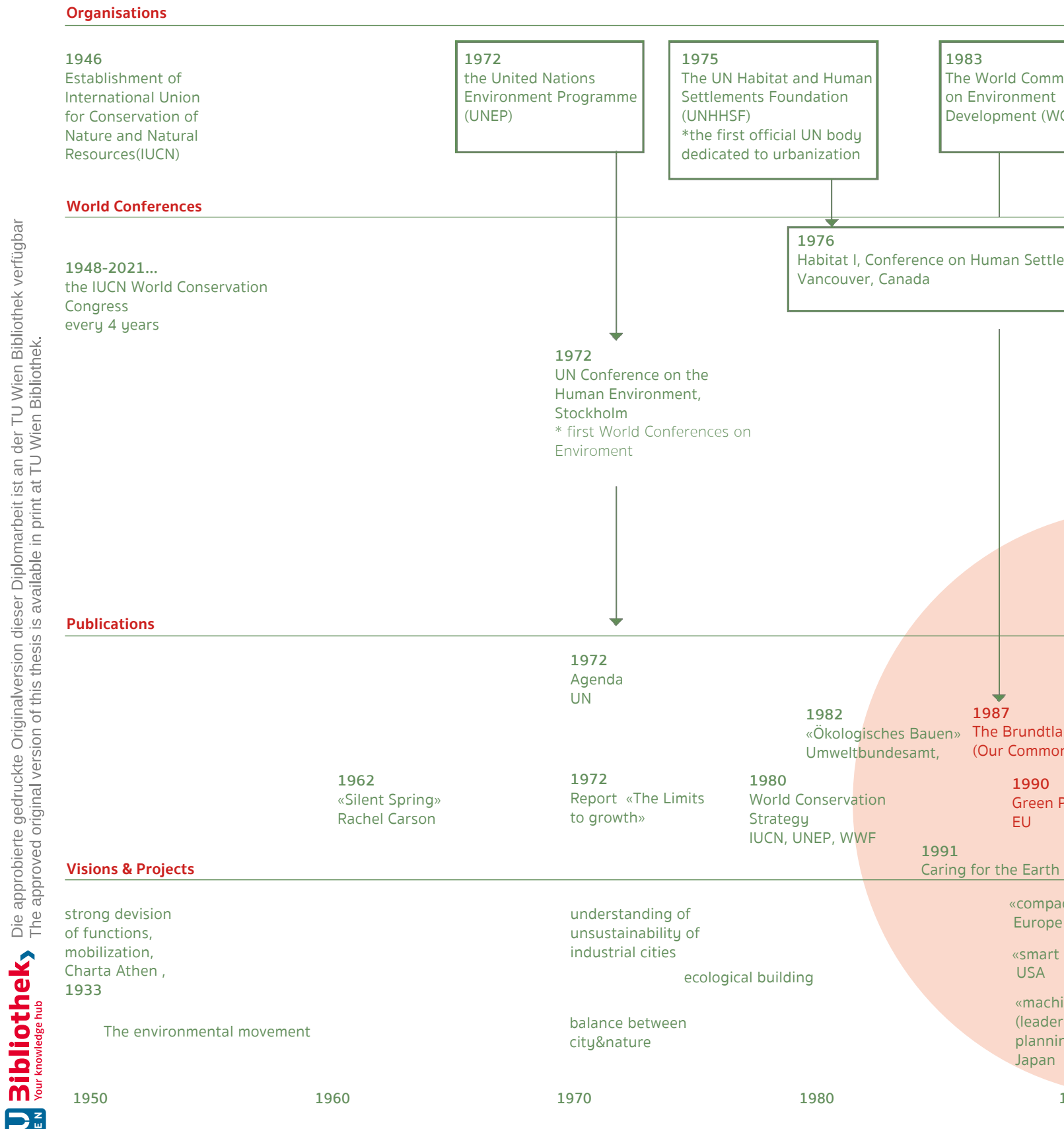
In Austria, for example, it resulted in a National Enviromental Plan in 1994 (that is also legally non-binding). (4)

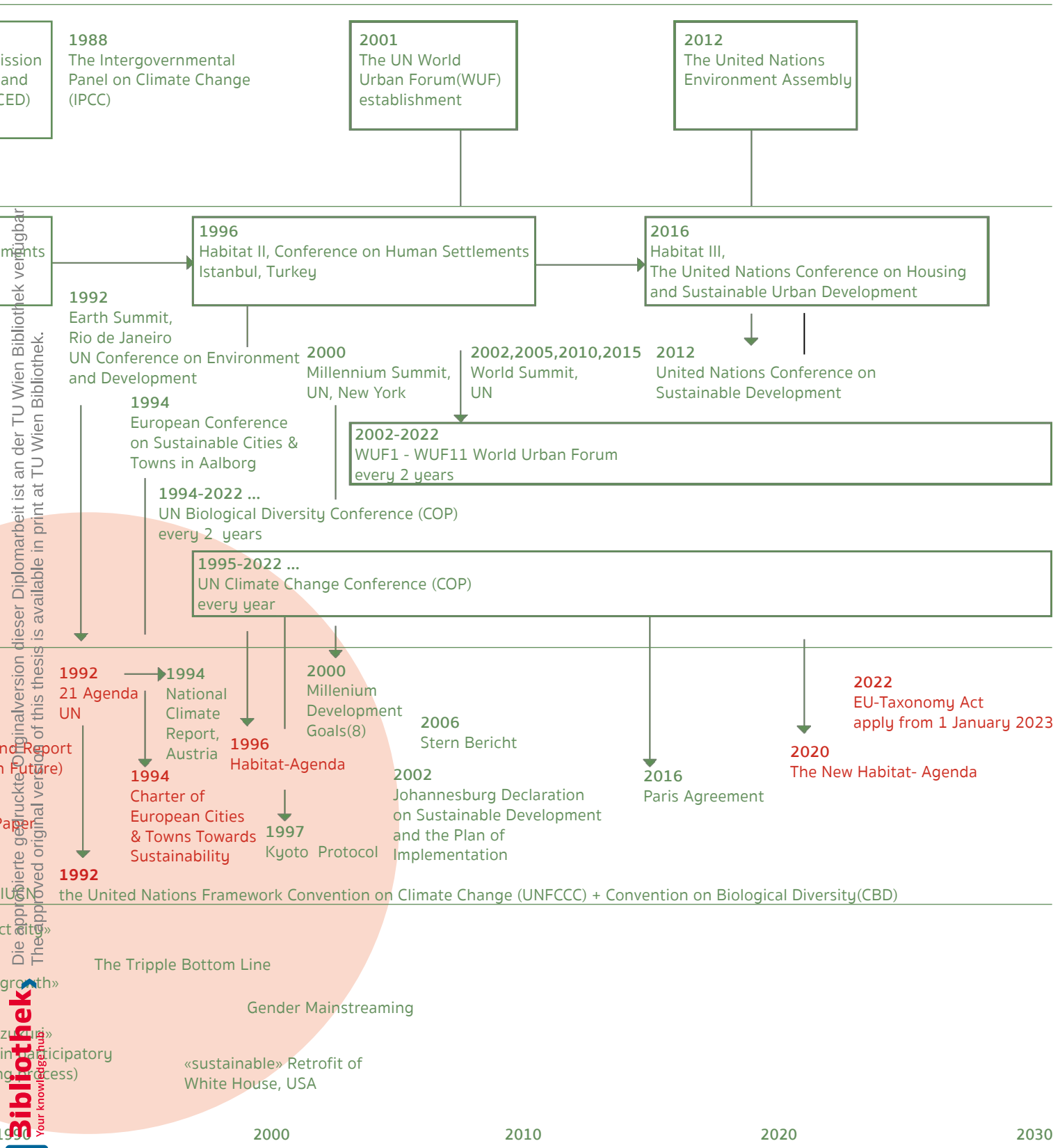
of (European) cities and towns for the current environmental situation, «as 80% of EU population live in urban areas», with understanding that «cities and towns are key players in the process of changing lifestyles, production, consumption and spatial patterns» and that «sustainability is neither a vision nor an unchanging state, but a creative, local, balance-seeking process extending into all areas of local decision-making».
It describes the most important issues for the cities and sounds like commitment of European Cities to

Fig.1 Margaret Tredeau and other dignitaries at Worlds First Water March, June 6, Habitat 1976. UN Habitat Secretariat member George Muhoho at left, and Barney Danson, the President of the official conference (and then Minister of Urban Affairs) at right

Charter of European Cities & Towns Towards Sustainability, 1994

Charter of European Cities & Towns Towards Sustainability is a result of the first European Conference on Sustainable Cities and Towns in Aalbor, Denmark in 1994.
The Document is an important groundwork and guideline for future local sustainable urban development strategies for the cities & towns (Local Agendas 21) . It is devided into III parts:
Part I Consensus Declaration: European Cities & Towns Towards Sustainability: is an acknowledgment of responsibility change things and create sustainable way of living in all spheres.
It is important that there is a guideline on what to do, for example:
- increase the end-use efficiency of products, such as energy-efficient buildings, give priority to environmentally friendly urban transport (in particular walking, cycling, public transport), achieve higher densities, while maintaining the human scale of development, mix functions, use renewable energy sources, work with all sectors of communities while developing agenda, organize monitoring of the process, etc.(7) (continues on the page 20)





(the beginning on the page 17)

«We shall integrate the principles of sustainability in all our policies and make the respective strengths of our cities and towns the basis of locally appropriate strategies».
Part I, Charter of European Cities & Towns Towards Sustainability, 1994

Part II
Describes the activities and collaborations required to advance sustainable development, including monitoring and setting the year of the next meeting to assess progress.

Part III
Describes following stages that should be included in the process of creating Local Agenda 21.

The Habitat-Agenda, 1996

In the framework of the second United Nations Conference on Human Settlements two central themes where formulated in a very precise document: «Adequate shelter for all» and «Sustainable human settlements development in an urbanizing world».

The Habitat Agenda contains the Commitments (Chapter III) and the Global Plan of Action: Strategies for Implementation (Chapter IV), which need to be used and integrated in local governments and communities. To ensure the goals there are Actions in different areas of importance.

Decentralisation of shelter policies and their management is of great importance in each of the issues, as well as cooperation and open dialogue between municipalities, authorities and all stakeholders are of great importance to promote social justice.

The main themes of the document are:
- affordable, local, safe, efficient and accessible building materials, the use of human resources;
- energy-saving methods in urban planning and architectural design;
- rehabilitation, modernisation and maintenance of the existing building stock;
- creating equal opportunities for all: elderly, youth, women, man, disabled people;
- promoting changes in production and consumption patterns;
- reducing transport demand, creating environmentally friendly transport options;
- preserving productive land;
- decentralising authorities and resources, etc.

«The sustainability of the global environment and human life will not be achieved unless, ..., human settlements in both urban and rural areas are made economically buoyant, socially vibrant and environmentally sound, with full respect for cultural, religious and natural heritage and diversity.» (1)

Conclusion (first phase of sustainable development, until 2000)

All these documents became a basis and guidelines for the local sustainable development agendas in countries, cities&towns. In Europe, the idea was first embodied in the concept of the «compact city», while in the USA «smart growth» became a major political movement.
While European and American cities tried to create a compact city with more density, Japan tried to develop good infrastructure in its compact cities, which were suffering from their density and living conditions due to very rapid development and lack of good infrastructure(3).
There is no one solution for every city, as each of them is currently on its own stage of development, and living requirements and circumstances are constantly changing. This means that sustainable development is a changing process that needs to be adapted and updated.

The Triple Bottom Line (TBL)

Since the concept of sustainability is very broad, everyone can describe it from a different perspective.
What is considered to be stable in the discourse are three equally important dimensions of sustainability: Economic, Ecological and Social, which are referred to as the Triple Bottom Line. It is acknowledged that sustainable development can only be achieved by implementing ecological, economic and social goals.(2)

For urban planning and architecture, this means incorporating these goals into a planning process and looking for solutions that ensure their realisation.

1 The Habitat Agenda : goals and principles, commitments and Global Plan of Action, 1996

2 Helmut Bott, Gregor C. Grassl, Stephan Anders: Nachhaltige Stadtplanung. DETAIL Business Information GmbH, München, 2018

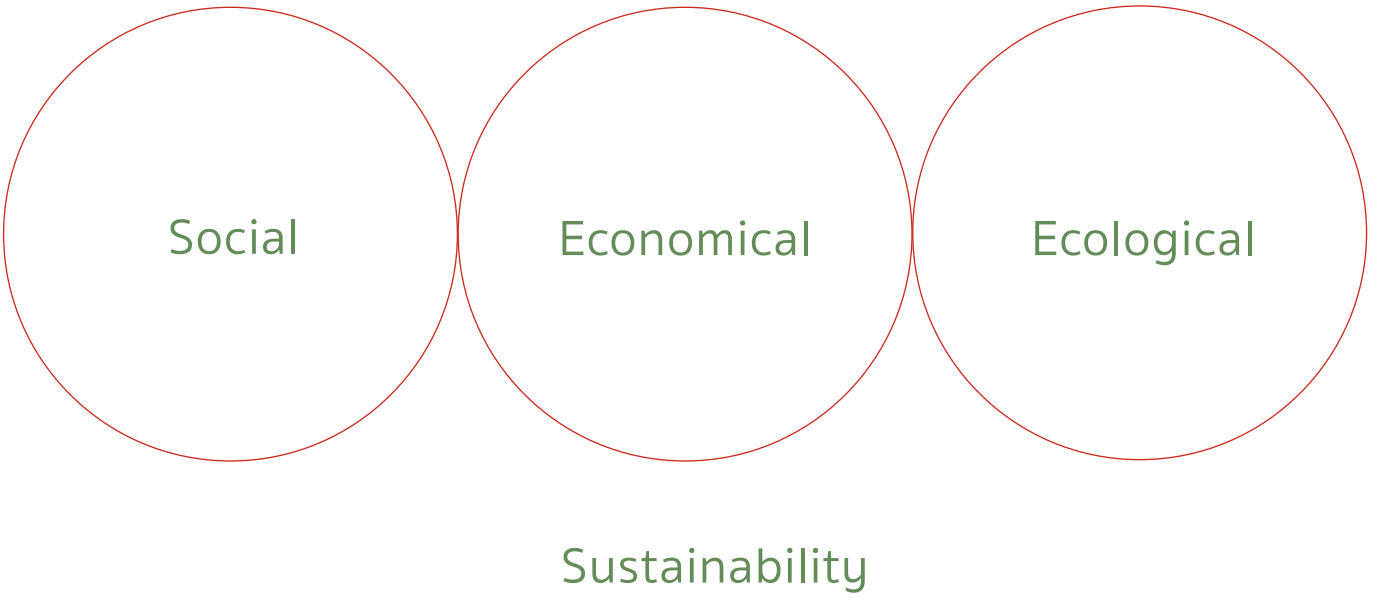


Fig. 2 The Triple Bottom Line sense of Sustainability

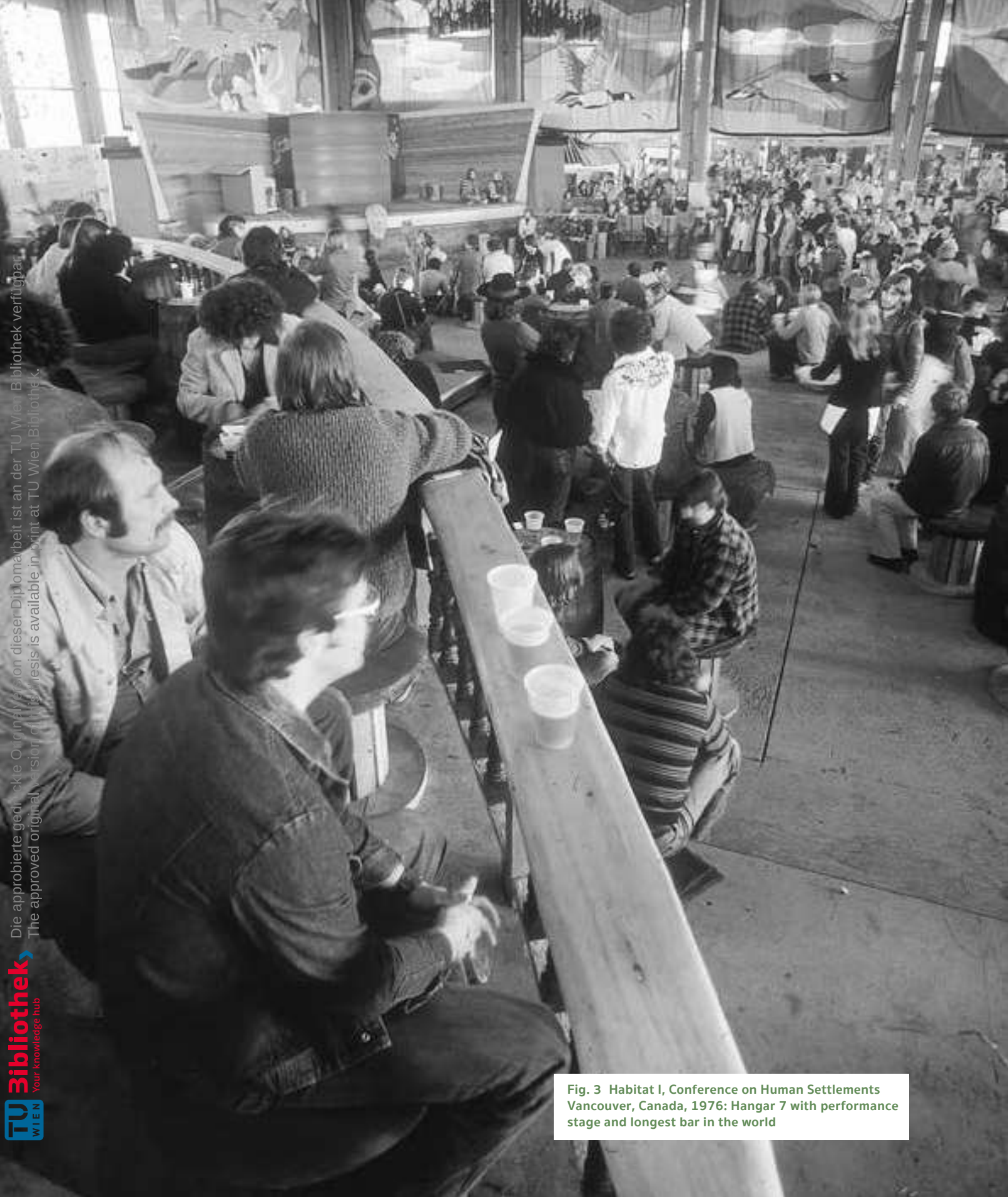


Fig. 3 Habitat I, Conference on Human Settlements Vancouver, Canada, 1976: Hangar 7 with performance stage and longest bar in the world

Second phase of sustainable development, starting from 2000

UN Sustainable Development Goals (SDGs)

The first Global Goals Agenda was initiated in 2000 and set 8 Millennium Development Goals for a better future. The main idea was to end poverty and create a more sustainable life for all by 2015.(1)

The 8 Goals included:
1. Eradicate extreme poverty and hunger 2. Achieve universal primary education 3. Promote gender equality and empower women 4. Reduce child mortality 5. Improve maternal health 6. Combating HIV/AIDs, malaria, and other diseases 7. Ensure environmental sustainability, 8. Develop a global partnership for development.
This was a first global connective Agenda with common Goals and a reporting system that brought 189 countries together. Unfortunately, the success during the time among the 8 Goals was not the same and varied from country to country.

Therefore, starting from 2012, the work started on a new set of goals that had to ensure equal value between environmental sustainability, social inclusion and economic development. At the same time the process of integrating the role of Urbanisation into the Sustainable Urban Development Goals was advanced. The UN-Habitat Association mission played a leading role in it.
As a result **since 201**5, cities have had their own goal, namely **Goal 11**: **Sustainable Cities and Communities**.
But of course substantial sustainability can only be achieved if all 17 goals will be ensured:
1. End poverty in all its forms everywhere 2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture 3. Ensure healthy lives and promote well-being for all at all ages 4. Ensure inclusive and equitable quality education and promote life-long learning opportunities for all 5. Achieve gender equality and empower all women and girls.
6. Ensure availability and sustainable management of water and sanitation for all 7. Ensure access to affordable, reliable, sustainable, and modern energy for all 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all 9. Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation 10. Reduce inequality within and among countries 11. Make cities and human settlements inclusive, safe, resilient and sustainable 12. Ensure sustainable consumption and production patterns 13. Take urgent action to combat climate change and its impacts 14. Conserve and sustainably use the oceans, seas, and marine resources for sustainable development 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable and inclusive institutions at all levels 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development. (2)

The UN Sustainable Development Goals have brought together people and countries to work on the biggest challenges facing our world.
They were included in a UN Resolution called the 2030 Agenda and signed by 193 countries(all UN Members).
However, the biggest challenge is to achieve the goals, as the document is not legally binding.

1 United Nations Human Settlements Programme (UN-Habitat), 2020

2 https://www.un.org/millenniumgoals/

Fig. 4 UN Sustainable Development Goals (SDGs) 2015

1 United Nations Human Settlements Programme (UN-Habitat) 2020

The New Urban Agenda, UN-Habitat, 2020

After 20 years after The Habitat-Agenda in 1996 was published, the New Urban Agenda was adopted at Habitat III in Quito, Ecuador(2016).

In the New Urban Agenda, sustainability is considered under 4 main aspects: Social, Economic, Environmental and Spatial Sustainability. It differs from the Tripple Bottom Line by one component - Spatial Sustainability and is seen as accelerator of the 11th Sustainable Development Goal: Make cities and human settlements inclusive, safe, resilient and sustainable.

The New Urban Agenda is divided into 3 Parts: The core dimensions of the New Urban Agenda transformative commitments, Means of implementation and Monitoring and reporting.

Part I describes each of the 4 Sustainability Aspects. Every Aspect has two to four clear principles, which are accompanied by an Actions for implementation.

Overall, the document offers a clear perspective on sustainable urban development in the scale of the city. It provides hard facts, tools, case examples, and implementation processes from national urban policy to local governments, together with planning, management, financing and implementation and monitoring processes.(1)

Social Sustainability:
Empowerment of marginalized groups;
Gender equality;
Planning for migrants, ethnic minorities and persons with disabilities;
Age-responsive planning.

Economic sustainability:
Job creation and livleyhoods;
Productivity and competitiveness.

Environmental sustainability:
Biodiversity and ecosystem conservation;
Resilience and adaptation to climate change;
Climate change mitigation.

Spatial sustainability:
Spatial sustainability and equity;
Spatial sustainability and urban density.

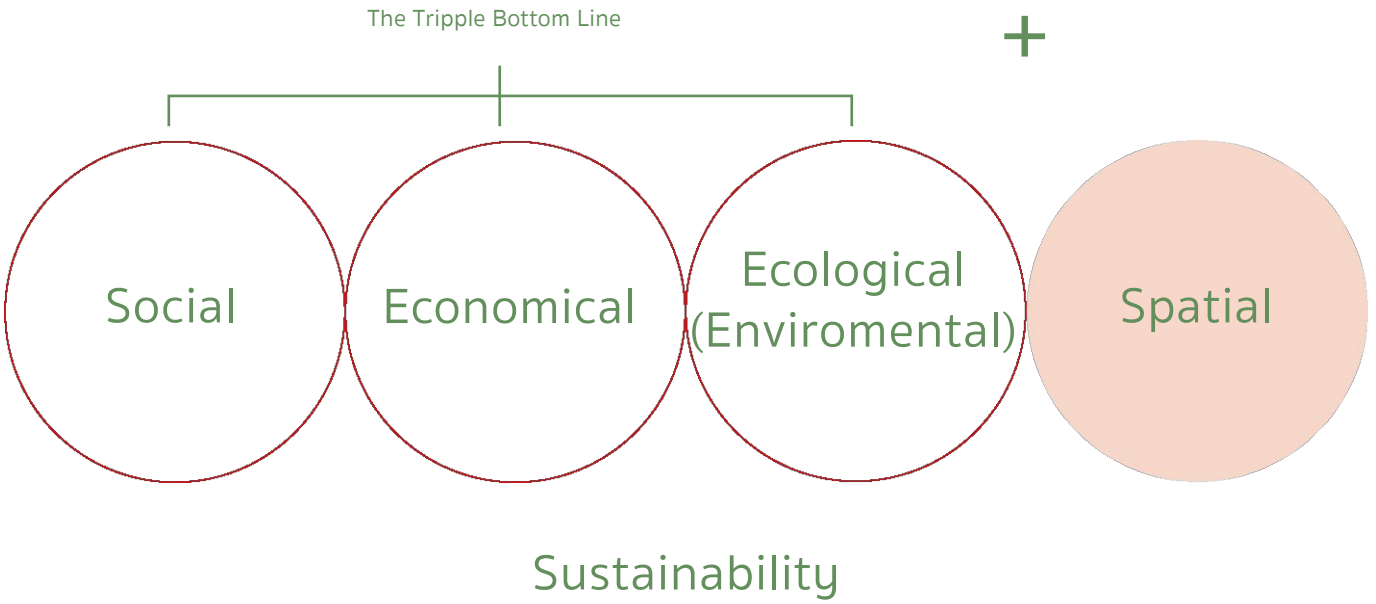


Fig. 5 Sustainable urban development due to The New Urban Agenda, UN-Habitat, 2020

EU Taxonomy: Complementary Climate Delegated Act to accelerate decarbonisation

In order to achieve a carbon-neutral economy and reach the objectives of the European green deal by 2050, the EU Taxonomy Act was created and adopted in February 2022. The complementary delegated act will apply from January 2023.

The main idea here is to create a transparent instrument for private investment, taking into account economic sectors and activities, that have potential to avoid the production of greenhouse gas emissions. This should contribute to the EU climate change mitigation and climate change adaptation ambition. This process is very important, as public investment alone is not enough to achieve the big goal.
This means that both public and private investments should be environmentally sustainable and contribute to climate change mitigation and/or adaptation.
It will be demonstrated by a robust and generally applicable methodology for calculating life-cycle greenhouse gas emissions.
Furthermore, due to the responsibility for greenhouse gas emissions in the EU, the most important areas of influence have been identified:

Buildings are responsible for 36% of direct greenhouse emissions, 40% of energy consumption in the Union.
- Construction of new buildings and their renovation should be made with technical screening criteria;
Transport operations are responsible for 23% of direct greenhouse emissions in the Union.
- Creating infrustructure that enables clean mobility;
Energy sector is responsible for 22% of direct greenhouse emissions in the Union, and 75 % when taking into account the use of energy in other sectors.
- Development in direction of renewable and low-carbon electricity and heat;
Manufacturing - 21% of direct greenhouse emissions in the Union, is a key sector,after energy sector, to become low-carbon;
- Priority is given to manufacturers that have the greatest potential to reduce greenhouse gas emissions or increase greenhouse gas removal and long-term carbon storage;

Water, Sewerage, waste and remediation sectors contribute less to greenhouse gas emissions, but are crucial in order to reduce it in other sectors.(1)

Important is also to understand the meaning of absorbers of CO2, such as forests: Forests of the Union absorb the equivalent of 7% of the EU's total greenhouse gas emissions every year:
- Improve both the quality and the quantity of forest areas!

The big discussion is also about using woods as renewable energy:

«Europe's forests could be an excellent line of defence against climate breakdown, but this potential is being squandered as more trees are cut and burned for energy production. The EU should be restoring and protecting Europe's forests, but instead it's driving forest destruction by counting tree-burning as renewable energy» (2)
Greenpeace EU forest campaigner
Sini Eräjää

Coming back to architecture, we can have a look at 1 Chapter from the EU Taxonomy Regulation: Construction and real estate activities: Construction of new buildings; Renovation of existing buildings.
The most important urban planning regulations concern the reuse of existing structures and the waste generated on the construction site:
«at least 70% (by weight) of the non-hazardous construction and demolition waste generated on the construction site is prepared for reuse, recycling and other material recovery»;
as well as new buildings design and renovation of existing buildings should

1 Commission Delegated Regulation (EU) 2021/2139, Official Journal of the European Union, 2021

2 greenpeace.org

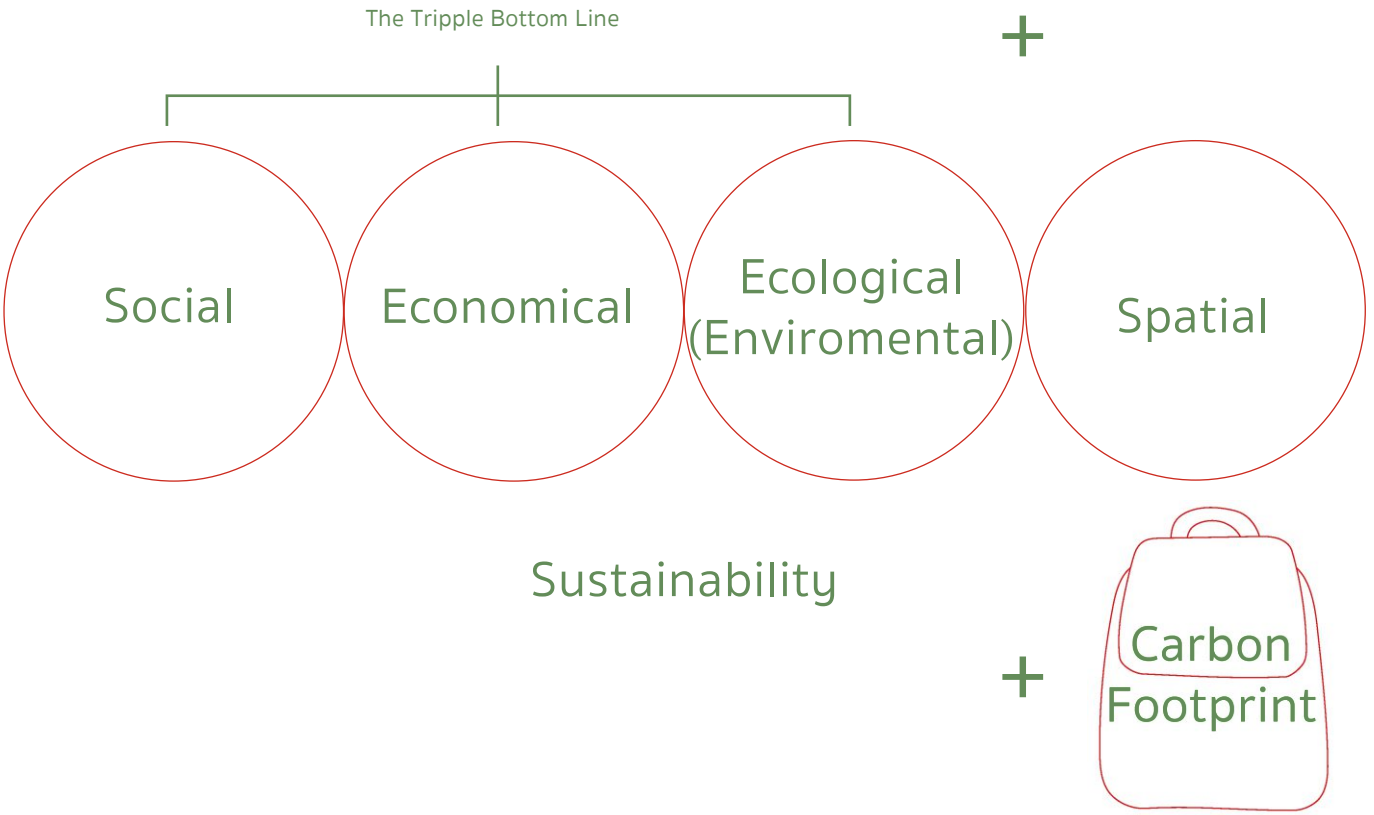


Fig. 6 Sustainable Urban Development due to The New Urban Agenda and actual challenges

flexible and dismantleable to enable reuse and recycling».
While planning we should think about how we use resources and about future usages of designed structures.
The EU Taxonomy gives new vision on private investment and organisation of space between design and processes, it is clear that planning will become even more complex and is already implementing new aspects to achive sustainable decelopment and reducing CO_2 Emissions.

Carbon Footprint

Often the projects get a very loud names «Sustainable Development», «Climate Neutral Neighbourhood». The sustainability is partially achieved in there very well, but only partially. There is a good energy concept (Neue Weststadt, Stuttgart), but social sustainability does not work, and the materials used will never give a chance to make the development climate neutral. There is a good urban design solution with clear mobility and social concept (Sonnwendviertel, Vienna), but more than 95% of development is built with steel and concrete. This makes the development far away from sustainable. We have to take into account the grey energy from the ver beggining of the planning. That is a «backpack» for every development and building, wich they have to carry as a footprint through the whole life cycle. With sustainable development the complexity and wider observation is still not so clear for most developers.

All the documents described in the last chapter formed a solid basis for understanding the concept of sustainability at the global and urban level. The global society has understood that there is an urgent need for action.

Of course, there are many open questions and processes that can be implemented only in a long-term perspective.

The biggest concern is that most of the documents are not legally binding, which means that implementation is not equal depending on the awareness and capabilities of individual countries (governments) and cities.

The good is the awareness, the cooperation and the willingness to act. The critical is the complexity of the tasks and the slowness of the results, as well as luck of instruments for smaller scale developments.

The EU Taxonomy as very progressive document also doesn't have that much to do with the construction sector. We should build sustainable, but there are no clear instruments on how to achieve that. So the next few years could be crucial in determining whether we can achieve our 2050 targets.. At the moment, the situation is still questionable.

«Old New Concepts»: perspective on sustainable urban planning

1 Schwanke, Dean: Mixed-use development handbook, Washington, DC, Urban Land Inst., 2008

When we think about Mixed Use, it is often seen as a new urban concept that emerged in postindustrial cities with understanding that separation of living and working is not a sustainable way of city development. It causes urban sprawl, which means overuse of land resources, more roads, more traffic and more energy consumption - with negative effects on the environment.

It is also seen as a universal response to urban design trends such as the Compact City, the Urban Village, New Urbanism, etc.

If we return to the medieval city, we can see a perfectly dense, mixed and productive city.
Bordered with defensive walls, the urban structure integrates administrative, residential and commercial functions. The buildings themselves serve people, with workplaces, living spaces and places for social activities.

Strict separation of functions came with industrialisation, air pollution and noise emissions, and was intensified by the development of motorised transport.(1)

Fig. 7 Barrio de La Latina, Madrid

Mixed-Use

1 Mischung: Possible!
Wege zur zukunftsfähigen
Nutzungsmischung, Wien, 2017

Today, Mixed-Use is an extension of the concept of the Smart and Energy-efficient City with a focus on human well-being and has become more important with the recognition of the consequences of climate change and the responsibility that cities carry in this context.

Mixed-Use can only be applied successfully if it provides sufficient **flexibility**, **diversity**, **affordability** and **creativity**.

In other words, it can be described as:
Contemporary forms of living and working in ecologically sustainable neighbourhoods.

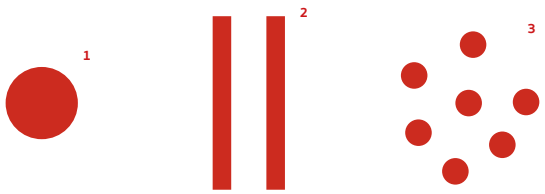
Mixed-Use Contributes to resource conservation, climate protection, reduction of traffic volume and equality between the genders, majority society and minorities, rich and poor.

There is no common concept how to develop a perfect Mixed-Use Enviroment, but there are 3 basic requirements that must be ensured(BBR 2006, Bretschneider 2007):
- Evaluation of site suitability: quality of the area and its location;
- Creating a structural-architectural solutions with residential and non-residential offers, and suitable enviroment for it;
- Organizing process managment over the entire planning, realization and period of use.

Steps for Mixed-Use Development:

+ Define mix of uses (% of gross floor area)
+ Allocate use (neighbourhood, block, building)
+ Define ground floor area
+ Develop public space
in coordination with
planned ground floor zone
+ Develop mobility concept for mixed use functioning
+ Floor height: ≥ 4 m groundfloor
≥ 2,8 m upper floors

don't forget to create the **identity!**(1)



Placement principles for non-residential uses
(neighbourhood scale):
[1] punctual concentration
[2] linear allocation along a shopping street
[3] fine mix of use

Fig. 8 Concentration of functions

> 5000m2 **very large granulation:** business park, office buildings, wholesale trade.
500 - 5000m2 **varge granulation:** supermarket, smaller office buildings, supply companies, urban production, co-working spaces as well as kindergartens, hotels, medical centres.
100 - 500m² **fine granulation:** supermarket, smaller office buildings, supply companies, urban production, co-working spaces as well as kindergartens, hotels, medical centres.
20 - 100m² **small granulation:** 'author shops', nail salons, special restaurants, tobacconists.
10-20m² **super fine granulation:** workspaces for one-man businesses, mini-author shops.

Fig. 9 Granulation of functions

Productive city

1 Brussels Productive City, Bruxelles, 2019

However, our mixed-use urban development is not as mixed as we like to think. The concept of the typical post-industrial mixed city is incomplete. A truly mixed city or neighborhood must incorporate production into its daily life. The city is no longer seen only as a place of consumption, but as a self-sustaining place to live, work, produce and enjoy. New technologies allow industry to be more suitable for the neighbourhoods, as it can be more quiet and discrete.
This can promote urban resilience, create new employment opportunities, create innovation, more efficient use of materials, and reduce transportation needs.

Reference
The city of Brussels is a great example to follow. Over the last twenty years many industrial sites were replanned into vibrant residential neighbourhoods with office facilities, restaurants and shops. In retrospect, the city understood that they systematically omitted one function - production.
On the government level, so-called enterprise zones in an urban environment (ZEMU) with mixed use were included in the land use plan. When developing an area of 10000 m2 , a minimum percentage of productive economy must be included, covering 90% of the surface of the soil layer. In this way, the government promotes mixed use between living and working.

«It is just madness that a plumber living in Molenbeek- Saint-Jean needs to start his day by driving to a depot in a business park beyond the Brussels ring road for spare parts, before returning to repair houses back in the city centre. Hardly what you call efficient, ecological and social».(1)

2 https://citiesofmaking.com/project/

Key questions to answer when planning a productive mixed-use development:
- What technologies/resources are appropriate for 21st century urban industry?
- How can we connect the living environment with production so that both residents and workers have quality space?(2)

>90 %
of the surface area of
the ground level layer
for Production

Fig. 10 Novacity project: Integration of production into residential development

In this work, I will consider sustainability in the 4-pillar model, as in the New Urban Agenda, UN-Habitat, 2020. Spatial sustainability plays a major role in neighborhood development and helps to achieve other Goals. The work will also refer to SDG 11– Make cities and human settlements inclusive, safe, resilient and sustainable as well as other related SDGs (3,5,7,9,12,13).
«Mixed-Use» and «Productive City» Princples are seen as essential part of sustainable development.

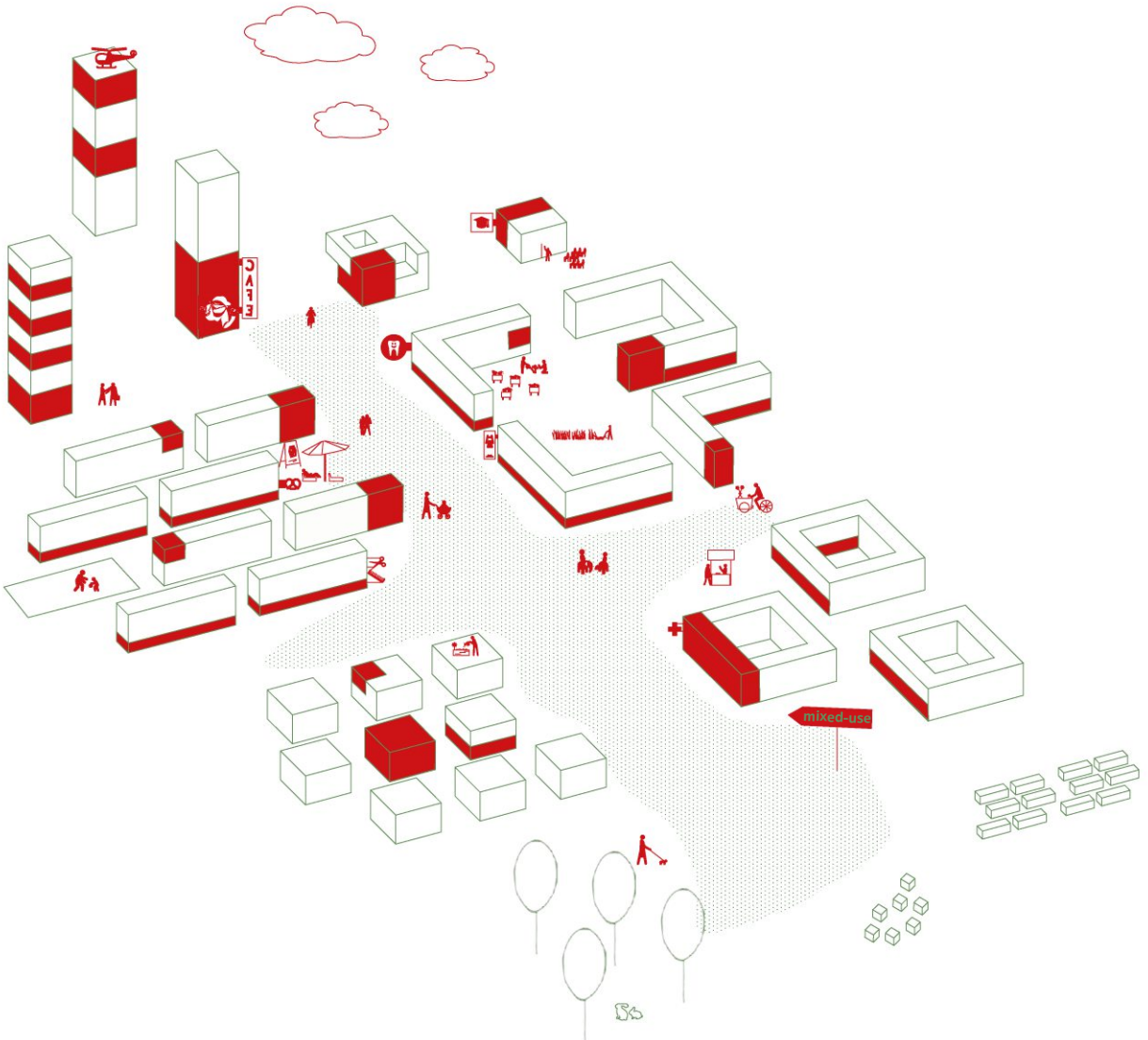
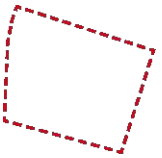


Fig. 11 Mixed-use development with different typologies and qualities

Case Studies

Prinz-Eugen-Park Development

The ecological prototype settlement in Munich



1 Baudokumentation, Ökologische Mustersiedlung Prinz-Eugen-Park in München, München, 2020

2 DBU Bauband 4: Wohnquartier in Holz – Mustersiedlung in München, Sabine Djahanschah, DETAIL Business Information GmbH, München, 2020

The construction of the new neighborhood began in 2016 on the former Prinz Eugen military site in the Bogenhausen district of Munich. The entire project was intended to become a lively neighborhood with 1,800 apartments. Great emphasis was placed on participatory processes, community facilities, car-reduced housing, good local infrastructure and connected neighborhoods.

The urban structure of Prinz Eugen Park is devided into two different models. The first model is located along Cosimastrasse in the western part of the area and closes itself from the busy street with 5 perimeter block developments with green courtyards. The other model is divided into 9 plots (clusters) of fairly equal size and consists of row development (5-7 storeys), townhouses (4 storeys), a row house (2-3 storeys) and an atrium house. Each of the clusters has a specific landscaping as well as a different approach to residential development.(1)

A perimeter block development and three clusters in the southern part are planned as an ecological model housing estate and will be built in timber construction, which accounts for 550 flats. (2)

The construction of Prinz Eugen Park began with educational facilities (Elementary school and Sport Hall), that is located on the northern part of the development.
The heart of the project is a park with nicely grown existing trees that were preserved during construction.


30 ha


former military site


municipal property


1800 apartaments


4000 people


12 ha public green space


0.6 - 1 per household



16 000 m²

Fig. 12 Prinz-Eugen-Park Development: top view

Development timeline of Prinz-Eugen-Park

Fig. 13 Prinz Eugen military site

Fig. 14 After demolishing of existing buildings

Fig. 15 Prinz-Eugen-Park Development

2006
The former Prinz Eugen military site in the Bogenhausen district of Munich. ▭ - the only preserved building is the indoor swimming pool with the «diving tower» built in 1976, which plays an important role in local sports.

2016
The construction began with educational facilities (elementary school and sport hall). The existing road structure was adopted for the future project. Development plots were allocated in a two-stage tender process.

2022
The construction of the settlement is still in progress, the ecological model development (timber construction) was completed in 2020. Great efforts are being made to preserve the existing trees.

Educational Campus in Prinz-Eugen-Park

Fig. 16 Educational Facilities: front facade and visible structure

Fig. 17 Educational Facilities: school playground

Diverse typologies in Prinz-Eugen-Park development

Fig. 18 Perimeter block development

Fig. 19 Row house: 5-7 story

Fig. 20 Town house: 4 story

Fig. 21 Row house: 2-3 story

Fig. 22 Landscape design: green loan

Fig. 23 Landscape design: urban gardening

Landscape design in Prinz-Eugen-Park

Landscape design plays an important role in the Prinz-Eugen development: it's diverse, playful and green. Different playgrounds for children made of wood, urban gardening, working with water and a variety of plant species make each square something very special.

Every cluster has a different landscape design, that was created by liebald aufermann landschaftsarchitekten and won at Bavarian Landscape Architecture Award 2022 in the category: Building Greening and Biodiversity.(1)

1 https://bdla.de/en/regional-associations/bayern/news/3752-bayerischer-landschaftsarchitektur-preis-2022-fuer-prinz-eugen-park-in-muenchen

Fig. 24 Landscape design: diversity of plants

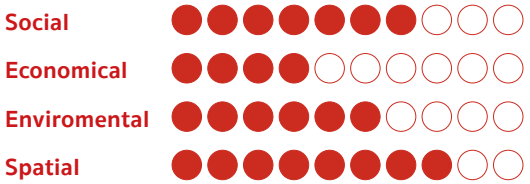
Fig. 25 Landscape design: water in landscape

Fig. 26 Landscape design: functional zones

Fig. 27 Landscape design: simple and sustainable

Fig. 28 Landscape design: children playground

Evaluation of the project in terms of its sustainability



Social Sustainability:
A very green, barrier-free development with educational facilities, childcare facilities and various housing models, including building communities. There is a community center on the site that actively addresses social issues in the neighborhood. The clusters have community spaces on the first floors, some even have underground event spaces and children's movie theaters. There are many green open spaces with children's playgrounds, urban gardening and recreational opportunities. There is a rather private/semi-private atmosphere in the individual clusters, however the park located between the clusters provides open space for all residents. Ruth-Drexel-Straße has a wide pedestrian zone and almost no trees = no shade, and it is occupied by many cars. There is no clear division of pedestrian-friendly paths. There is no parking garage. The same situation applies to Jurg-Hube-Straße.

Economic sustainability:
In its current state, the development appears monotonous, with predominantly residential function and most local infrastructure is located in the western part of the settlement. The lack of a mix of functions and s the lack of space for productivity may encourage commuting and use of private motorised transport.

Environmental sustainability:
The existing layout of the site was taken as a starting point, the roads remained unchanged and the surrounding area was only slightly altered. There is varied landscaping with different plants with beautiful «wild» design on the site. Preservation of the existing green structure (trees around and inside the settlement), planted fruit tree gardens on the north side of the settlement, water playground for children, wooden playgrounds, sports zone in the south play an important role for enviromental sustainability. There ia a water-bound sidewalk on the pedestrian paths and many infiltration areas. 550 of 1800 apartments were built in mixed wood construction.

Spatial Sustainability
The area has a compact design with quite low density, yet very comfortable, taking into account the location of the development, it fits into the environment and is connected to the city centre by tram and bus lines.

Urban concept
+ diverse in typologies
+ wide variety of housing models
- monotonous with predominate housing function

Mobility concept:
+ public transport: bus and tram
+ bicycle infrastructurer
- may lead to the use of private motorised transport

Local infractructure:
+ school, kindergartens
+ shopping facilities, pharmacy
+ restaurants
- all functions concentrated on the western part of the development

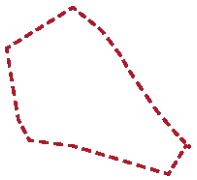
Social and cultural offers:
+ community spaces
- lack of cultural offers

Greenery and leisure possibilities:
+ a lot of greenery
+ diverse open spaces
+ children playgrounds

Materials
+ 560 apartments built with timber structure
- 1240 apartments built with steel and concrete

Fig. 29 Entrance to WA 15 West: relation between green and paved

Sonnwendviertel



1 Sonnwendviertel. Gefördert wohnen in einem neuen stadtquartier, © wohnfonds_ wien, 2017

2 Quartiershäuser Sonnwendviertel: https://www.iba-wien.at/projekte/projekt-detail/project/quartiershaeuser-sonnwendviertel

The Sonnwendviertel is part of a 60 ha development around Vienna Main Station(former South railway station). 5.000 apartments for 13.000 people, 20.000 work places, an educational campus, a medical center and the 7 ha big Helmut-Zilk-Park were planned on the former railway tracks site.

The construction began on the western part of the development with 1260 apartamnets and a 20.000 m² educational campus.

The urban structure of Sonnwendviertel consists of traditional Viennese perimeter block developments with protected inner courtyards, that slightly open themselves to the green center - Helmut-Zilk-Park.(1)

An important aspect for this development was the connection with its surrounding. A strong mobility concept promotes a sustainable way of living using very good public transport infrastructure, see Fig. 34 : tram, that runs through the park and metro and bus routes are close to the site. Two bridges create an important north-south connection for pedestrians, cyclists and cars, see Fig. 35.

Clear division of green spaces, park and the urban promenade offers great potential for this area. Around the park is a path that encourages jogging, walking, while the urban promenade between the blocks offers many ground-floor attractions such as: restaurants, shopping facilities, doctors offices, pharmacy, co-working spaces, etc.(2)

30 ha

former railway area

The Austrian Federal Railways

5 000 apartments

13 000 people

7,2 ha park

0.5-0.7 per household

Education Campus
20 000 m²

Fig. 30 Sonnwendviertel: top view

Brief timeline of Sonnwendviertel development

Fig. 31 Former railway depot

2006

The former railway Südbahnhof (South railway station) is located in 10th district in the city of Vienna. Sonnwendviertel is part of a 60 ha development around Vienna main station.

Fig. 32 Construction of Sonnwendviertel West

2011

The first phase of development began on the western part with densely built housing estate (1.260 apartments) and educational facilities.

Fig. 33 Sonnwendviertel connected with the city

2022

An important aspect for this development was the connection with the surrounding. Two bridges create an important north south connection for pedestrians, cyclists and cars and Helmut-Zilk-Park becomes a central meeting point for the whole district.

Accessibility in Sonnwendviertel

Fig. 34 Mobility concept: tram line, that goes through the park

Fig. 35 Mobility concept: pedestrian bridge

An important aspect for this development was connection with the surrouding. Strong mobility concept promotes sustainable way of living using very good public transport infrastructure, pic.1 : tram, that goes through the park and metro and bus routs close to the site. Two bridges create an important embedding with north-south part for pedestrians, cyclists and cars, see fig. 34.

Building typologies in Sonnwendviertel

Fig. 36 Variety of typologies: Gleis 21

Fig. 37 Variety of typologies: generationen:leben

The project also shows a wide variety of housing types such as: neighborhood houses, building group projects, subsidized and privately financed housing (both rental and owner-occupied), a student dormitory, offers for temporary living.

Helmut-Zilk-Park in Sonnwendviertel

Fig. 38 Main route and livable green space

Fig. 39 Motoric park

The Helmut-Zilk-Park became very beloved part of the district. It offers a lot of free space for sport activities, has a zone for urban gardening, an animal zone and children playgrounds. It has a great cooling effect in summer and gives plenty of space for biodiversity.

Fig. 40 A lot of free green space

Fig. 41 Central square with children playgroung and water fountain

Landscape design in Sonwendviertel

Diverse designed open space gives opportunity for leisure activities for children, young people, elderly, men and women. The space is diverse, attractive and livable as we see it today. It offers a motoric park for all ages groups, comfortable inner courtyards, different playgrounds for children, drinking water possibilities, urban gardening and an animal zone.

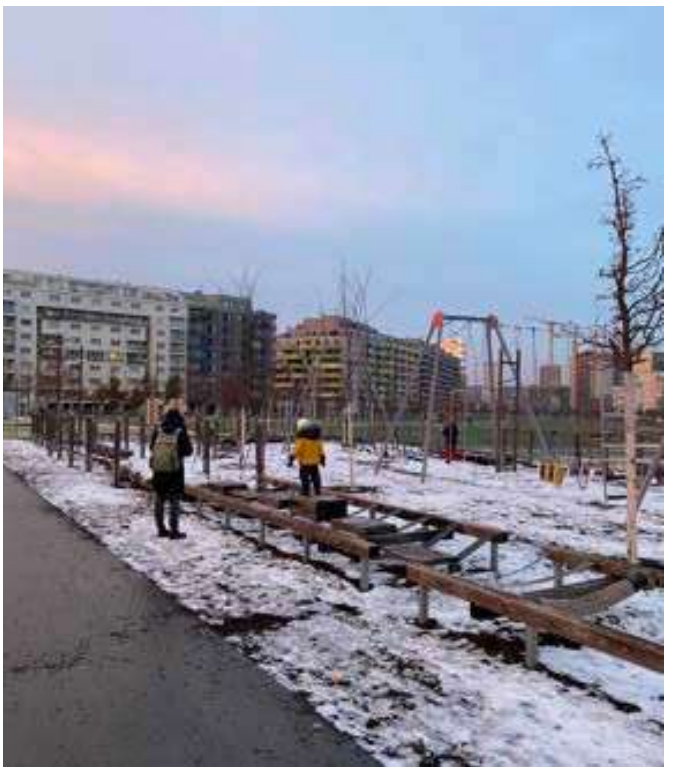


Fig. 42 Landscape design: motoric park in winter

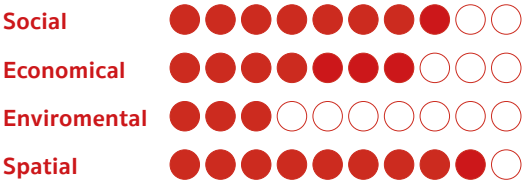
Fig. 43 Courtyard arranging with gardening possibilities

Fig. 44 Entrance square with trees and outdoor furniture

Fig. 45 Drinking water installations

Fig. 46 Green courtyards with outdoor furniture

Evaluation of the project in terms of its sustainability



Social Sustainability:
The Sonnwendviertel offers a wide variety of housing options: Community housing projects, subsidized and privately financed apartments (both rental and owner-occupied), student dormitories, hotels and offers for temporary living. It also offers its residents shopping facilities, restaurants, schools, kindergartens, doctors' offices, individual practices, pharmacies and other «attractions» on the ground floors. The outdoor area offers people of all ages various recreational opportunities.

Economic sustainability:
There are a variety of amenities along the promenade, from local grocery stores to co-working spaces and office buildings.
In addition, there are punctual functions located throughout the neighborhood. For example the «Stadtelefant» which is a neighborhood house and architecture cluster with numerous architectural offices working in the same building, Atelierhaus C21 offers gallery, dance studio and a café with outdoor area, offices, repair and production rooms and studios for various freelancers(78 studios: 40 - 120m², 6 workshops: 40 - 175m²). The community housing building Gleis 21 holds events in its own event hall on the ground floor, gives music and creative courses in the studios and offers housing for artists.
There is much more potential for a productive neighbourhood, that could be realized in this project. For example the ground floor area facing Maria-Lassnig-Strasse is used for residential purposes, this does not create attractive living conditions and would also be a very good place for urban production from a logistical point of view.

Environmental sustainability:
The largest environmental impact in terms of biodiversity, resilience and social sustainability is the 7 ha Hilmut Zilk Park in the Sonnwendviertel, which provides a lot of open space for people, wild rabbits and bees etc., it provides infiltration areas and has a cooling effect on the surrounding area. Each courtyard has a varied landscape with lots of green space. The settlement is very well connected to public transport and has a continuous bicycle infrastructure, which contributes greatly to sustainable mobility and reduces the negative impact on the environment. The most critical aspect is the sustainable mindset are the materials used in the development. Only 100 out of 5000 apartments were built from a material other than concrete. For such a development, this number is extremely low.
Another critical point is the planned promenade, which does not provide enough shade; trees are greatly missed there.

Spacial Sustainability:
There is a very compact usage of the territory with clearly high density, that works really well with its surrounding. It is a very well connected neighbourhood with a very strong mobility concept which provides services and opportunities for productive development.

Urban concept:
+ diverse in typologies
+ wide variety of housing models

Mobility concept:
+ public transport: tram, bus, metro
+ bicycle infrustructurer
+ parking garages
+ mobility point

Local infructructure:
+ school, kindergartens
+ shopping facilities
+ medical center, pharmacy
+ restaurants

Social and cultural offers:
+ childcare possibilities
+ events spaces
+ co-workings
+ offices

Greenery and leisure possibilities:
+ motoric park
+ urban gardening
+ animal zone
+children playgrounds
+ free space

Materials
+ 100 apartaments built with timber structure
- 4900 apartaments built with steel and concrete

Fig. 47 Concrete - main material used in the construction of Sonnwendviertel

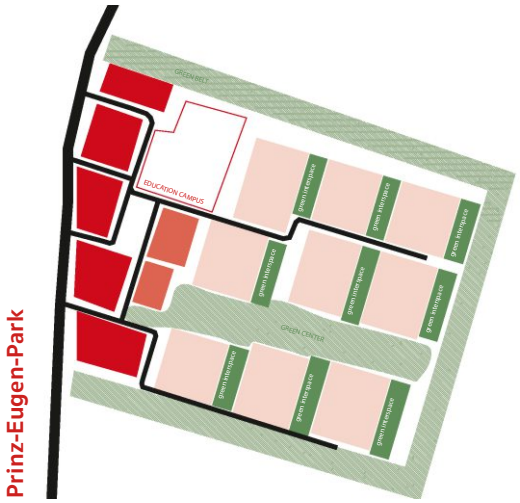


Fig. 48 Urban concept Prinz-Eugen-Park: density and permeability

Fig. 49 Urban concept Sonnwendviertel: density and permeability

the more red, the more enclosed development

semi-private / public green space

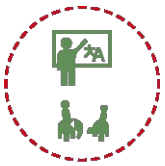
Conclusion

We look at two development projects that are pretty much the same in terms of size, but the approach is very different. First of all we can compare these two in density, on the same size area of 30 ha 5000 apartments (Sonnwendviertel) and 1800 apartments (Prinz-Eugen-Park Development)were built.

Prinz-Eugen-Park has a very green surrounding, while Sonnwendviertel is more about urban development.

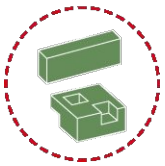
While Sonnwendviertel is fullfiled with different functions along the development, Prinz-Eugen-Park has a more monotonous living enviroment with infrastructure facilities only on the western part.
Both case studies show the implementation of participatory urban development and are great examples for community building projects.

These case studies will be used as a basis for the development of Pohulianka neighborhood, which should become a competitive project.
The future neighborhood area should provide a broader concept of mix use as well as productivity, which was seen as a weakness in both case studies.
Sustainable materials and reuse of existing structures/resources should become an integral part of the project to achieve a more sustainable design.



Educational Campus:
important integral part of the project, should be developed in the first phase

Reach landscape design:
variety of public spaces and green areas, diverse plants and trees, big green space for the whole area



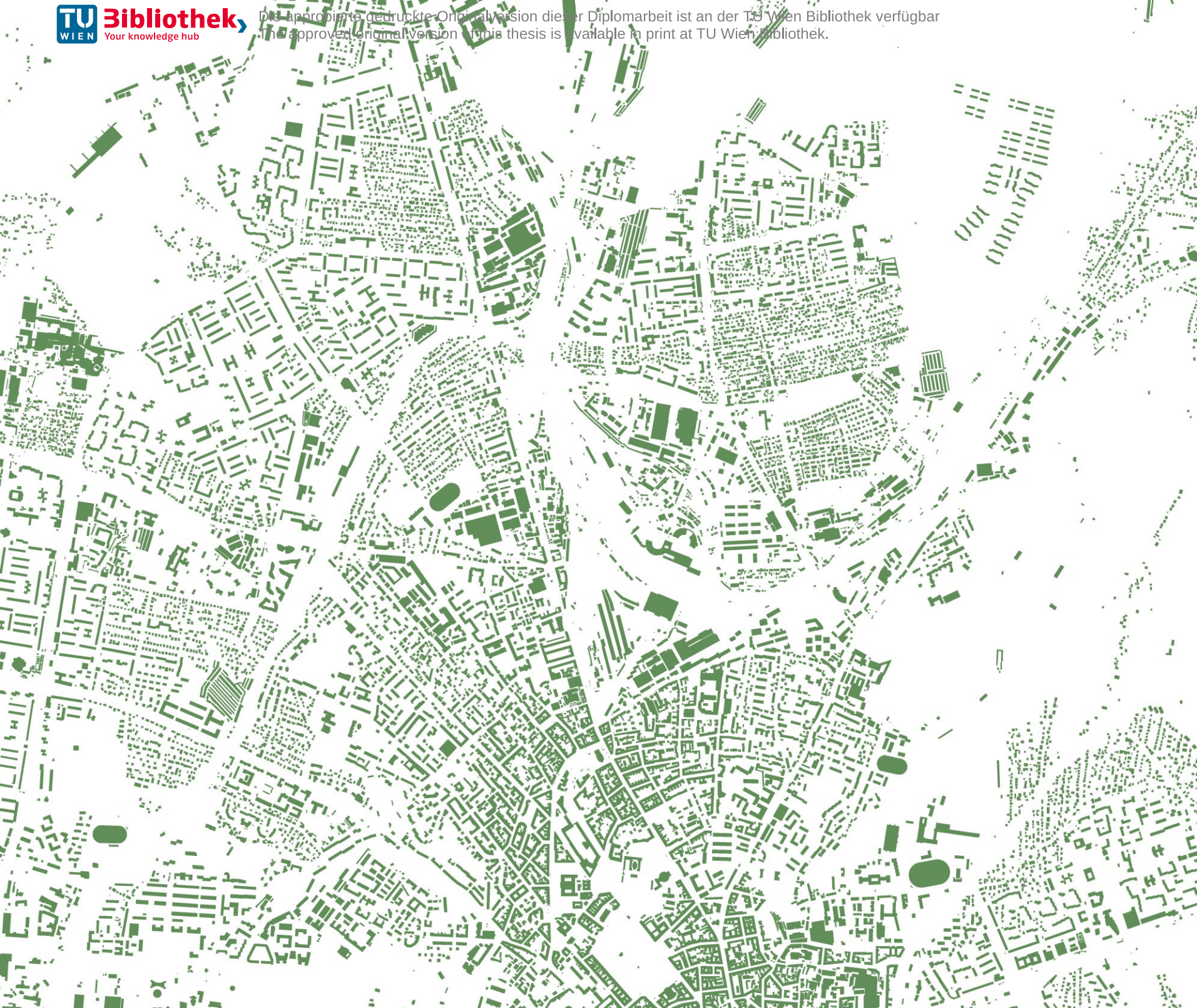
Diverse Typologies:
using diverse typologies for an inclusive surrounding, to promote variety and flexibility in project and meet different people's needs

Strong mobility concept:
accessibility and connection with the surrounding, focus on public transport and green mobility offers

Fig. 50 Positive principles in the projects

Urban Portrait of the city of Lviv

In this chapter we are going to meet the city of Lviv, explore its urban portrait, geographic and historic facts, territorial development, strategies and concepts developed for the city, as well as visions for its future development. We will also take a look at the difficult reality of the war that Lviv is facing now (2022-2023). and what impact it has on the city's image and how development direction and urban thinking are changing.



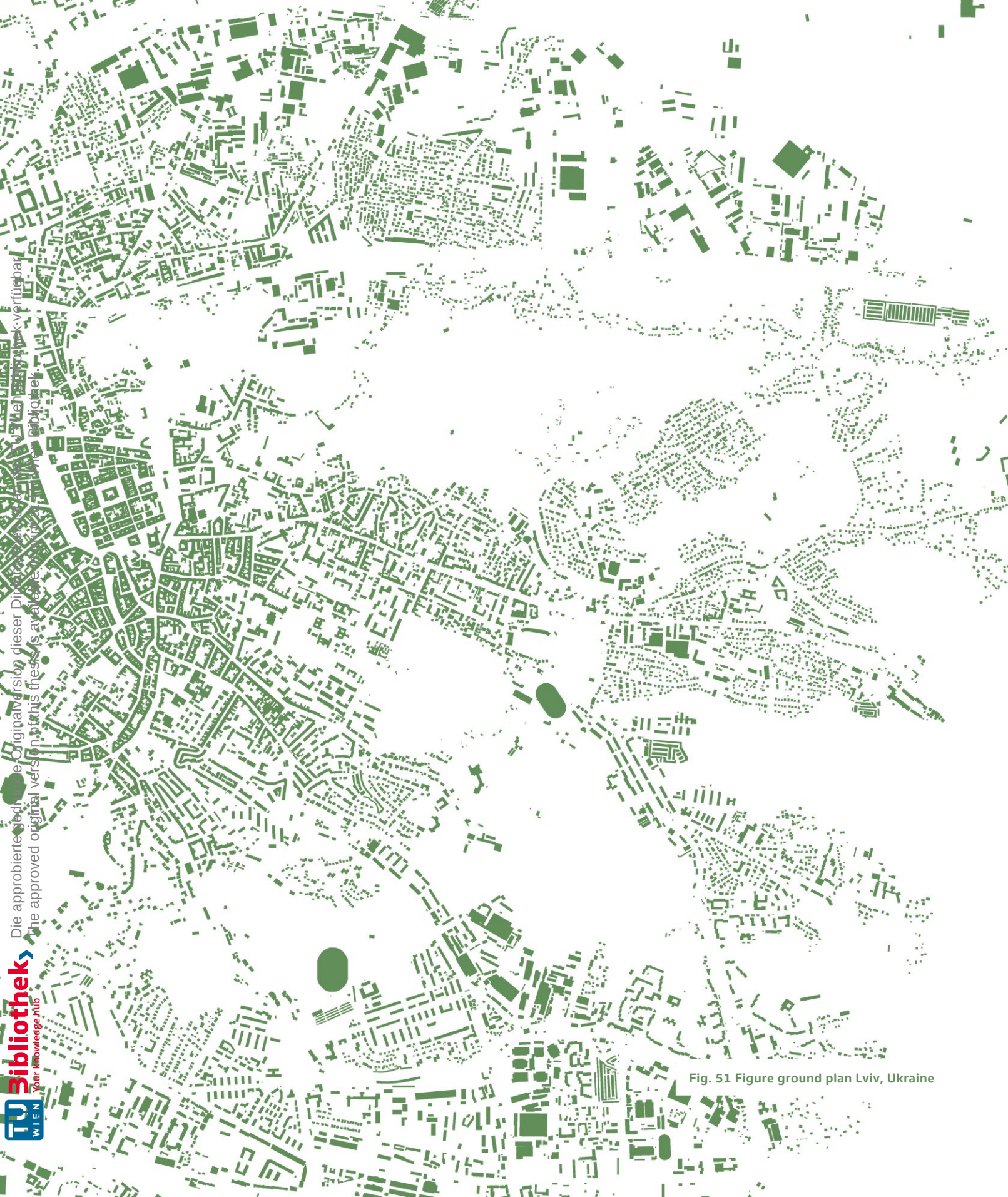


Fig. 51 Figure ground plan Lviv, Ukraine

Geographic and historic facts

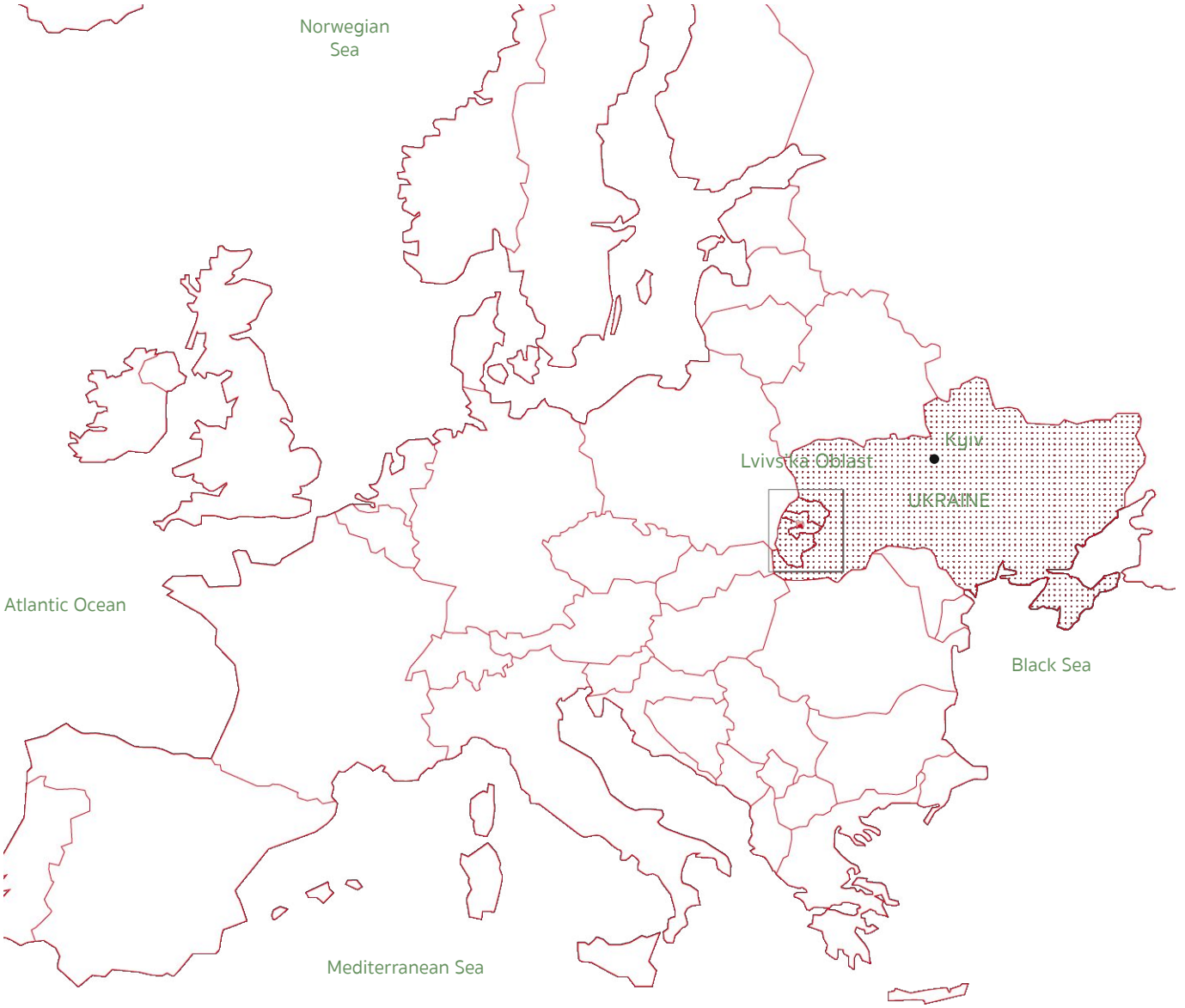
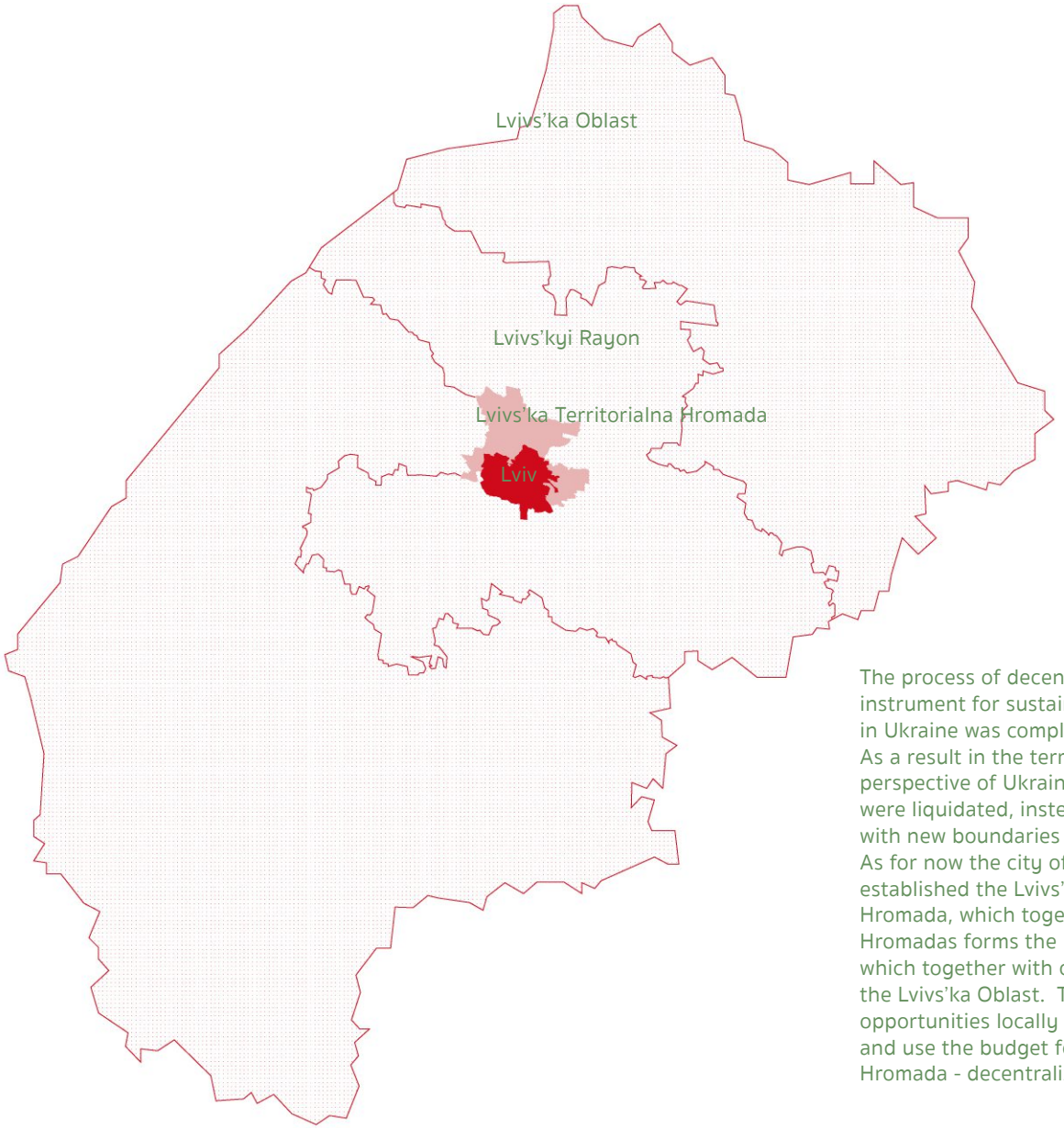


Fig. 52 Allocation: Ukraine in Europe, Lvivs'ka Oblast



The process of decentralisation as an instrument for sustainable development in Ukraine was completed in 2020.
As a result in the territorial formation perspective of Ukraine: 490 old Rayons were liquidated, instead 136 Rayons with new boundaries were formed.
As for now the city of Lviv has established the Lvivs'ka Territorialna Hromada, which together with other Hromadas forms the Lvivs'kyi Rayon, which together with other Rayons forms the Lvivs'ka Oblast. This gives more opportunities locally to make decisions and use the budget for the needs of Hromada - decentralized.

Fig. 53 The process of decentralisation and territorial division of Lviv

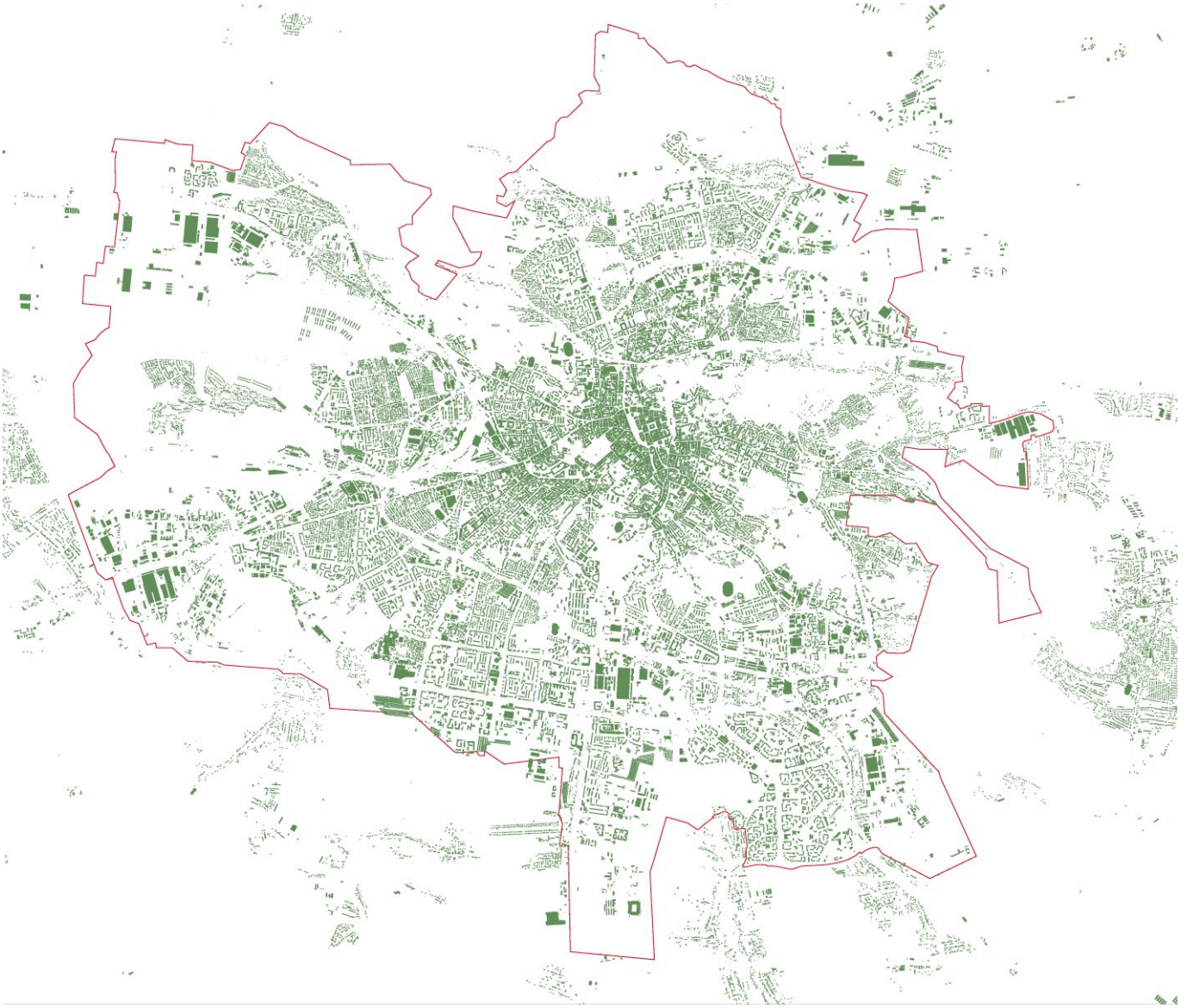


Fig. 54 Getting to know the city of Lviv: Figure ground plan Lviv, Ukraine

km² **182** km²

founded in **1256**

780.800*

*before war

500 residents/km²

Historical overview

Fig. 55 Medieval Lviv 1618

Fig. 56 Austrian Empire Rule, Lviv 1866

Fig. 57 Orange Revolution, Lviv 2014

Fig. 58 Lviv Arrival City, 2022

The city of Lviv was founded in the middle of the 13th century as the capital of Kingdom of Galicia–Volynia, a powerful medieval state in Eastern Europe. Due to its unique geographical location at the intersection of the main trade routes between the West and the East, Lviv became the leading trade center of Eastern Europe and the largest city in Ukraine in the 15th and 17th centuries.

For the last 150 years Lviv has been under the rule of the Austrian Empire(1772 - 1918), the Russian Empire(1914 - 1915), the West Ukrainian People's Republic(1918), the Republic of Poland(1919 - 1939), the Nazi occupation(1941 - 1944), and Soviet Union(1939 - 1941, 1944-1991). With the independence of Ukraine in 1991, the Lviv became a cultural center of the country.

Being part of different countries and cultures for over 500 years, Lviv has a very rich architectural heritage. A very interesting period of historical development from the architectural and urban planning point of view was Lviv under the rule of the Austrian Empire. In almost 150 years, the transformation of the city was planned and carried out in four phases.(**Fig. 59-62**)

The medieval old town has preserved its authentic structure. Even today, the cultural and architectural differentiation of the area into Ukrainian, Jewish, Catholic and Armenian parts can be seen, each with their own church as spiritual centers in the old town.This is the history of the city and the face of its multiculturalism.

In 2004, Lviv played the role of a major social catalyst for the democratic Orange Revolution.
Today,, in 2022, because of Russian invasion, Lviv became an arrival city for the whole country.(1)

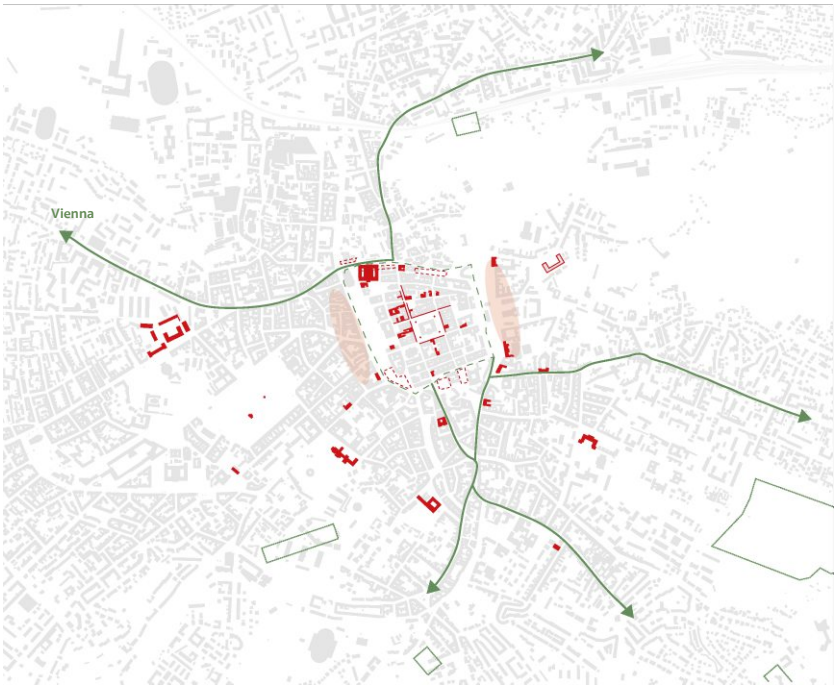
1 The shortest history of Lviv: https://city-adm.lviv.ua/portal/history-of-lviv

Lviv city urban development in 4. Phases under the rule of the Austrian Empire 1772 - 1890

1st Phase (1772-1826):
Removal of the fortification walls and further development within the former boundaries.(1)

- Relocation of cemeteries outside the city center
- Demolition of the fortification walls
- Development areas outside the city center
- Ringstraße
- Main routes

Fig. 59 1st phase of urban transformation under the rule of the Austrian Empire



2nd Phase(1826-1848):
Development of the city center and suburbs: reconstruction of the market square. Concentration of construction activity in the areas directly adjacent to the city center and then further distribution along the main roads (transit). In this phase, 2,612 buildings were built, of which 425 were public.(1)

- Rebuildng
- New construction
- Square
- Facade modernization
- New fountain figures

Fig. 60 2snd phase of urban transformation under the rule of the Austrian Empire

Fig. 61 3rd phase of urban transformation under the rule of the Austrian Empire

3rd Phase(1848-1870):
Beginning of the construction of the representative city center, the expansion of the buildings in the direction of the main railroad station, as well as the construction of the railroad network. (1)

- Railway

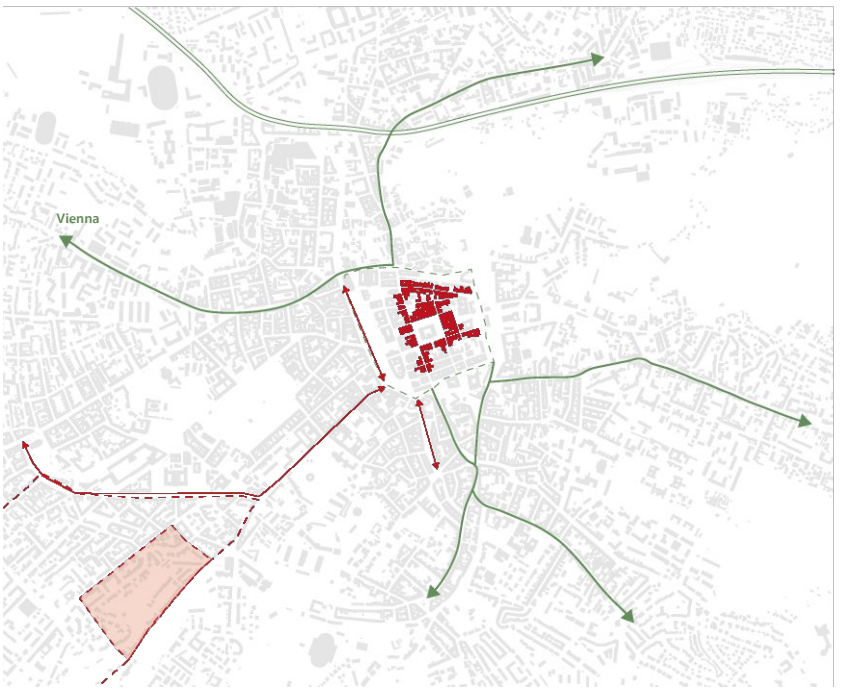


Fig. 62 4th phase of urban transformation under the rule of the Austrian Empire

4th Phase(1870-1890):
Beginning of the functional zoning of the city, definition of the administrative boundaries, transformation of the buildings around the market square into a solid four-story buildings, canalization of the Poltva river. In this period the first tram was launched in Lviv and the whole Ukraine.(1)

- Densification/redesign
- Building representative axes
- Novyy Svit
«New World»
Camillo Sitte principles
- Kastelivka

1 Y. Birulov: Architecture of Lviv. Time and styles: thirteenth and twentieth centuries. Center of Europe. Lviv, 2008

Lviv territorial development

Lviv Territorrial Development in 3 periods

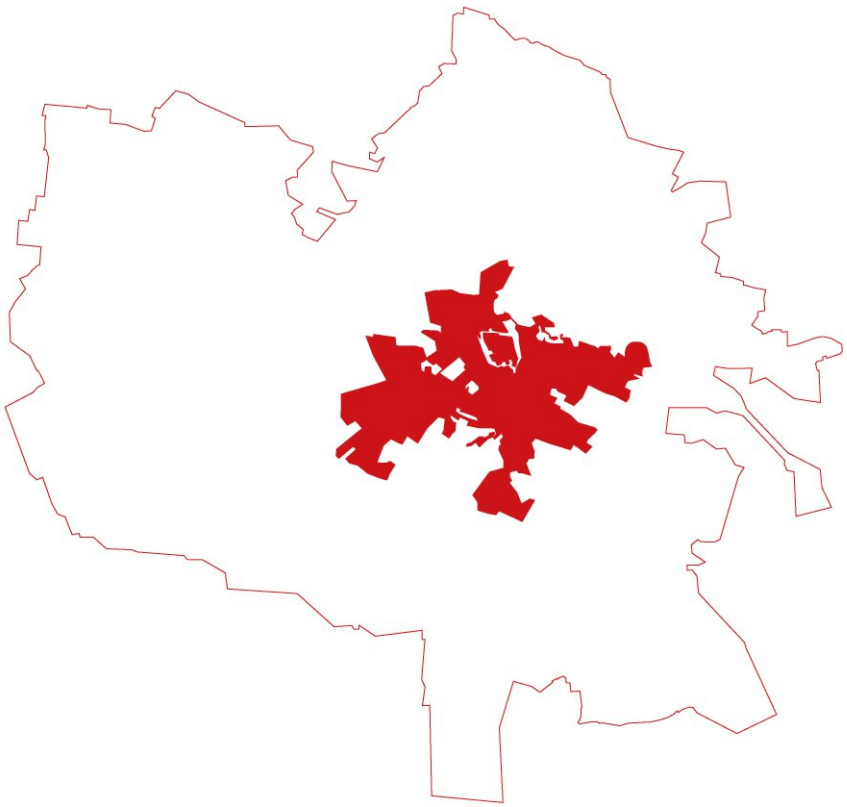


Fig.63 Dense built environment, formed before the Second World War

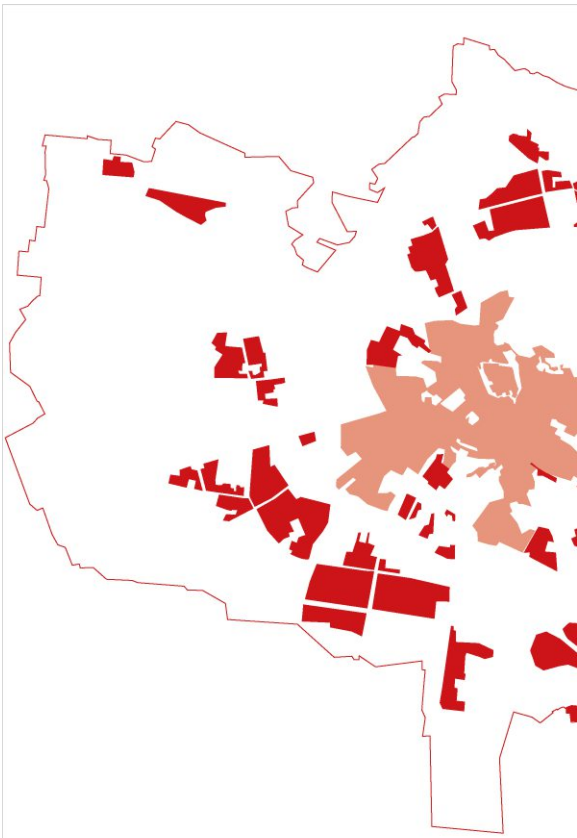


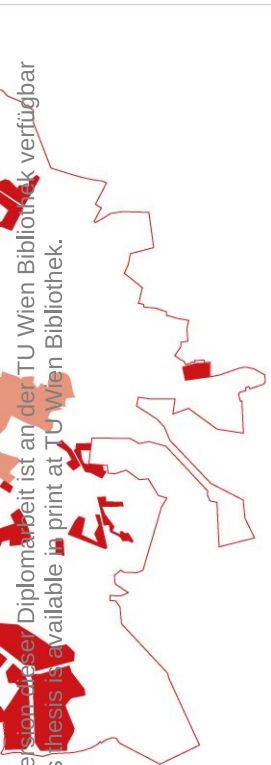
Fig. 64 Built environment of the Soviet period (before 1

The territorial development of the city is characterised by a strong core - the densely built medieval old town and its surrounding area. (**Fig. 63**)

At the time when industry in Lviv was growing rapidly, new modernist soviet housing developments were emerging just as quickly in the north, south and west of the city to provide housing for factory workers.(**Fig. 64**)

Soviet plans to rebuild Lviv into a monumental industrial city weren't realized and the authentical city structure was preserved, nevertheless new prospects and clear axes with dominant buildings emerged in newly developed neighbourhoods. (1)
In addition to massive residential development, this period left a modernist footprint throughout the city.

After Ukraine became independent, there was a lack of urban thinking, the master plan for Lviv was outdated, and its development principles no longer met the current needs of the people and the city. (2)
Starting from 2010, Lviv experienced a construction boom, triggered by the natural process of a lack of living space and a willingness to improve living conditions(**Fig. 65**).



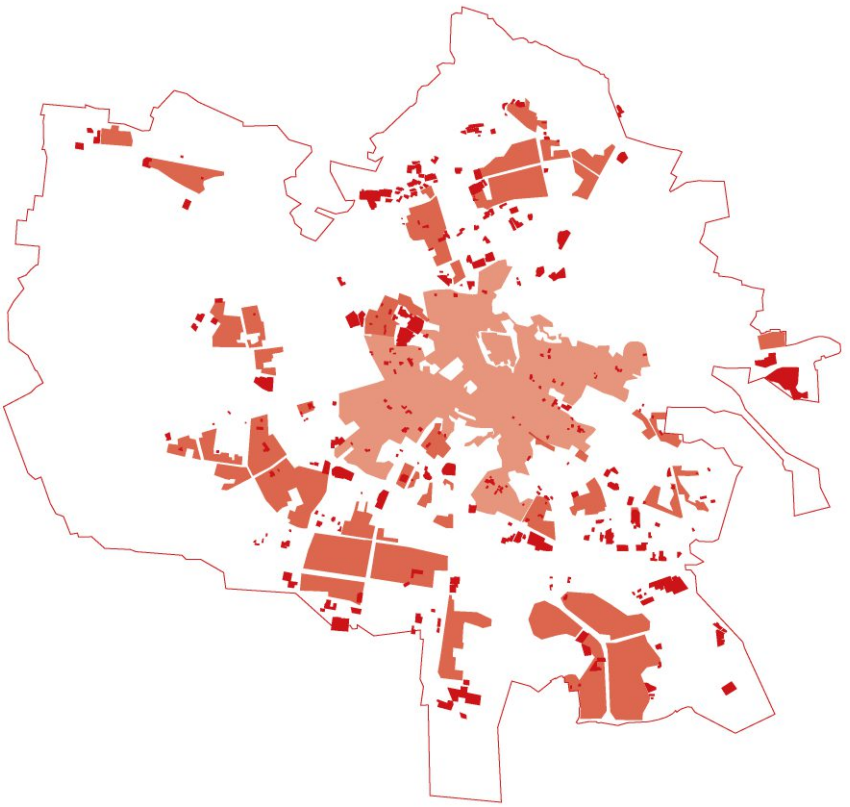


Fig. 65 Residential Developments (starting from 2010)

These were mostly single-building or group-of-buildingsdevelopments that often lacked adequate infrastructure to function properly. Most services were concentrated in the central part of the city, public transport was very slowly developing, and public spaces were not a priority, what caused a big amount of private motorized transport.

1 Lviv's chief architect talks about the history of the city's construction, unsuccessful buildings of his contemporaries, and paving stones: https://nachasi.com/city/2018/04/25/architector-lvova-interview/

2 IDC LVIV 2030, 2021

Fig. 66 Master Plan of future residential development, 1963

Fig. 67 Panorama of the city, 1860

Fig. 68 Ivan Franko Lviv State University , 1881

Fig. 70 Residential building
in the city center, 1964

Fig. 69 Housing for fabric workers, 1960

Fig. 71 Residential building, 2019

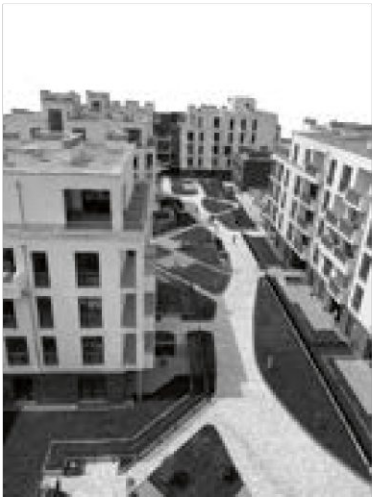


Fig. 72 Residential complex, 2017

Lviv strategic planning

Fig. 73 Vision for energy efficient development of Lviv

With the establishment in 2009 of the «City Institute», a municipal institution and center for strategic planning and development in Lviv, the city has gained more expert and scientific opinion on future development directions and has created a number of strategic documents that influence urban thinking and promote sustainable development.

In 2008, Lviv became one of the first cities in Ukraine to join the EU Covenant of Mayors program. A key document, the Sustainable Energy Action Plan, was developed for Lviv as a guideline for achieving its CO2 emissions reduction target (1). The city's ambition is to become energy independent, which involves the development of the city's energy sector and transition to 100% renewable energy sources by 2050, as well as the development of energy efficient and energy positive districts in the city. (2) Even during the war, the city of Lviv continues to work on its goals and in July 2022 presented a new action plan for sustainable energy development and climate of Lvivs'ka Territorialna Hromada until 2030. (3)

Starting from 2010 the city began to work on development a program for bicycle infrastructure that was initiated by demonstration of cycling activists. At the same time NGO Lviv Association of Cyclists was established.
Since then, 126 km(from 270 km planned) of bicycle routes were built in the city(for the end of 2021)(4).

In 2020 Lviv City Council approved the «Green Action Plan» for Lviv.
This document shows all the challenges faced by the city and proposes specific measures to be taken for each area, as well as shows the financial investments needed to implement them.
The main areas for improvement in the city are waste, water, transportation, construction, land use, energy, and biodiversity.

Vision :"Clean, Vibrant and Liveable City for All" (5)

In 2021, the City Council approved another important document: IDC LVIV 2030, Integrated Development Concept and Sustainable Urban Mobility Plan for Lviv.
IDC LVIV 2030 shows the understanding of the city and presents its future development direction based on today's needs and challenges. It is also an easily adaptable vision that can be used as an instrument for other development strategies and projects.

Vision: «Lviv is a city of short distances
A compact city of opportunities that preserves the past and cares about the future» (6)

Sustainable urban mobility plan measures for Lviv was approved by the city in 2021. It is a strategic document that defines the city's transport policy for the next ten years and answers the question of how to optimize the city so that the movement of residents in it is efficient in terms of time, comfort, cost, promotes health and has the least negative impact on the environment.

Vision: «Safe, environmentally friendly, comfortable, fast transportation in the city for everyone» (7)

1 The covenant of mayors - Demonstration: https://com-dep.eu/about-the-initiative/

2 Action plan for sustainable energy development and climate of Ivivs'ka territorialna hromada until 2030, Lviv, 2022

3 Lviv intends to reduce CO2 emissions by 35% by 2030: https://city-adm.lviv.ua/news/science-and-health/ecology/292363-do-2030-roku-lviv-maie-namir-zmenshyty-vykydy-so2-na-35protsent

4 Lviv bicycle nfrastructure: https://lav.org.ua/veloinfrastruktura-lvova/

5 Lviv is one of the first cities in Ukraine to develop a strategy for «green city development»: https://city-adm.lviv.ua/news/science-and-health/ecology/276059-lviv-odnym-z-pershykh-v-ukraini-rozrobliaie-stratehiiu-zelenoho-rozvytku-mista

6 IDC LVIV 2030, 2021

7 Sustainable Mobility Plan for Lviv until 2030, Lviv, 2021

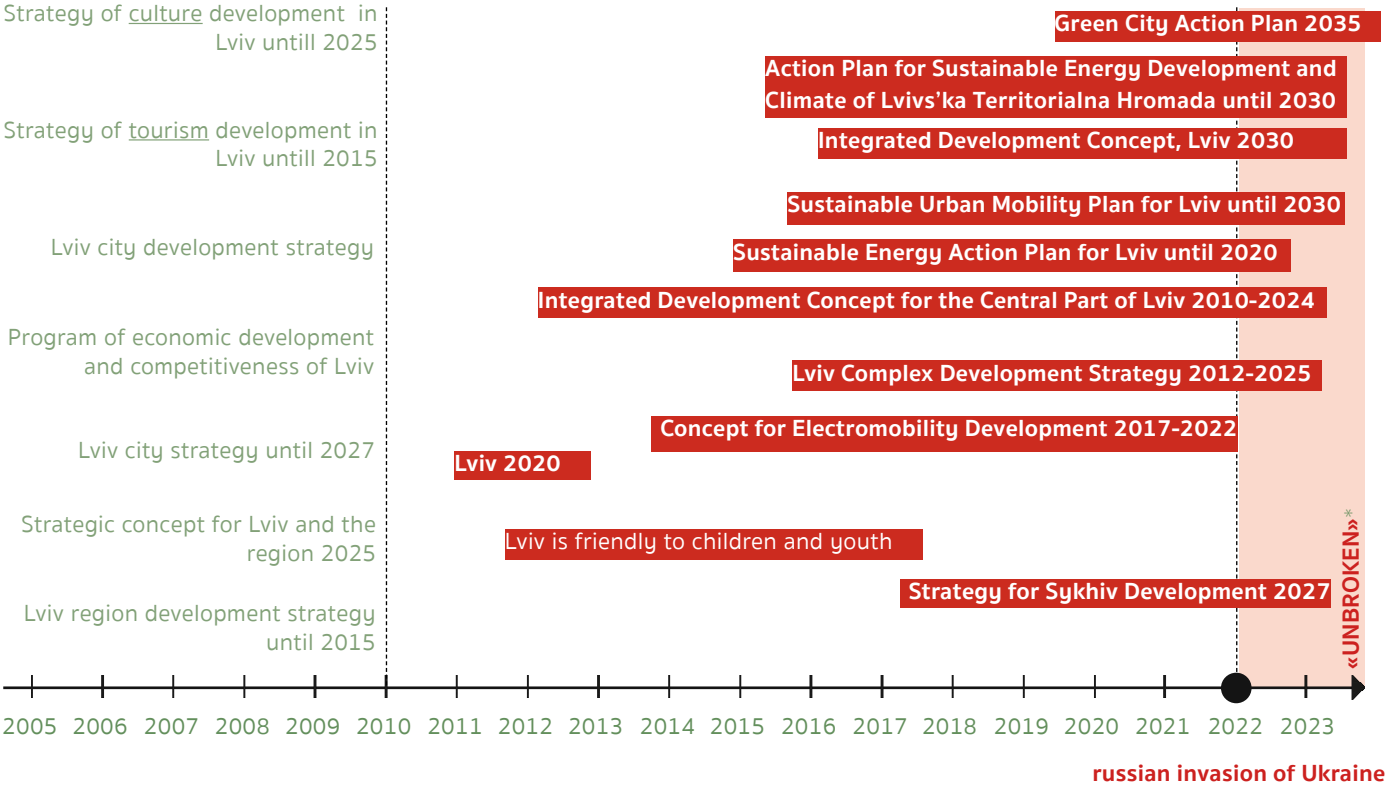


Fig. 74 Lviv strategic planning documents

Conclusion

Lviv has gone through a transformation from a historic city to an industrial and tourist city and is now moving towards sustainable development. Ambitious goals and a clear vision are what we see now in all strategic documents. Of course, the reality is not so simple, and there are many steps that need to be taken to build a sustainable and energy efficient city for future generations. This also includes changing the mindset of the population, awareness and support of the city towards sustainable development. Lviv has a great potential to become a sustainable, resilient, and comfortable city for all.

Lviv during the war 2022-2023

Fig. 75 Missile attack in the northern part of Lviv

*the war still continues as for march 2023

Fig. 76 Children look at the crater after the russian missile attack

Fig. 77 Lviv railway station met 50 thousand displaced people daily

Fig. 78 People all ages volunteer to help the country to confront the enemy

Fig. 79 Valunteer centers organized by locals

Fig. 80 Les Kurbas Lviv Academic Theater - temporary accommodation for displaced people

Fig. 81 Lviv without electricity

Fig. 82 People use generators to keep their businesses running

Fig. 83 Neptune sculpture is hidden from possible attacks

Fig. 84 Hidden Boim Chapel in Lviv

Even during the war the city of Lviv is developing and achiving new goals. There are a couple of realized projects as well as competitions held. New challenges became an impulse for thinking changing process.

In summer 2022 a mother and child center for more than 100 pregnant women «Unbroken Mothers» was built. The center consists of two two-story houses with a total area of 1300 m2, and are built in wooden construction. Along with the housing, there are walkways, a playground and a lake.(1)

Also during the last year 4 modular settlements were realized within the city, the last one - the biggest was realised for winter stay.
Great attention has been paid to the development of open spaces to create a comfortable environment for people. These include playgrounds, recreation areas, community kitchens, etc.(2)

The city is also working on the idea of building community housing to solve the problem of housing vulnerable groups. The rehabilitation and productive city issues became very important topics in terms of urban thinking and city development direction.(3)

Local production and education should enable people returning from war to find new employment. Together with rehabilitation, this will be the most important development direction for the city: mixed-use inclusive developments as well as adapting existing developments to meet today's needs.

1 Lviv City Council: https://city-adm.lviv.ua/news/culture/architecture-and-historic-heritage/294843-lvivskyi-tsentr-nezlamni-matusi-sered-naikrashchykh-proiektiv-realizovanykh-pid-chas-viiny

2 Lviv City Council: https://city-adm.lviv.ua/news/society/social-sphere/291600-u-lvovi-na-sykhovi-vidkryly-tretie-modulne-

3 Lviv City Council: https://city-adm.lviv.ua/architectural-competitions/293681-arkhitekturnyi-konkurs-na-proiektnu-propozytsiiu-novoho-budivnytstva-kompleksu-bahatokvartyrnykh-zhytlovykh-budynkiv-na-vul-i-mykolaichuka-u-m-lvovipropozytsiiu-novoho-budivnytstva-kompleksu-bahatokvartyrnykh-zhytlovykh-budynkiv-na-vul-i-mykolaichuka-u-m-lvovi

Fig. 85 Playground in modular settlement in Lviv

Fig. 86 Modular settlement integrated into the environment of the city

Fig. 87 Mother and child center «Unbroken Mothers»

Fig. 88 Playground in mother and child center

Challenges of Lviv and its future development principles

The Russian invasion is the biggest challenge for Ukrainian cities, the issue of safety for residents became the crucial aspect, and the resilience of urban space and developments became a fundamental factor in urban thinking. Climate change mitigation and future development direction are strongly influenced by today's challenges and are even more difficult to deal with, when city is suffering from so much pressure.

The city of Lviv, like any other city in the world, has its challenges to deal with. Nowadays, Lviv faces the consequences of climate change, an outdated sewage system, as well as too many paved areas in the city and urban changes that have led to a change in the ecosystem in the surrouding. One of the results can be seen on **Fig. 77**, when excessive rain leads to flooding in the city and makes movement impossible.

Another challenge are poorly developed new neighborhoods that are not connected to the city structure, encourage the use of private transport and do not provide people with adequate living conditions. There is a lack of proper public spaces, and many projects do not focus on people, so we have more car-friendly spaces in the city than pedestrian- and cyclist-friendly ones. Accessibility is a very important issue for Lviv (**Fig. 78,79**).

Because of russian invasion, the city of Lviv became an arrival city for thousands of people. About 5 million Ukrainians used and are using Lviv as a rescue destination. Some of them stayed in Lviv for a short time, others went abroad, and some still live and work in Lviv today.(3) Life for Ukrainians has changed, and so has urban thinking. What is more important: sustainability or human life? Of course, the aspect of safety has become more important, and the city of Lviv has presented new measures for new developments, developed on the model of Israel, which has been at war for more than 70 years.. Escape rooms, safe spaces for events, affordable housing and accessibility, inclusivity and adaptation of people who have arrived, electricity problems are the issues that have come to the foreground.

Rainwater management and climate change pressure

Fig. 89 Flood in Lviv

Lack of urban planning, chaotic developments with no common concept

Fig. 90 Cars and open space quality

Accessibility in public spaces and buildings design, walkways organization, connectivity

Fig. 91 Quality of public space

russian invasion: safety in the city

Fig. 92 Missile explosion in Lviv

russian invasion: integration of displaced people

Fig. 93 Lviv - arrival city

1 Lviv:
https://www.sparcs.info/index.php/cities/lviv

2 IDC LVIV 2030, 2021

3 About 5 million ukrainians have traveled through Lviv since the beginning of full-scale war: https://tvoemisto.tv/news/cherez_lviv_z_pochatku_povnomasshtabnoi_viyny_proihalo_blyzko_5_milyoniv_ukraintsiv_134306.html

IDC Lviv Main Goal: Develop Lviv as a city of short distances = Compact city

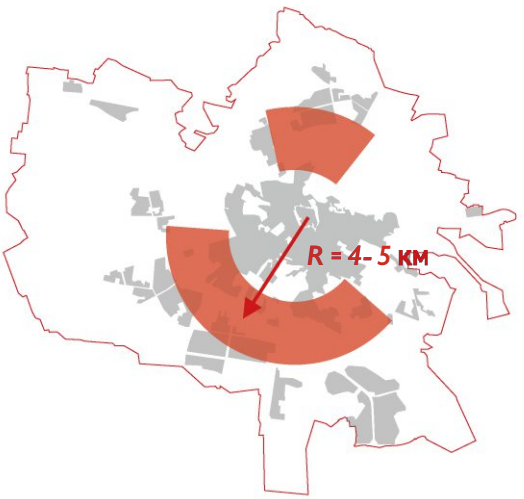


Fig. 94 Radius for the intensification of development

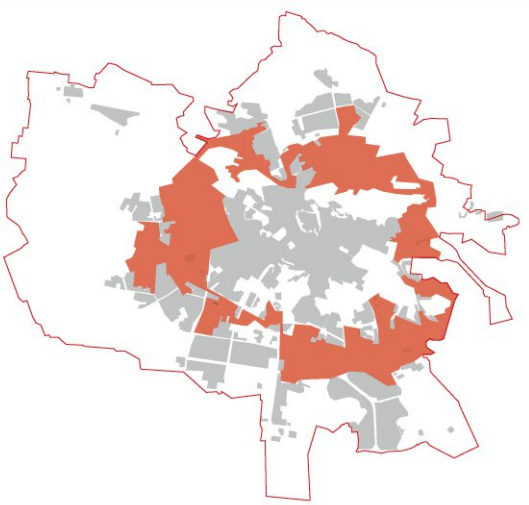


Fig. 95 IDC Lviv: Potential territories for transformation

Development of the natural framework:

- preserving existing parks, creating new ones and connecting them into a network through green links
- protect valuable areas of green hills in the north and peat moorlands in Levandivka from development
- renewal of urban water ponds(1)

Improvement in energy efficiency:

- development of alternative energy sources ;
- decrease in district heating heat losses;
- reduction of CO_2;
- decrease in natural gas consumption;
- boosting municipal co-financing program «Teplyi Dim»(Warm House) for building renovation;
- Electric trolleybus network expansion and modernisation of existing e-bus substations for multi-charging of different vehicles (2)

Development on the basis of the public transport system and sustainable urban mobility:

- creating a high-quality public transportation network, especially environmentally friendly
- allocate separate lanes for public transport outside the historic center
- arrangement of transport hubs with Park&Ride parking in connection with the public transport network (1)

Formation of centers and sub-centers

- relieving the city center: creating a network of active sub-centers outside the historic center, which will play an important role in local services (1)

Safety measures

- foreseeing protective rooms made of reinforced concrete in new buildings;
- arrangement of flexible social infrastructure in each house, that could dean as safe place for work and leisure;
- safe infrustructure for events and communty gatherings;
- arrangement of modern bomb shelters with the possibility of transformation to another function

Fig. 96 Main principles for Lviv future development (1,2)

3

Pohulianka urban design project

In this chapter, the reasons for working with the chosen site will be described. We will go through the different phases of the project development: analysis of the area and the surroundings, defining the goals, developing the concept and the project itself.

Why Pohulianka?

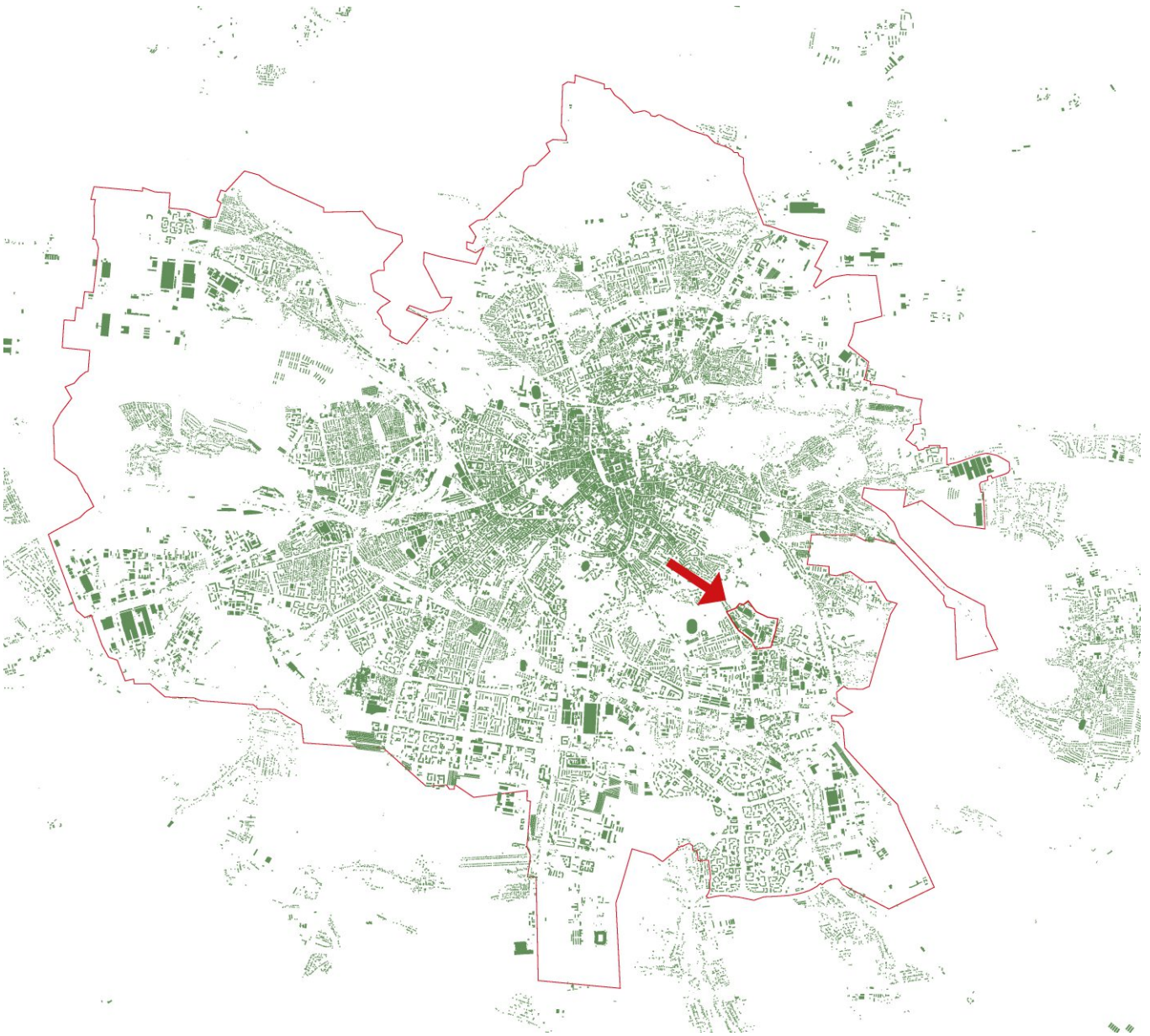


Fig. 97 Pohulianka in the context of the urban fabric

Choosing the site
On the map **(Fig. 88)** you can see potential territories for future development in Lviv. These are mostly old industrial sites, that are close to the city center, have good connections with public transport and are used ineffectively now.

From the large number of red areas, I selected the one that I think has great potential for sustainable transformation and is not considered attractive now. The advantage is that most of the areas are municipally owned, but at the same time the regulations do not make it easy because the rental regulations give more rights to the tenants than to the owners of the site.

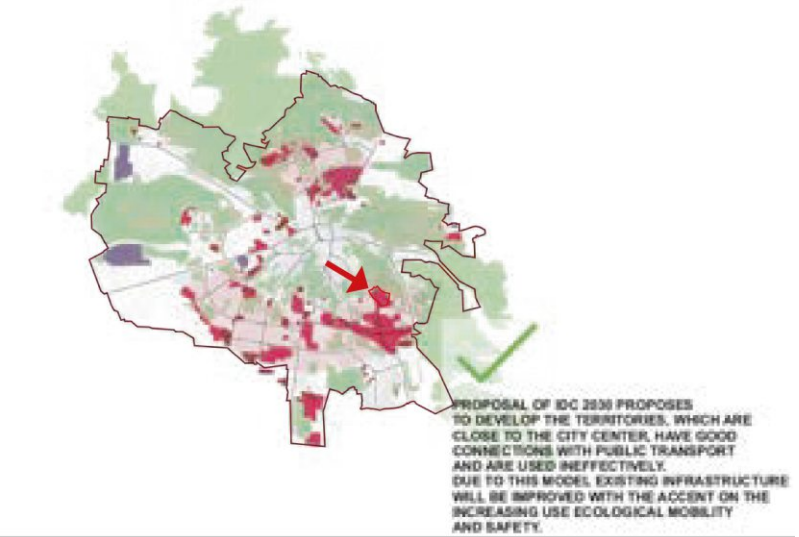


Fig. 98 Map IDC Lviv 2030: potential territories

Pohulianka Area got its name, because it is located dirrectly on the huge Pohulianka Forest Park.
It has a great potential and role being a part of green connection corridor in the city scale.

Undervalued meaning of Pohulianka Forest Park for new Developments became a crucial aspect in choosing the area and leads to one of the goals for future design project: bringing green into the neighborhood.

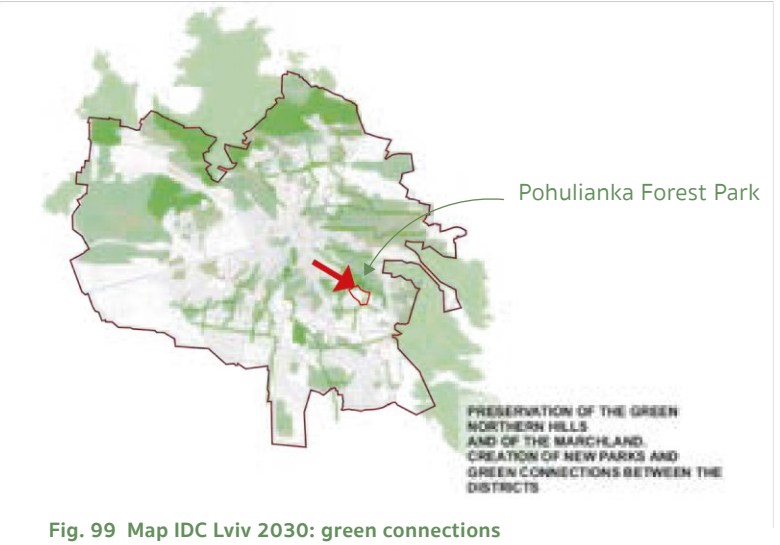


Fig. 99 Map IDC Lviv 2030: green connections

Fig. 100 Pohulianka contrast landscapes

Fig.101 View to existing neighborhood on the site

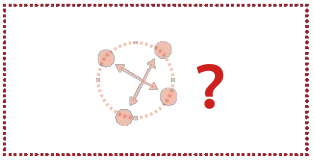
STRENGTHS

1. Location:
- Pohulianka Forest Park
- Snopkivskyi Park
- close to the city center

2. Existing Infrastructure:
- public transport
- healthcare facilities
- market, shops

3. Community:
- active community in existing neighborhoods

WEAKENESSES



1. Lack of spatial organization:
- no urban plan for the whole territory
- «Island» residential dwellings
- lack of organized urban space
- connections and lighting problems

2. Lack of infrastructure
- sport
- recreation
- education
- culture
- shopping

3. Mobility
- no barrier-free connections on the site and to the park
- industry = barrier(no connection to Zelena street and between new developments)
- no bicycle routs
- bad quality of streets
- cars parked everywhere

Fig. 102 Pohulianka SWOT analysis

OPPORTUNITIES

- develop an overall urban development plan for the area, which will enable efficient and convenient usage of it;
- creation of a sustainable, livable, mixed-use neighborhood;
- using greatest potential of the area - the Pohulianka Forest Park;
- use of the existing green network for healthy living and well-being;
- create bike lanes, shared mobility stations - promote sustainable transportation;
- adding functions - making the neighborhood self-sufficient.

THREATS

- further chaotic developments on the area without common concept;
- car-oriented neighborhood without qualitative open space - promotes unsustainable way of living and unhealthy enviroment;
- very little greenery in the area and old industrial units lead to a heat island effect in the neighborhood

Conclusion:
Pohulianka has great potential to become a sustainable, liveable and mixed-use neighbourhood. There is an urgent need to develop a comprehensive urban development plan for the area before it becomes immovably built up with chaotic developments.

Analysis of Pohulianka: urban context

Fig. 103 Pohulianka on potential green connections map of Lviv

Fig. 104 Pohulianka on potential subcenters map of Lviv

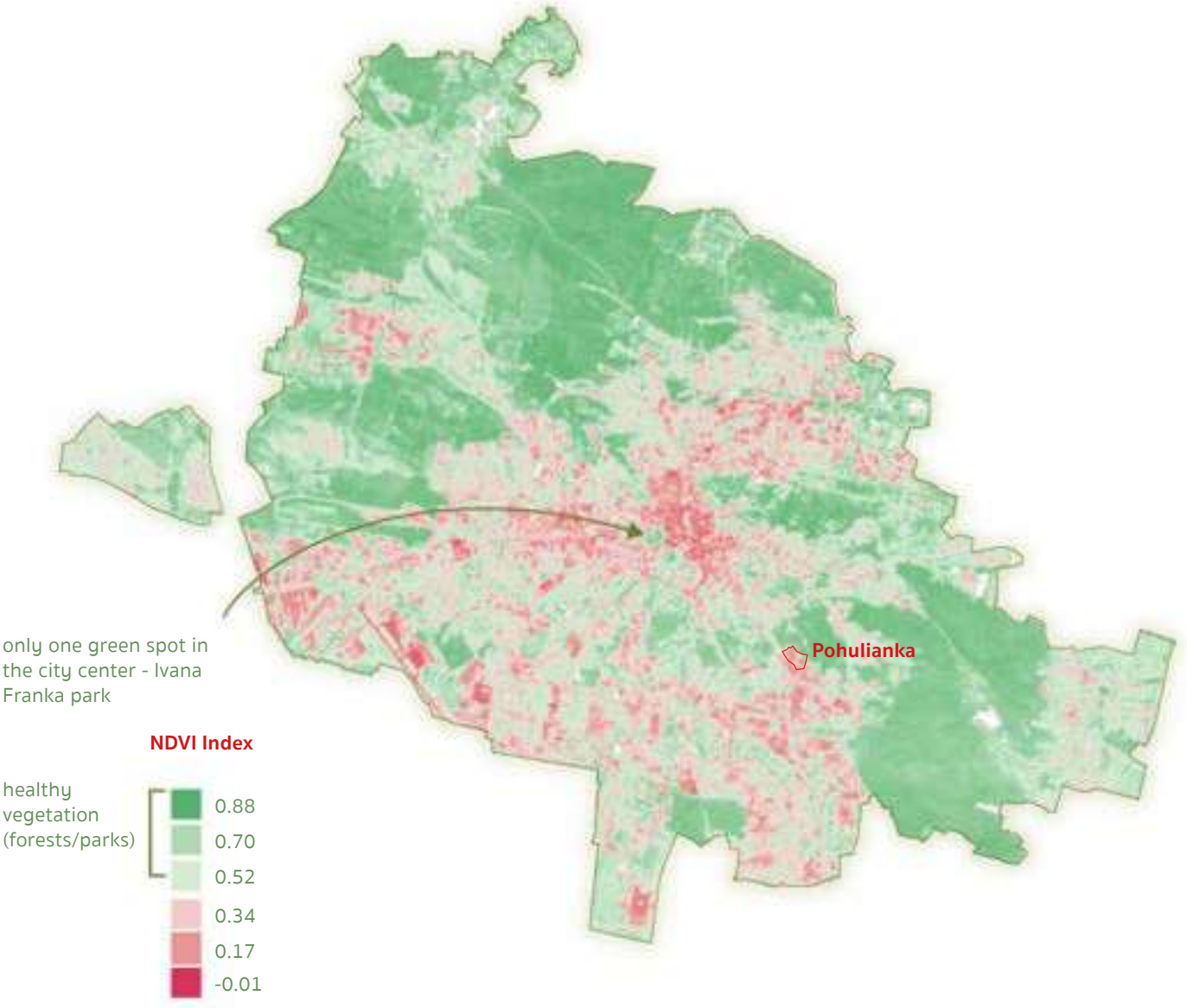


Fig. 105 Urban heat islands analysis: grennery

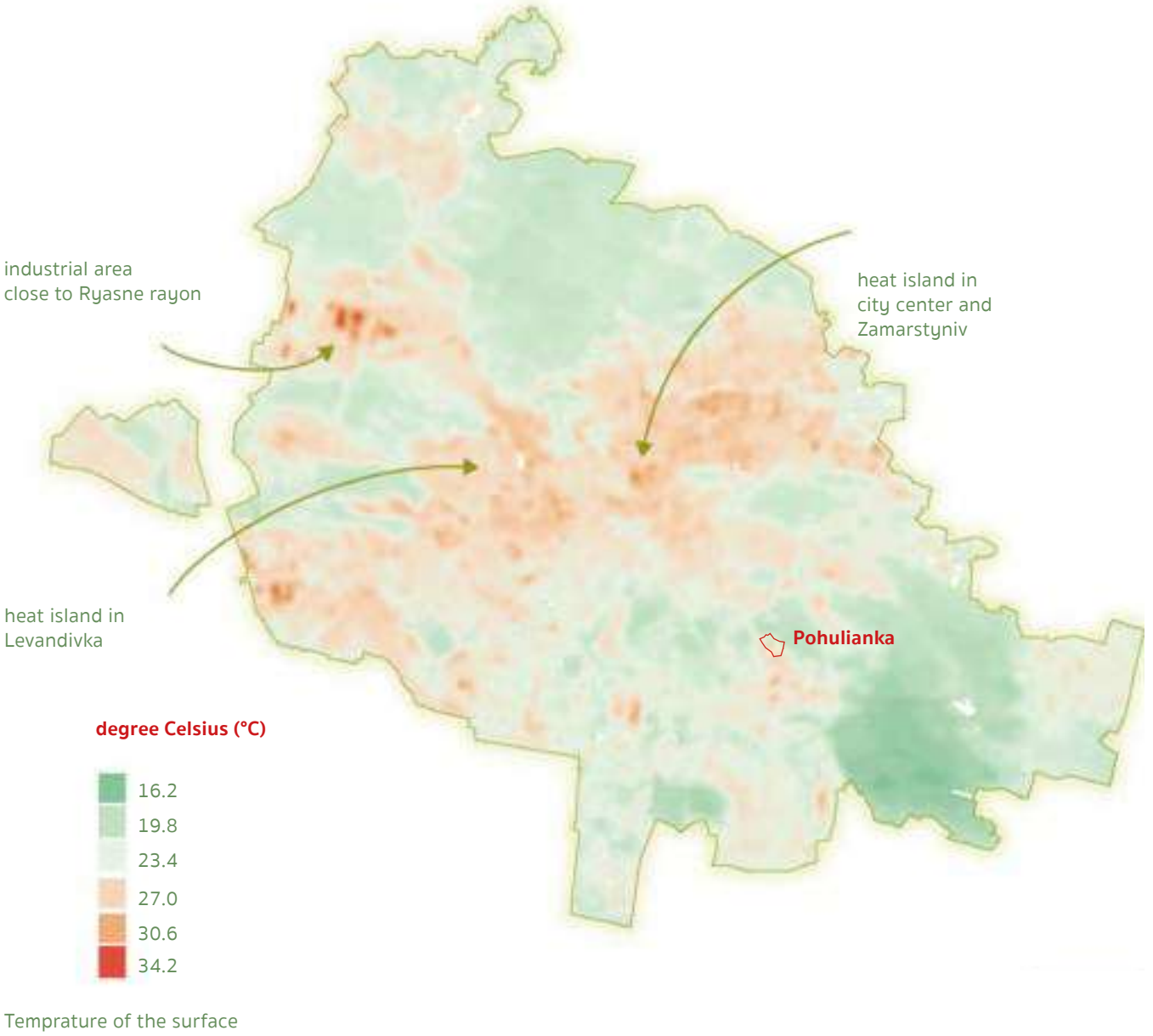
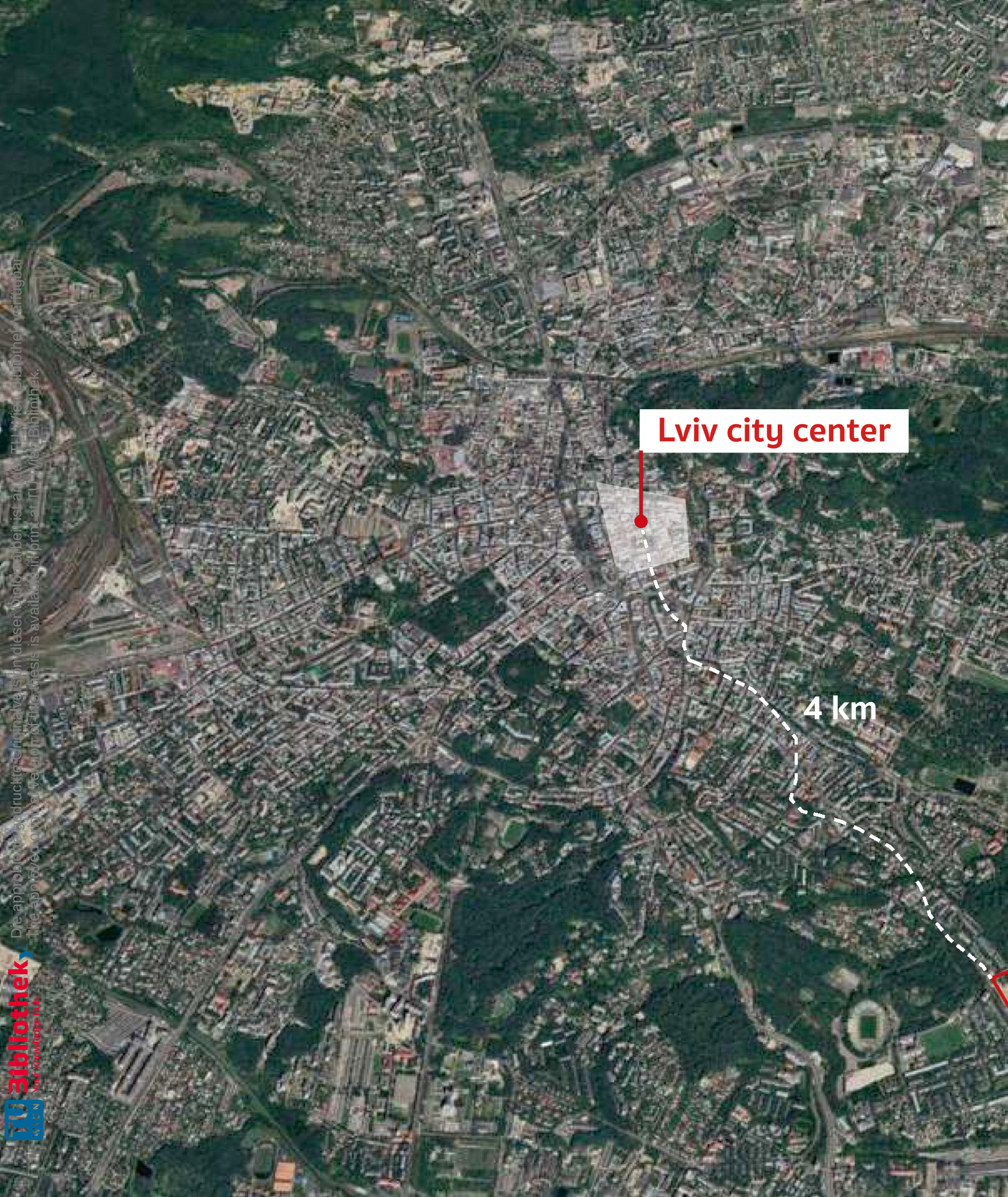


Fig. 106 Urban heat islands analysis: temprature

Historical background

Fig. 107 Location of pohulianka in the map Lviv 1783



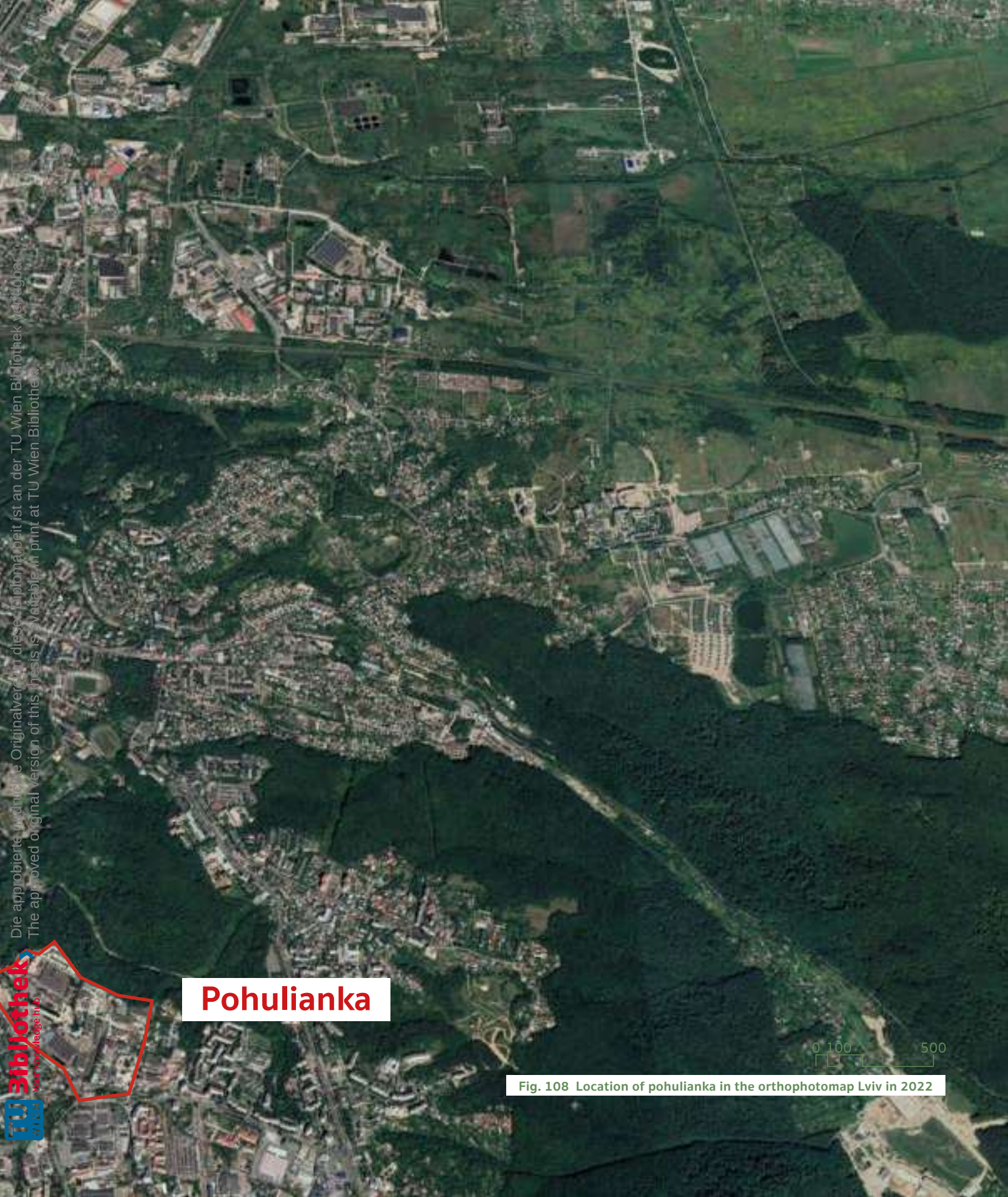


Fig. 108 Location of pohulianka in the orthophotomap Lviv in 2022

Fig. 109 Pohulianka in 1783

Part of the city called «Pasika» (apiary = bee-garden)

Fig. 110 Pohulianka in 1849

Territories engaged in gardening, beekeeping, first brick industries appear

Fig. 111 Pohulianka in 1947

A railroad track was laid from Persenkivka station to the large brick factory owned by the Mortgage Bank

Fig. 112 Pohulianka in 2005

In the last 50 years the area has become an industrial zone and was fully-built, the field was planted with trees

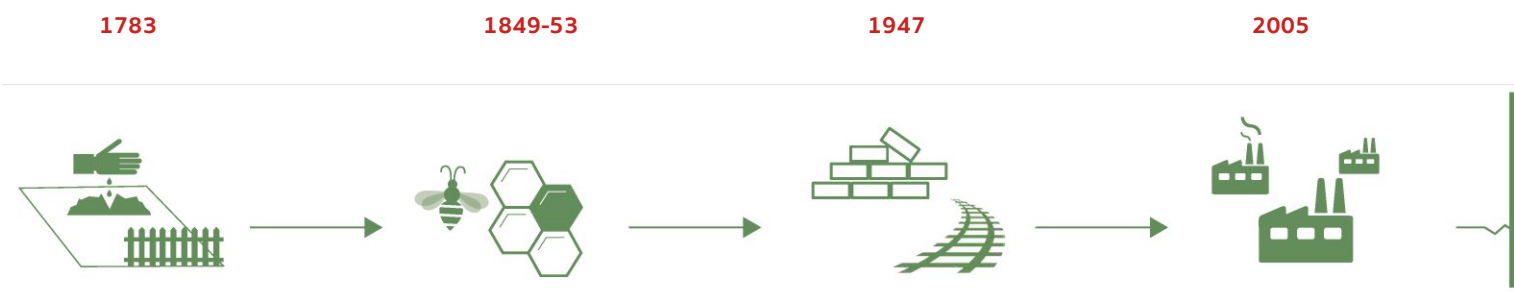


Fig. 117 Pohulianka development timeline

Fig. 113 Pohulianka in 2006

First housing projects appear at the area

Fig. 114 Pohulianka in 2012

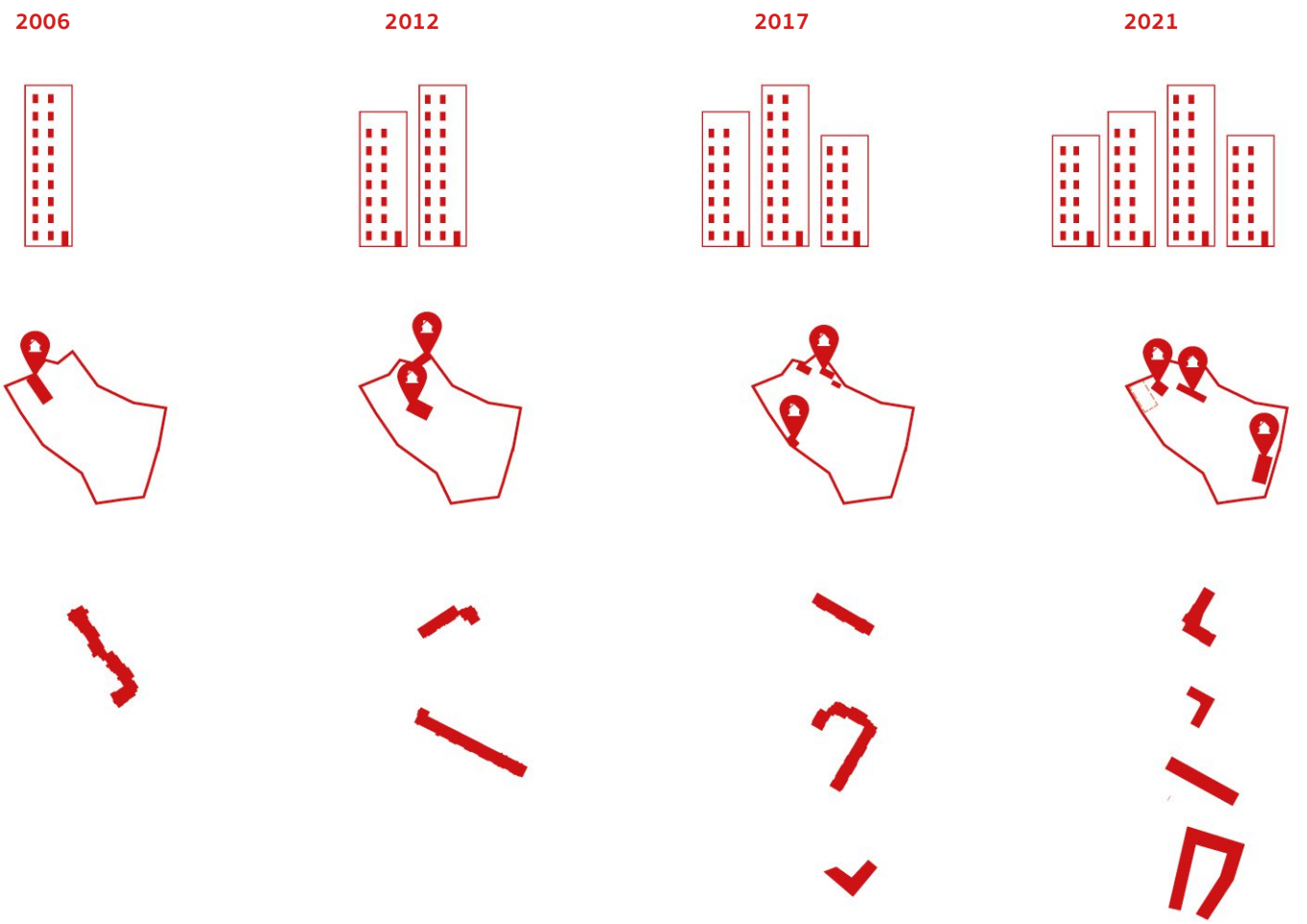
Another punctual interventions: Jasmynova 5B, Pohulyanka

Fig. 115 Pohulianka in 2017

Completed construction of both residential units and parking garage, new constructions in process: Z-119, Jasmynova 5

Fig. 116 Pohulianka in 2022

Construction of Lazur Sky, another one building of Pohulyanka residential comlex, Washington City residential complex with office block and office building with parking on Zelena 115 B



Surrounding functions

Fig. 118 (post-)industrial areas in the surrounding

The neighborhood of the site is very green, if not taking into account cuted out areas. Post-industrial areas in the surrounding create a risk for the heat island and interrupt the connection possibilities, at the same time are potential areas for future sustainable transformation for the city of Lviv.

project area

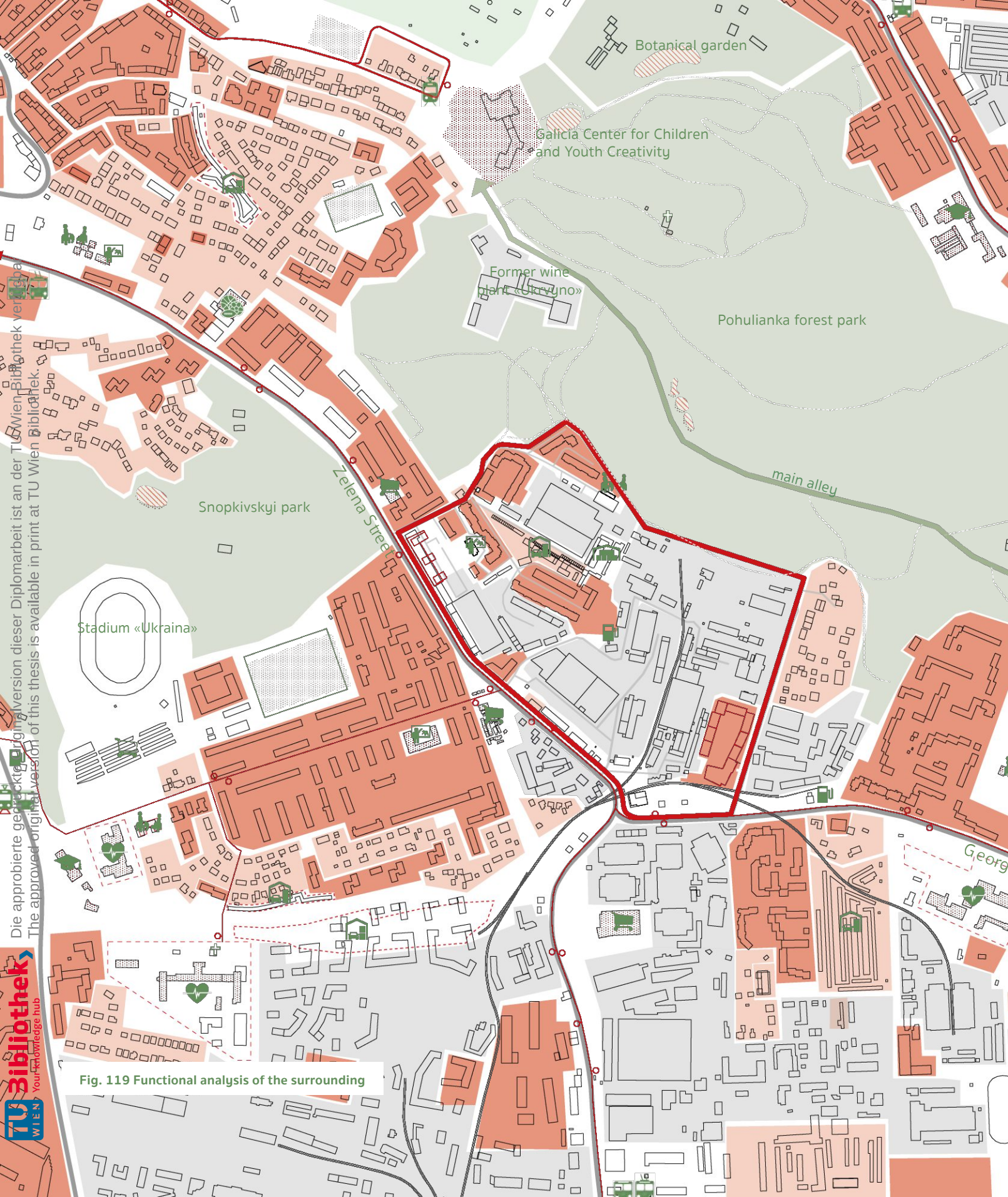


Fig. 119 Functional analysis of the surrounding

- Multi-family Housing
- Single Housing
- Industrial Area
- Park
- Healthcare Facilities
- Garage Cooperative
- Kindergarden
- School
- Collage/Academy/University
- Church
- Sport Facilities
- Indoor Pool
- Shop/Market
- Former Market
- Wholesale/Storage Buildings
- Gas Station

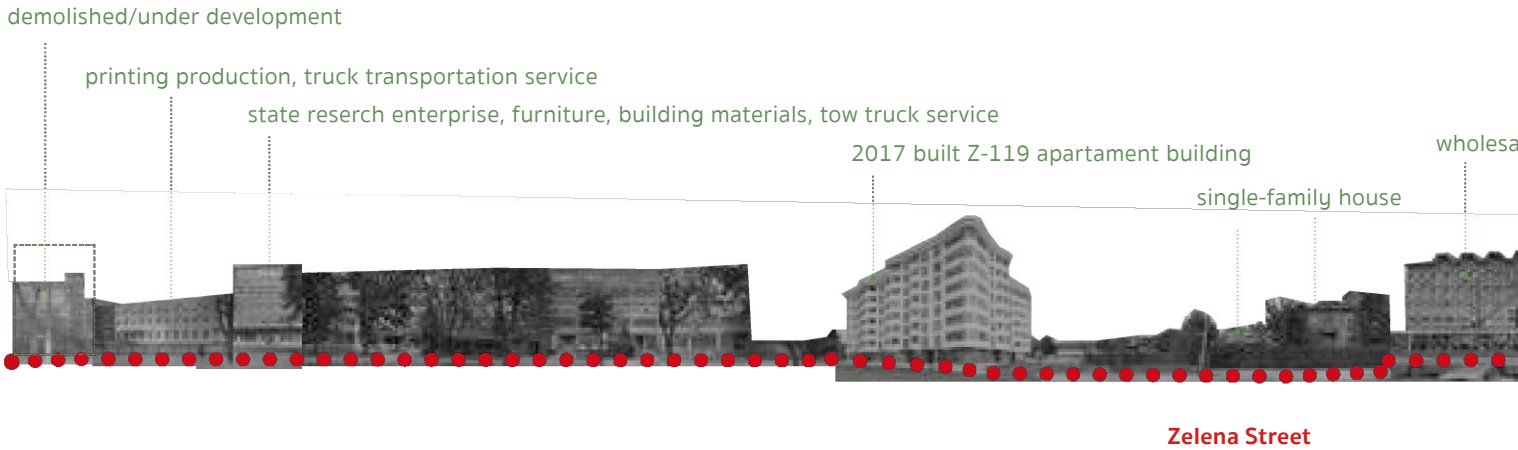


Fig. 120 Walking along the territory: Zelena and George Washington Street

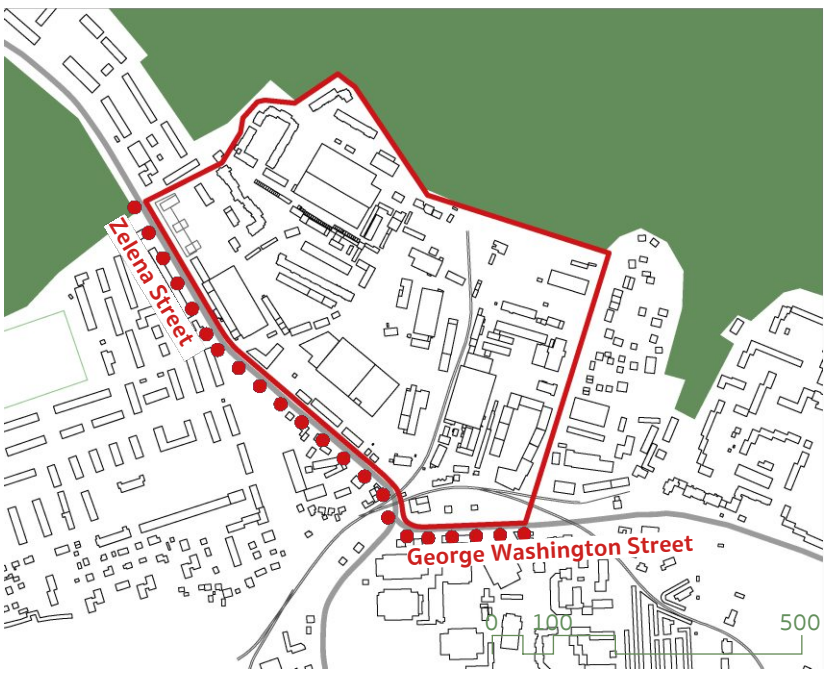
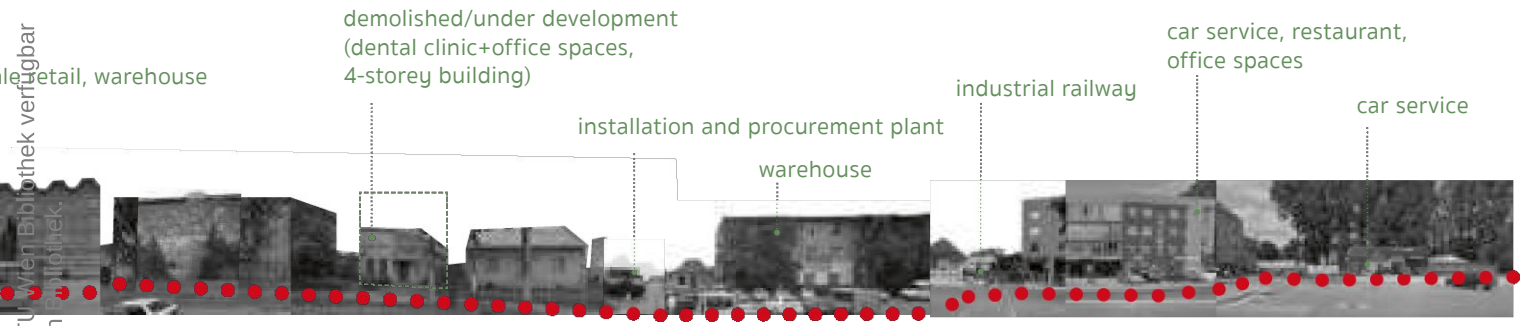


Fig. 121 Map: streets view



Zelena Street

from 1544: Volos'koho Mostu
from 1792: Grünenstraße (Green Street in german)
from 1944: Zelena Street (Green Street in ukrainian)

Fig. 122 Zelena street with paving

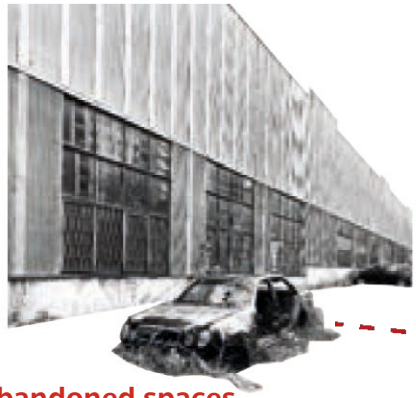
Fig. 123 Zelena street: accessibility

George Washington Street

from 1930: Pasiky Galitski
from 1958: Batalna Street
from 1992: George Washington Street

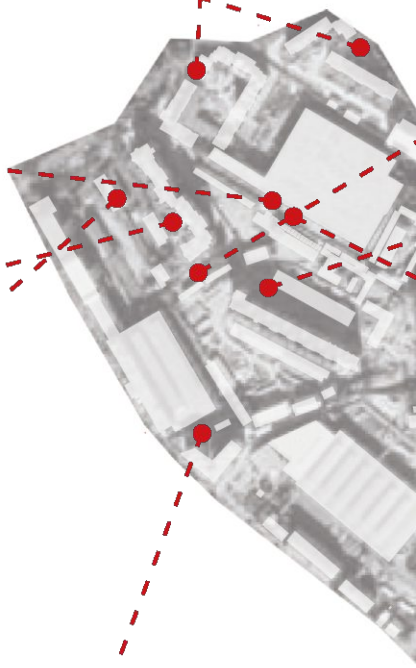
Fig. 124 George Washington Street view

Existing urban characteristics



abandoned spaces

closed to
the Forest Park
Pohulianka



outdoor space organisation

former dormitory

barriers vs new developments

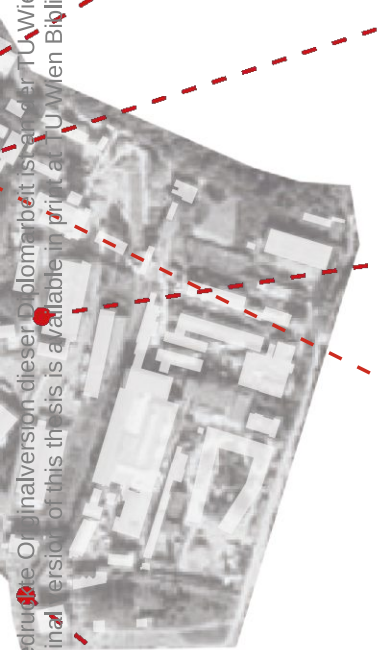
Fig. 125 Existing urban characteristics

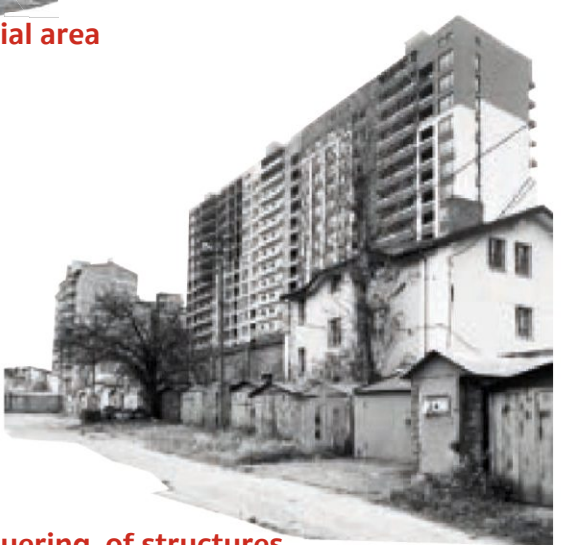
attraction of the area

football field created
by local community

otdoor space organisation

security of industrial area





layering of structures

leftovers from industrial networks

1

Fig. 126 Aerial photography: from center to west

2

Fig. 127 Aerial photography: from west to east

3

Fig. 128 Aerial photography: east border

4

Fig. 129 Aerial photography: south east corner

Fig. 130 Sandbox between concrete walls

Landscape as a barrier

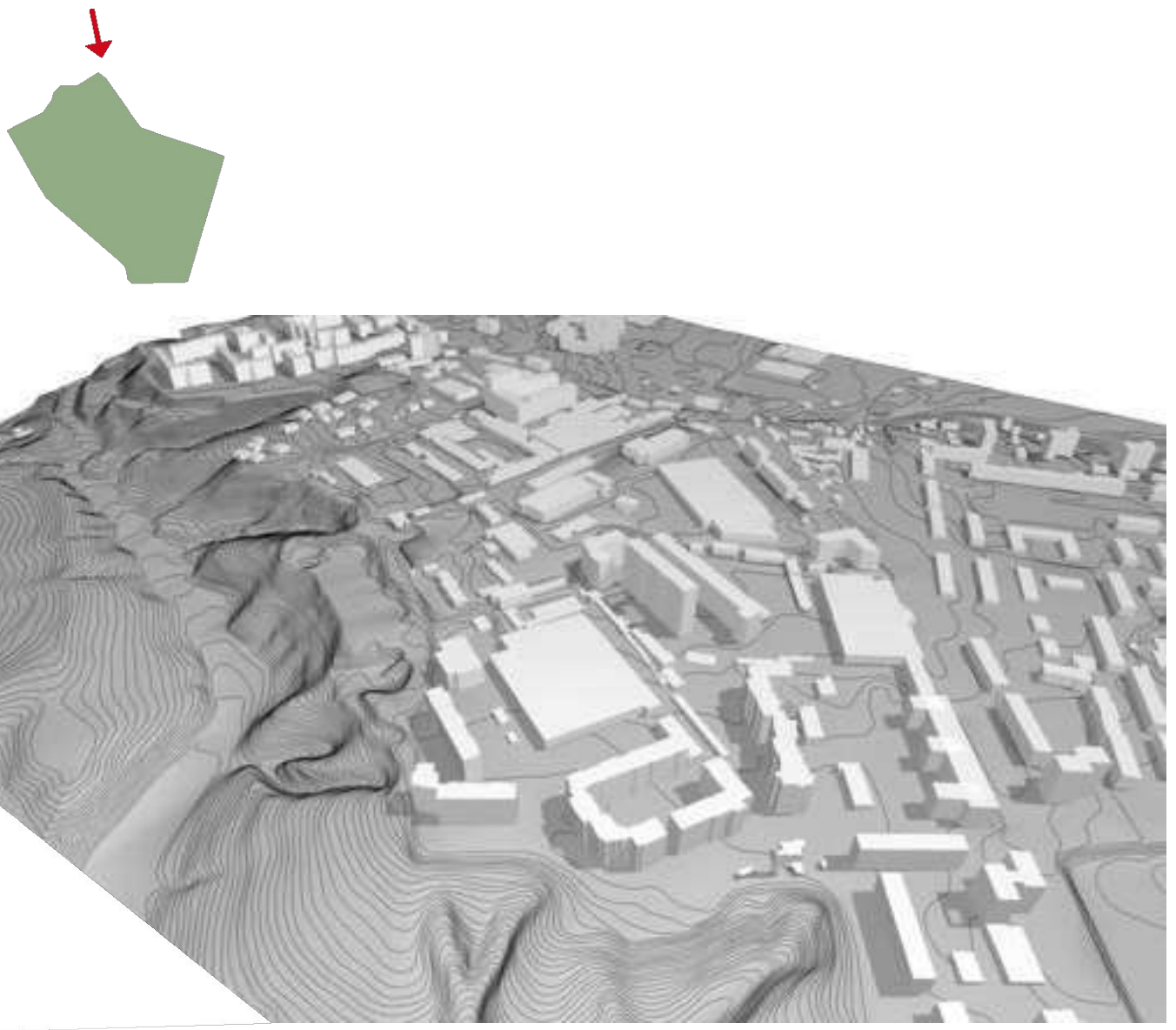


Fig. 131 3D model: landscape

Fig. 132 Existing residential buildings:Jasmynova 5Б

Residential «islands» developed after 2006 (see page 128-129)

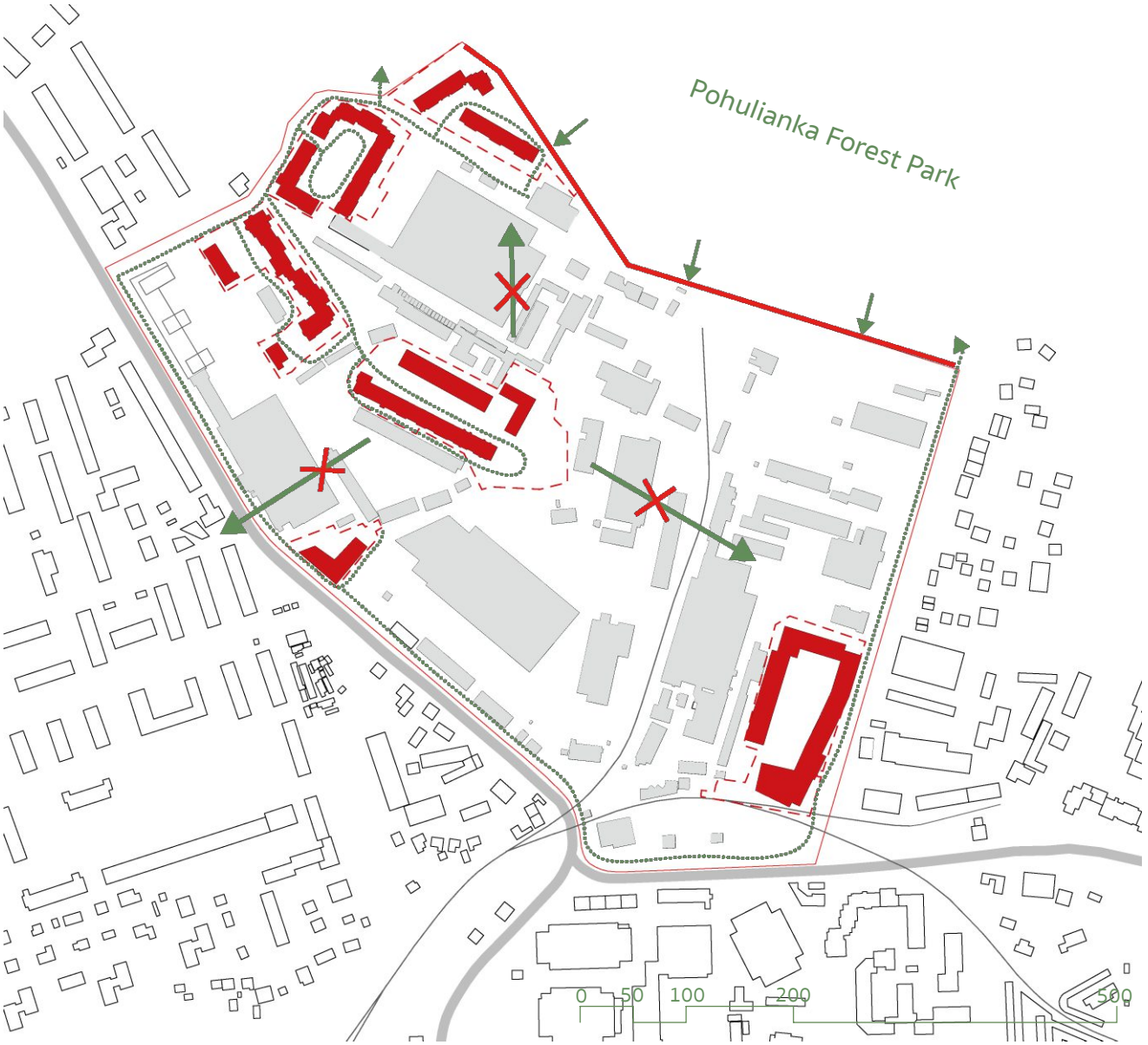


Fig. 133 Residential «islands» and movement possibilities

existing residential buildings
territory of the residential development
barrier to the Pohulianka Forest Park
movement possibilities
no movement possible

Residential Island	Year of construction	Number of floors/ Parking possibilities/ Functions	Number of apartaments	Accessibility
1	2014 - 2016		216	
2	2020 - 2022	= 50	165	
3	before 1985		16	
	before 1985		6	
	2006 - 2008	= 12	285	
4	2020-2022	= 50	225	
	2016-2022		399	
5	2019	= 33	72	
6	2020-2023	= 150	359	

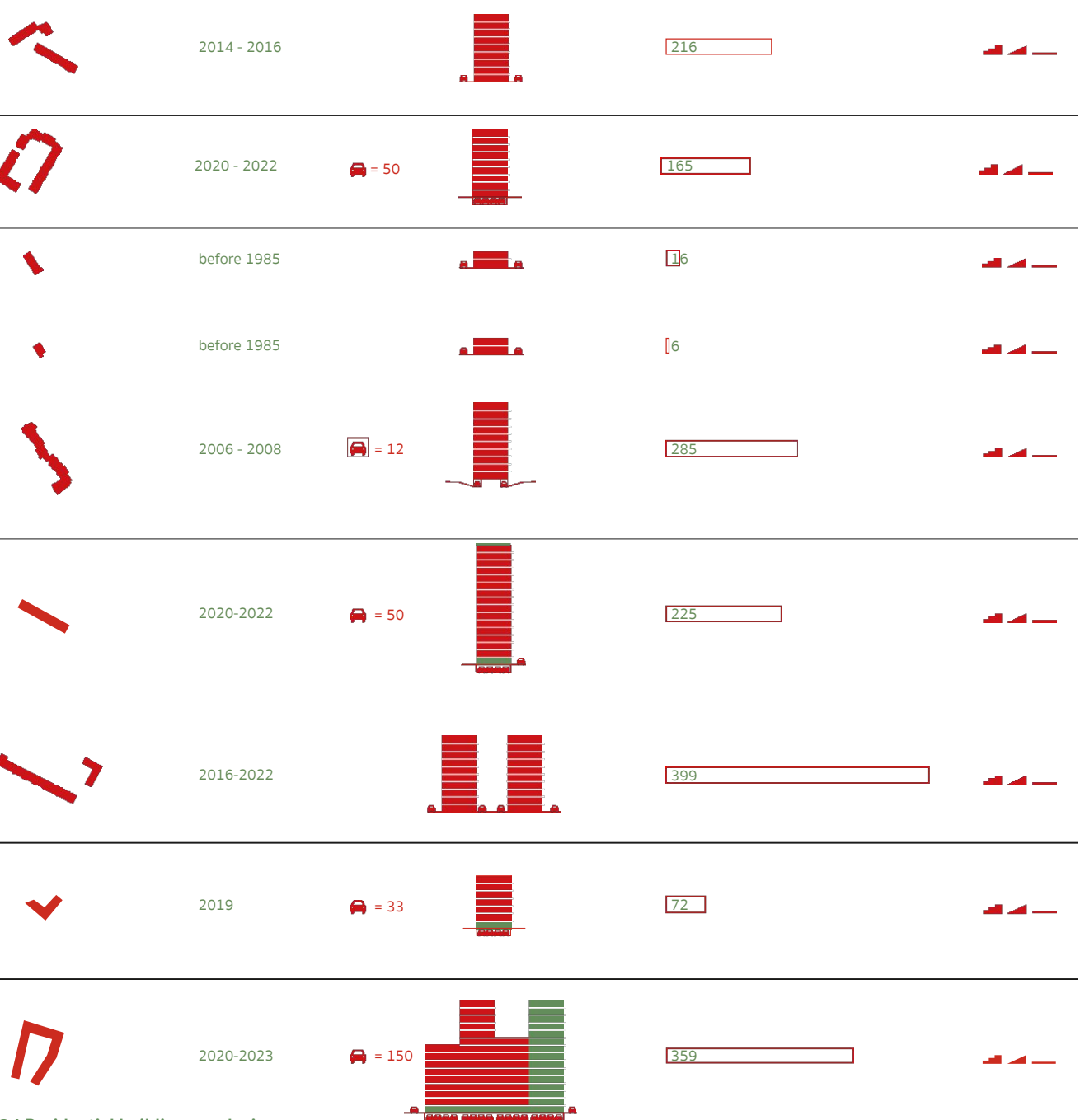


Fig. 134 Residential buildings analysis

Appearance

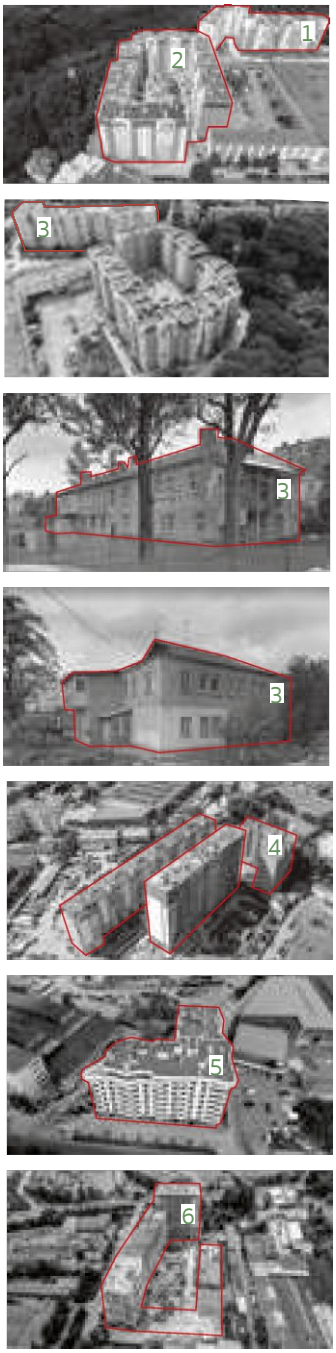


Fig. 135 Residential buildings

Allocation on the site

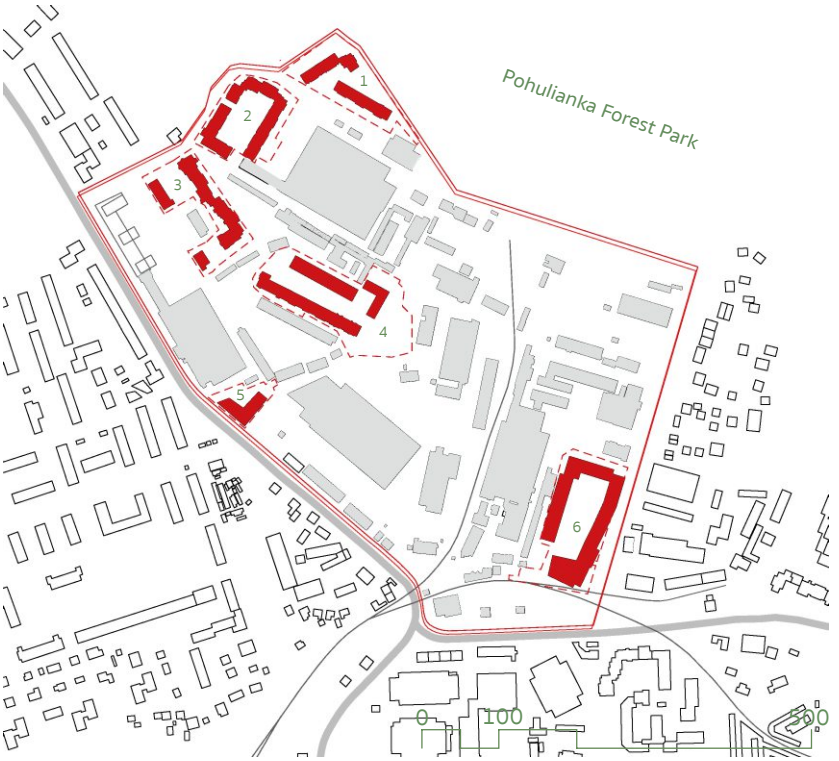


Fig. 136 Residential «islands»

Fig. 137 Property map analysis

private property

municipally owned

no official data available

According to the information, almost the entire project area is municipally owned. This gives the project and the city more influence on the future development of the area.

A detailed plan for the western part of the area has already been developed. In my diploma thesis, I do not consider the detailed plan of the territory as a basis. I see many critical points in the open space development and building structure and would like to look for other solutions for the entire area from east to west.

Fig. 138 Detailed plan of land use and building regulation

* Detailed plan of land use and building regulation (ukr: Detailed plan of the territory) - specifies the regulations of the master plan and determines the planning organization and development of the territory. A detailed plan is reviewed and approved by the executive body of the city council. Absence of an approved detailed plan of the territory or zoning plan prohibits transfer(providing) of land plots of state or municipal property into ownership or use by individuals and legal persons for town planning purposes. It is also prohibited to change the use of a land plot which does not meet the requirements of the zoning plan and/or detailed plan of the territory.

Pohulianka Forest Park

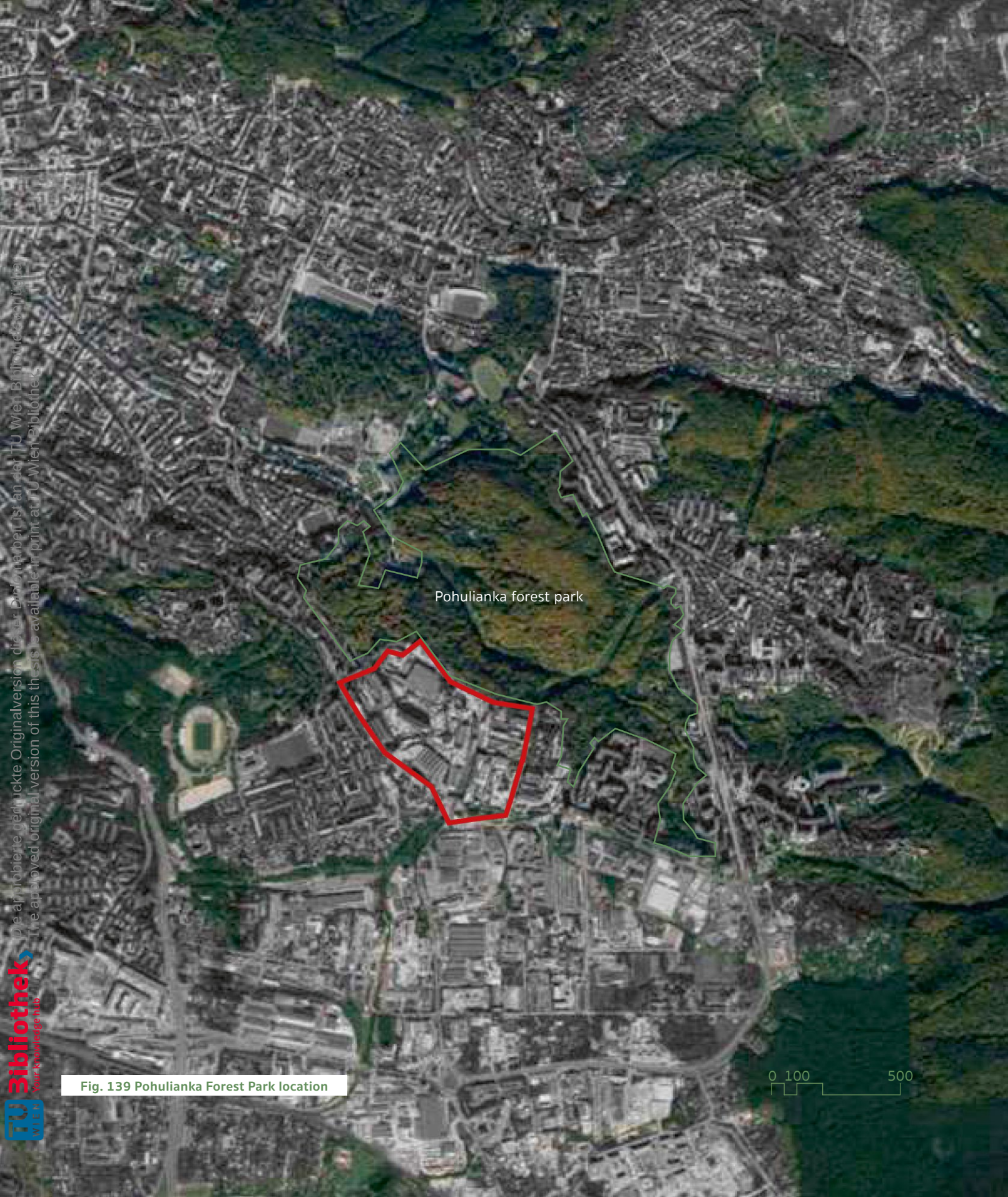


Fig. 139 Pohulianka Forest Park location

ha

100,33 ha

Former names:

«Attelmayerska Pasika»(apiary)
«Weglinskii Lisok» (forest)

Former functions:

suburban farms/
apiary/
recreation/
beer garden/
wine factory
zoo
ski jump
swimming in the lake

Important connection:

between Lychakiv, Batalna, George Washington and Dnistrovska streets

The location of the site was the biggest motivation for working in this area. First of all, it is located 3.5 kilometres from the city centre of Lviv and is surrounded on the north-western side by Pohulianka Forest Park, which, together with other green spaces in the city, forms a so-called green belt and plays a major role in the life of the city.

The way new developments in the area deal with this feature (Pohulianka Forest Park being a neighbour) indicates an urgent need for action in the form of the development of a urban plan for the whole area.

How the feature can become a border?

Fig. 140 Park

Fig. 141 Parking

Fig. 142 Fence

The Pohulianka Hills are part of the Lviv Heights, what creates a special topography in the area, which gives the impression of a ravine, through which flows the main promenade, surrounded on two sides by hills. On the right side of the main entrance, at the very top, is located the project site.

Background

Historically, the development of the area, where the Pohulianka Forest Park is located today, can be observed from the 17th century, when the lands were owned by the mayor of Lviv, Jan Attelmajer, who established big apiary here.

First in 1789 the area got its boundaries as a lower part of the entire estates. Originally, the name of the Forest Park «Pohulianka» comes from the word «walking».
The meaning of the word can be understood in two variations: to have a walk, or «to have fun». Historically since the ownership of Franciszek Weglinski(1810) a lot of festivities took place here («Pohulianka» was the name of his estate). It continues during restaurateur Johann Diestl(1821) and when the territory was passed to Johann Klein(1848), who established beer garden here.
The territory was known as very sociable location, gathering for good festivities writers, artists and locals in different times.

Additionaly to festivities Pohulianka had a great leisure activities such as beautiful nature routs for walking, zoo, even with zebra(1960), ski jump, lakes for swimming (1970s).

The turning point for Pohulianka Park begins in the early 19th century with the appearance of industry and real estate development. At that time Pohulianka began to lose its charm and original atmosphere, and during the First World War the recreational function was lost, the woods were used for fire and the paths were overgrown, Johann Klein brewery was destroyed.

The new birth of the park began in 1940, when «Pohulianka» Public Park» was created. First of all cleaning and arrangment of the territory started. In 1962 a project for the Pohulianka Park development was created and implemented in the following years.

The lardscape of the western part of the park has been significantly changed with construction of Galician Child and Youth Arts Center in 1984.

The main promenade along the park, was paved in 1989.

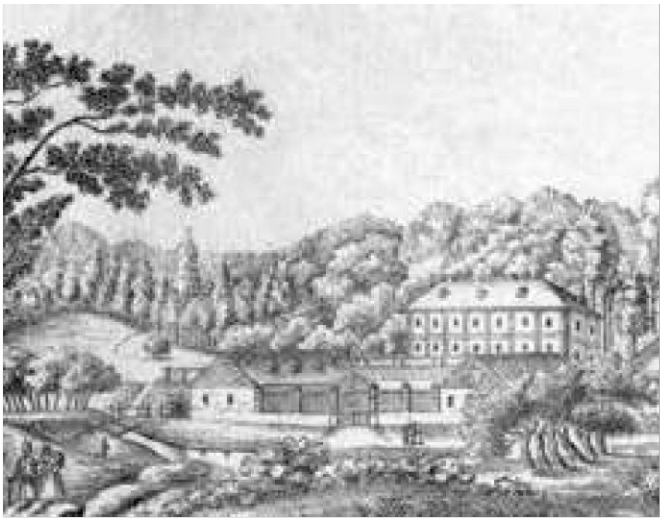


Fig. 143 Pohulianka in 1823

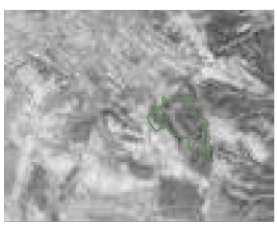
Fig. 144 Pohulianka in 1840

Fig. 145 Zoo in Pohulianka Forest Park in 1960

Fig. 146 Ski jump in Pohulianka in 1970s


Wate
1839


Lithograph
1823


1779-1782


1849

17th century

the territory was owned by Lviv mayor **Jan Attelmajer**

"Attelmajer **Apiary**" was established

1672

the territory was razed by Turkish forces

mid-18th century

Jan Złotorowicz new owner of the territory

Atanasiewicz and **Dobrucki families** became owners after the death of Jan Złotorowicz

1789

appellate court counselor **Krzysztof Deyma** bought the lower section of the property from the Dobruckis (his section comprises the current Pohulianka Park)

1799

Alojzy Gintowt Dziewiatkowski purchased the land from the Deyma family

1810

Franciszek Weglinski purchased the land

during the "Weglinski Period" the territory received the name of **"Pohulianka"** or, alternatively, "Weglinski's Forest"

182

re
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er catchment from

Lithography K. Auer, 1840

Ruines of «Ukrvyno» plant, built in 1948

Galician Child and Youth Arts Center, built in 1984

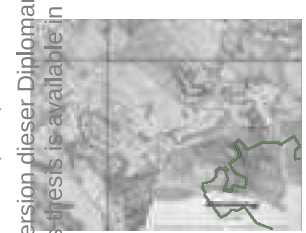
y A. Lange,

Jan Klein beer label from 1848

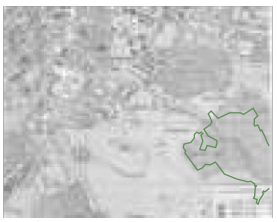
Church built on a local farm in 1897

Picture from 1960 of Zoo in Pohulianka Park

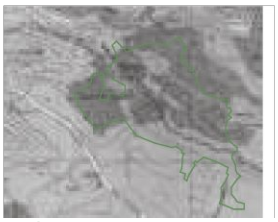
Recreation in Pohulianka, 2021



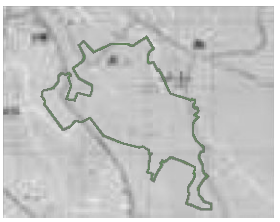
1844



1925



1931



1977

2022

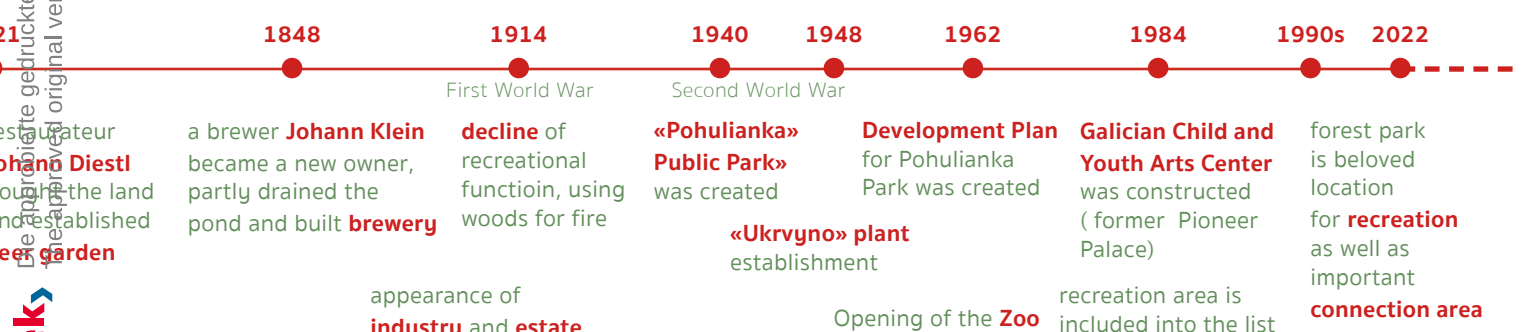


Fig. 147 Pohulianka Forest Park development timeline

Fig. 148 Family active recreation in Pohulianka Forest Park

Fig. 149 Lakes in Pohulianka Forest Park

Fig. 150 Forest feeling in Pohulianka Forest Park

Fig. 151 Walkways on the top of Pohulianka Forest Park

Fig. 152 Pedestrian bridge in Pohulianka Forest Park

Fig. 153 Hidden spaces in Pohulianka Forest Park

Interview with the residents from residential «islands»

Participants

The interview was held in Lviv, Ukraine, in 2021, before the war began in 2022. There were five blocks of questions: personal information, neighborhood evaluation, movement and recreation, positive and negative aspects of the neighborhood, specific thoughts about the building, and the open space in which the respondents live. The questions were configured as multiple-choice questions as well as open-ended questions.
125 people participated in the interviews, 25 on-site in the area and 100 online, 64 of them men and 61 women, most of them aged 30-40. The neighborhood received an average rating of 7 out of 10, but 90% of respondents indicated that the neighborhood does not meet their needs. Almost half of the respondents spend their free time in the Pohulianka Forest Park and more than 50% have their own car.

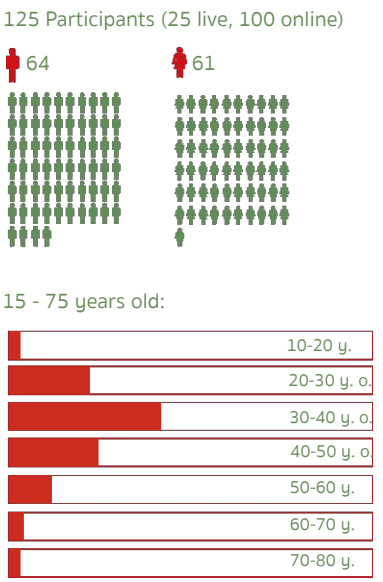
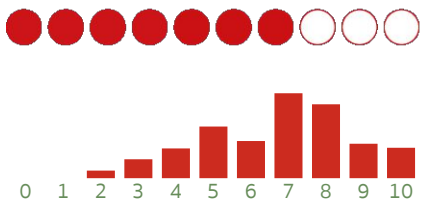


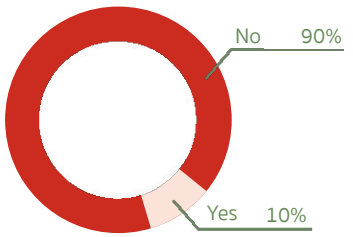
Fig. 154 Graphic Interview: participants

Neighborhood

Rate your neighbourhood from 1 to 10



Does your neighborhood meet the needs of you the area ?



What would you like to add to you neighborhood ?

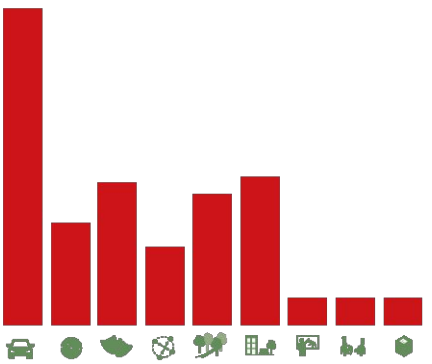
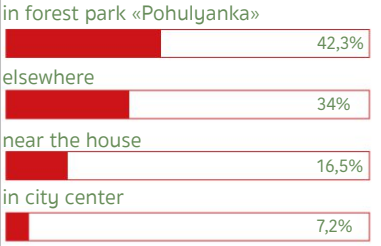


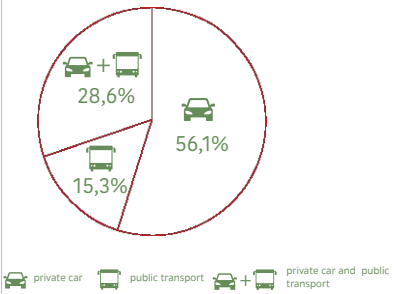
Fig. 155 Opinion about the neighborhood

Movement and recreation

Where do you spend your spare time?



How do you move around the city?



*bicycle was not considered because there are no ready bicycle connections. However, the bicycle is often used for recreation in the forest park.

How often you go to the city center?

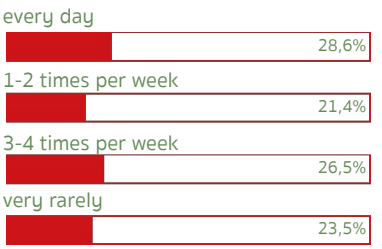


Fig. 156 Movement and rercreation of the residents

Fig. 157 Resident's positive opinions

«it is impossible
to dry laundry on
an open balcony»

«The design of the houses does not
take into account the necessary
parking spaces»

I negatively evaluate
the complete paving of the
surrounding areas and courtyards,
as it causes inconvenience
in the summer and during the rain.
As well as parking
on the sidewalks and
parts of the streets»

«Cluttered area
by garage owners»

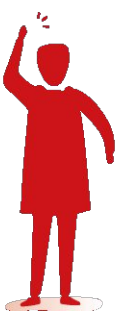
«The territories of all the surrounding
factories block the exits to the main street»

«Lack of proper
infrastructure»

«Each house on its own,
built chaotically»

Polina, 29 y.o.

«Abandoned and
uninteresting area.
A large number of garages,
car repair shops from which
often stinks of chemicals.
A lot of dirt and dust.
Lack of infrastructure for
leisure activities.
Poor connection to
Zelena street»

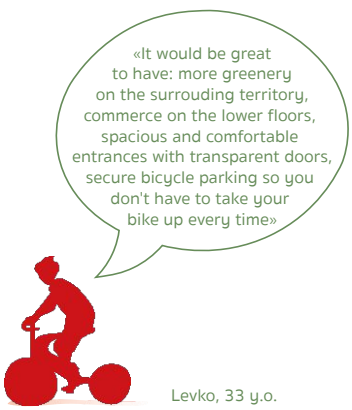


Levko, 33 y.o.

Fig. 158 Resident's negative opinions

Meetings with people in different parts of the area show different perspectives of the neighborhood, the quality of life changes from development to development and also depands on where it is located. It is clear that the neighborhood lacks the infrastructure necessary for daily life. Once again we see that accessibility is a big problem in this area, and old industrial buildings and car repair shops make life in this area unpleasant and even unhealthy.

Residents wishes create a shared vision with very specific and clear needs. Gathering information directly from residents helps to find the direction of further development and strengthens the previous part of the analysis.



Levko, 33 y.o.

Fig. 159 Resident's opinions allocated

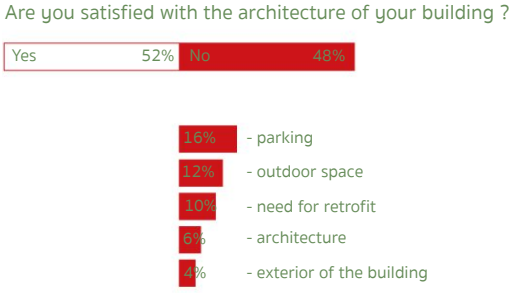


Fig. 160 Architecture and open space

In this interview part measures for improvement of the existing buildings from the point of view of the residents were gathered. Renovation and improving of existing buildings and its open space is needed. 52% of the respondents are satisfied with the architecture of their building. Negative feedback is mainly related to the parking situation, the outdoor space and the need to retrofit the building. The least number of people are concerned with the exterior of the building.

We would like to change:

Zelena 115 Ж :
- individual heating;
- renovate common hallways;
- storage spaces in the hallways;
- exchange lift;
- inconvenient ramps in the house between 0 and 1 floor;

Outdoor space:
- bigger playground with a proper pavement, better lighting behind the house.

Jasmynova 5 Б:
- improve soundproofing and heat insulation;
- minifootball court;
- improve the exterior of the house;
- solve the problem with parking lots;
-prohibit the addition and expansion of balconies.

Zelena 115 А:
- we would like to have nice new house!

Zelena 115 Д :
- more greenery on the surrouding territory;
- commerce on the ground floor;
- spacious, comfortable entrances with transparent doors;
- playground;
- recreation area;
- multi-storey parking lot for 115 Д/Ж;
- secure bicycle parking lots.

Fig. 161 Resident's ideas for retrofit

Pohulianka urban design project development

Goals of the project

For further steps of the project development, goals for the future neighborhood have to be defined.
In this part of the work, the knowledge gathered in previous chapters will be taken into account and adapted to the specific characteristics of the project area.

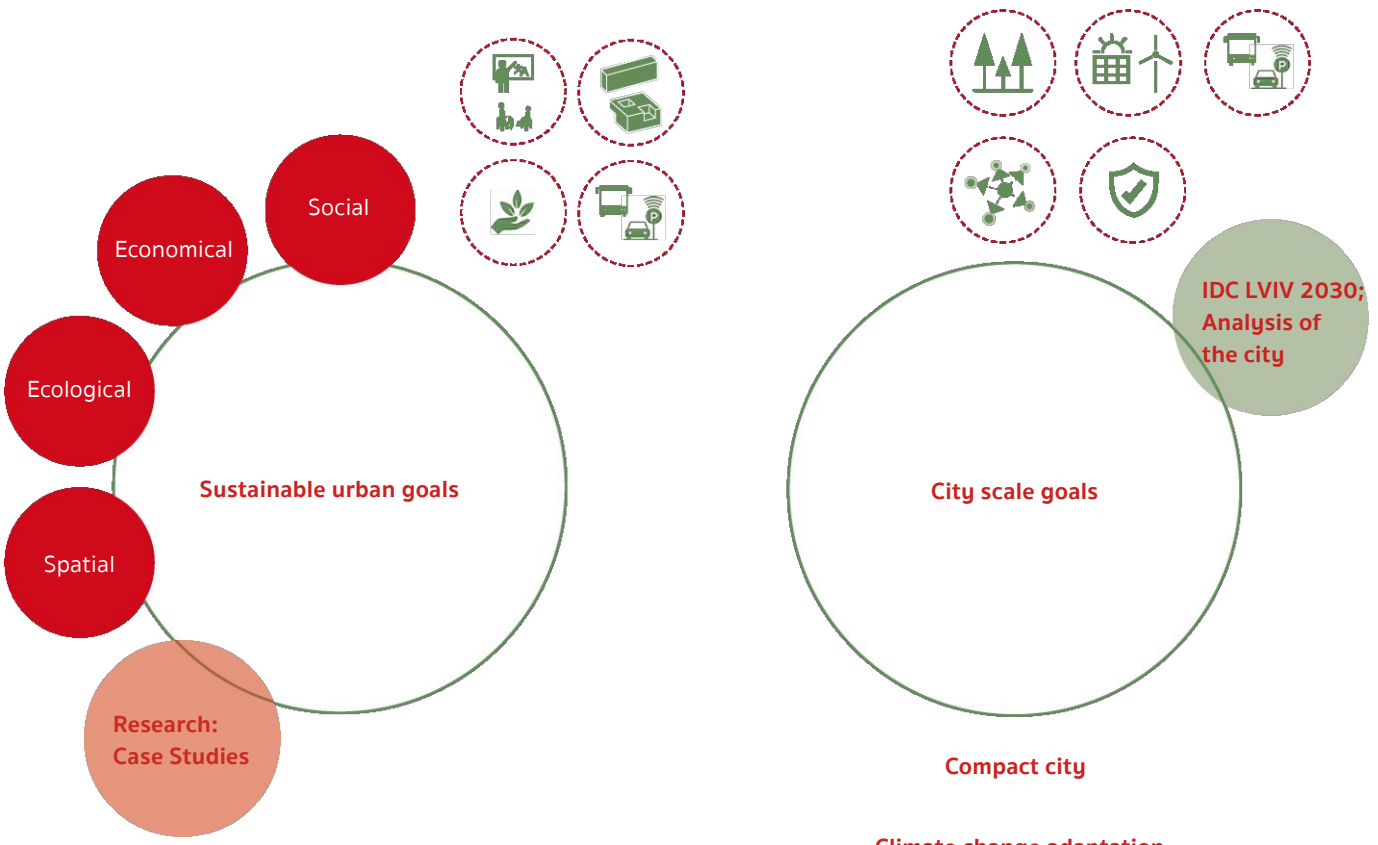
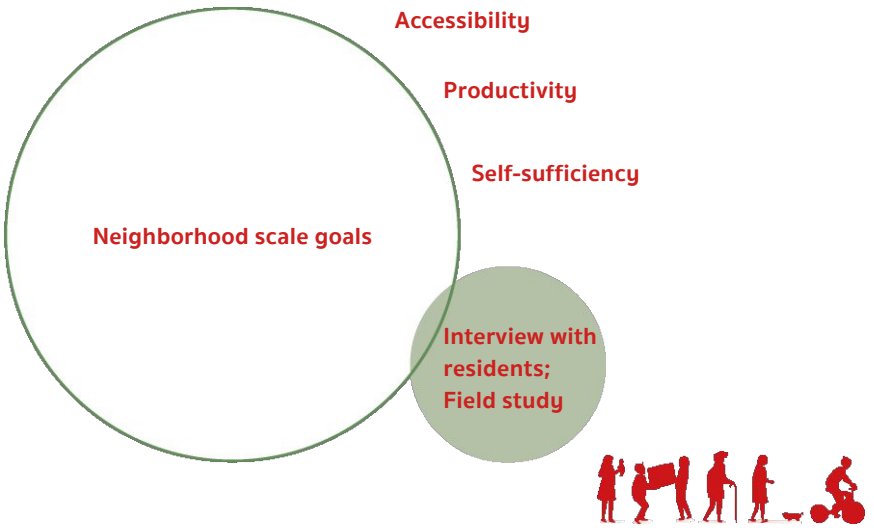


Fig. 162 Criteria for goals development



Goals

Transforming a post-industrial area into a sustainable neighborhood, creating space for living, working and producing using the tool of mixed-use development. Re-use of brownfield land, retrofitting of housing stock, reuse of demolition materials.

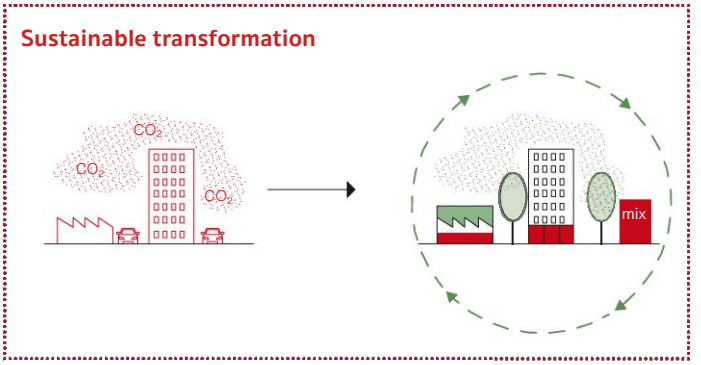


Fig. 163 Goal sustainable transformation

The city of Lviv is struggling with rainwater overflow, so the task is to retain water within the district and use it efficiently. Another challenge of climate change is the development of heat islands, so to prevent this, a climate-friendly environment will be developed, taking into account the challenges of the city and the specifics of the area.

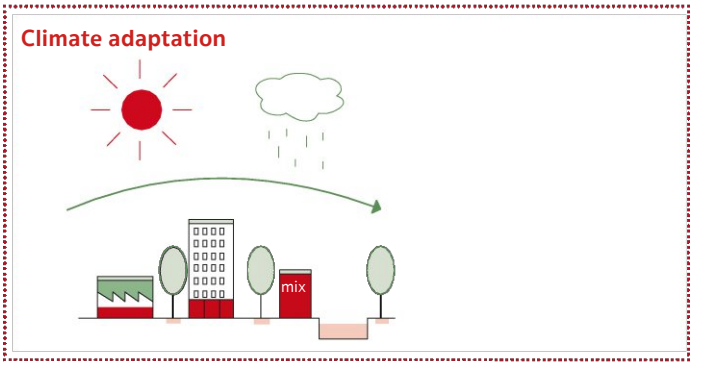


Fig. 164 Goal climate adaptation

Creating resilient infrastructure in new neighborhood with focus on sustainable mobility. Implementing new mobility concepts on the site, thereby removing cars from the territory and giving space to people and nature.

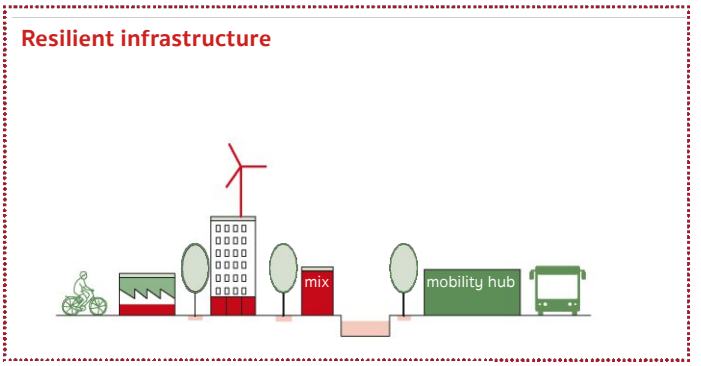


Fig. 165 Goal resilient infrastructure

Measures

Mix of functions

- create mix of live, work and urban functions
- develop variable und flexible typologies
- activate ground floor areas for trade, social and cultural infrastructure
- define ground floor hight
- give preference to smaller division activate public spaces
- include green mobility, esp. bicycle infrastructure facilities
- activate public spaces

Blue-green infrastructure

- provide shadow
- create natural habit
- make evaporation possible
- provide irrigation surfaces
- design direction of runoff water
- develop areas for retention of overrflow

Transition to low-carbon mobility

- focus on pedestrians and cyclists
- create «10 minutes city» with comfortably organized routes
- provide sharing offers: cars, bicycles, micro mobility
- include infrastructure for bicycles: parking and repair stations
- elocate mobility hubs in 200m reachability
- promote electric and public transport

*Safety measures due to war 2022-2023

- modern bomb shelter as flexible social infrastructure
- self-sufficient resilient energy supply

Concept

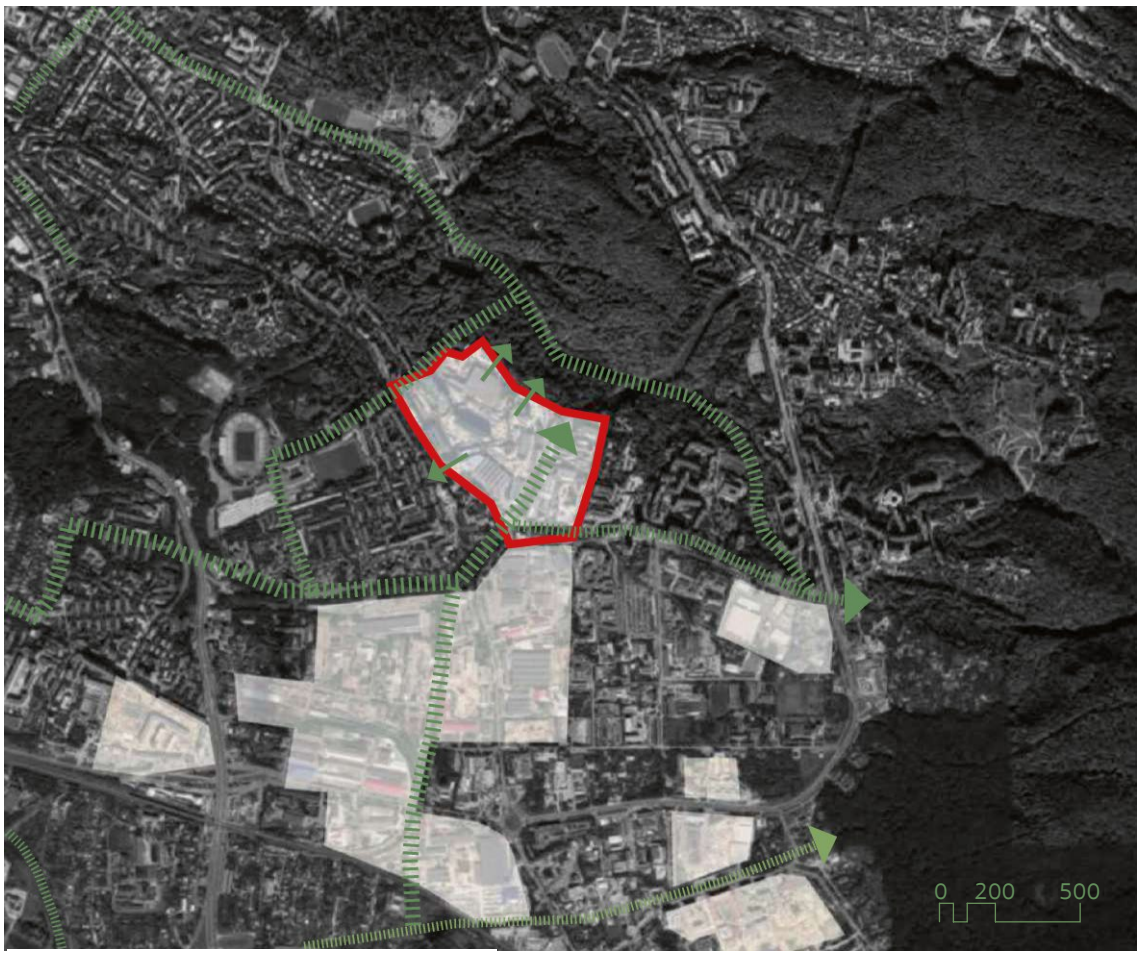


Fig. 166 Connect with the city green

Green Network

In the city scale the project has an important meaning in green network. Being located between two Parks it still has a risk to become an heat island location. That is why the concept of the project is on the first place based on organizing green connections. Using the greatest potential existing green areas and connecting them through industrial sites that are or will be under transformation.

Existing railway connection is also seen as potential green area and connection in the scale of the city. With the project of the transformation of the Pohulianka area, we are enclosing the inner green corridor of the city, connecting the area with Snopkivskyi Park, Pohulianka Forest Park and Vynnykivskyi Forest Park, and creating a green and safe connection with other parts of the city, which will encourage the use of sustainable movement opportunities throughout the city and improve the climate in the surrounding area.

Industry and topography became crucial barriers on the territory. To overcome the barriers. the green center solution was created, wich will become both the connector of two parts separated by the landscape and a magnet for the entire development and the surrouding area.

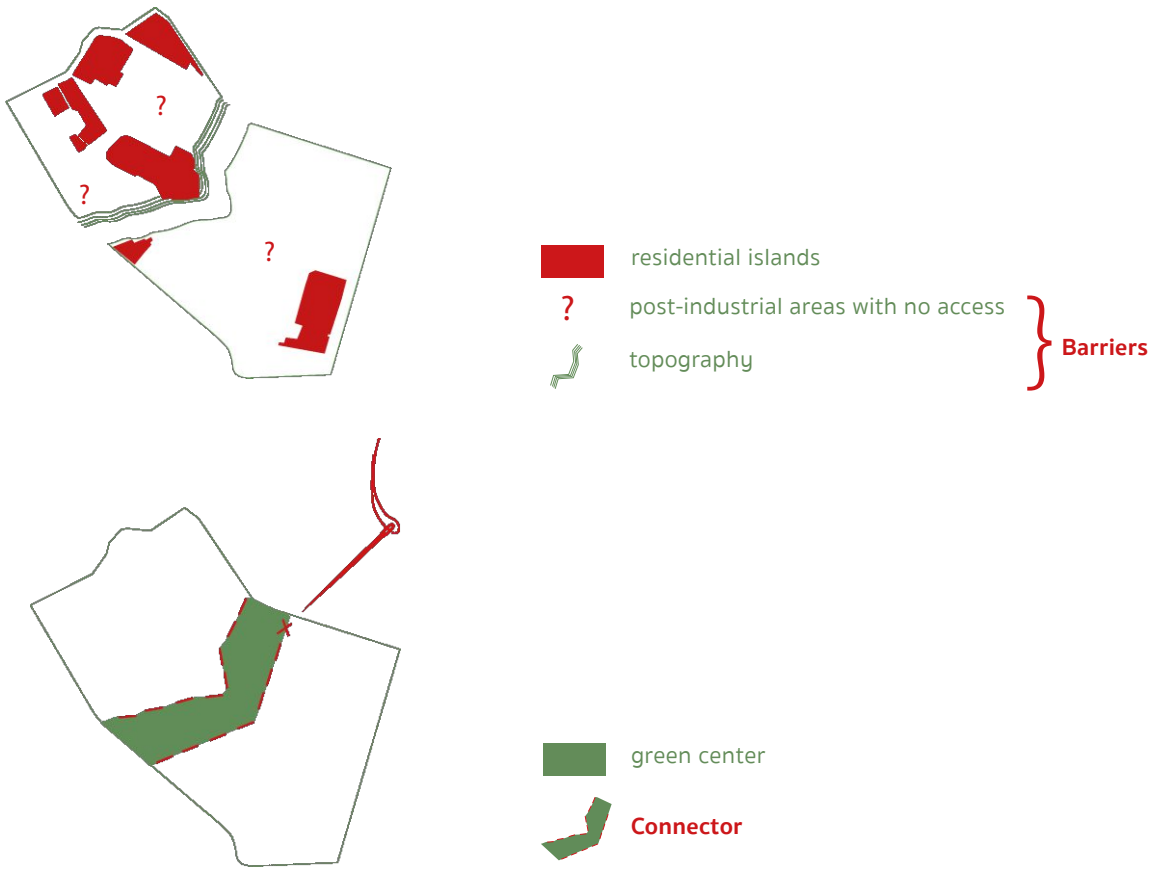
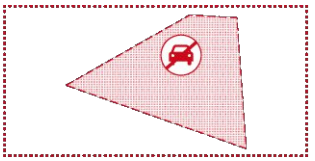


Fig. 167 Connect site parts

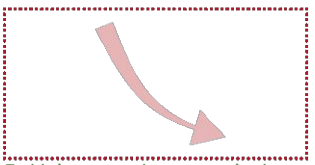
1. Green link from Pohulianka Forest Park through the site to the existing housing neighborhood



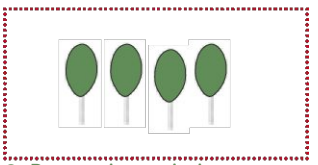
2. Car-free areas of development

3. Mix functions and reuse of the exsting structures

4. Rainwater mangment throughout the whole area



5. Using north-west wind flow for comfortable climate in the new neighborhood



6. Preserving existing trees

6. Promoting biodiversity

6. Accessible development for all

6. Promoting green mobility

Fig. 168 Concept key elements

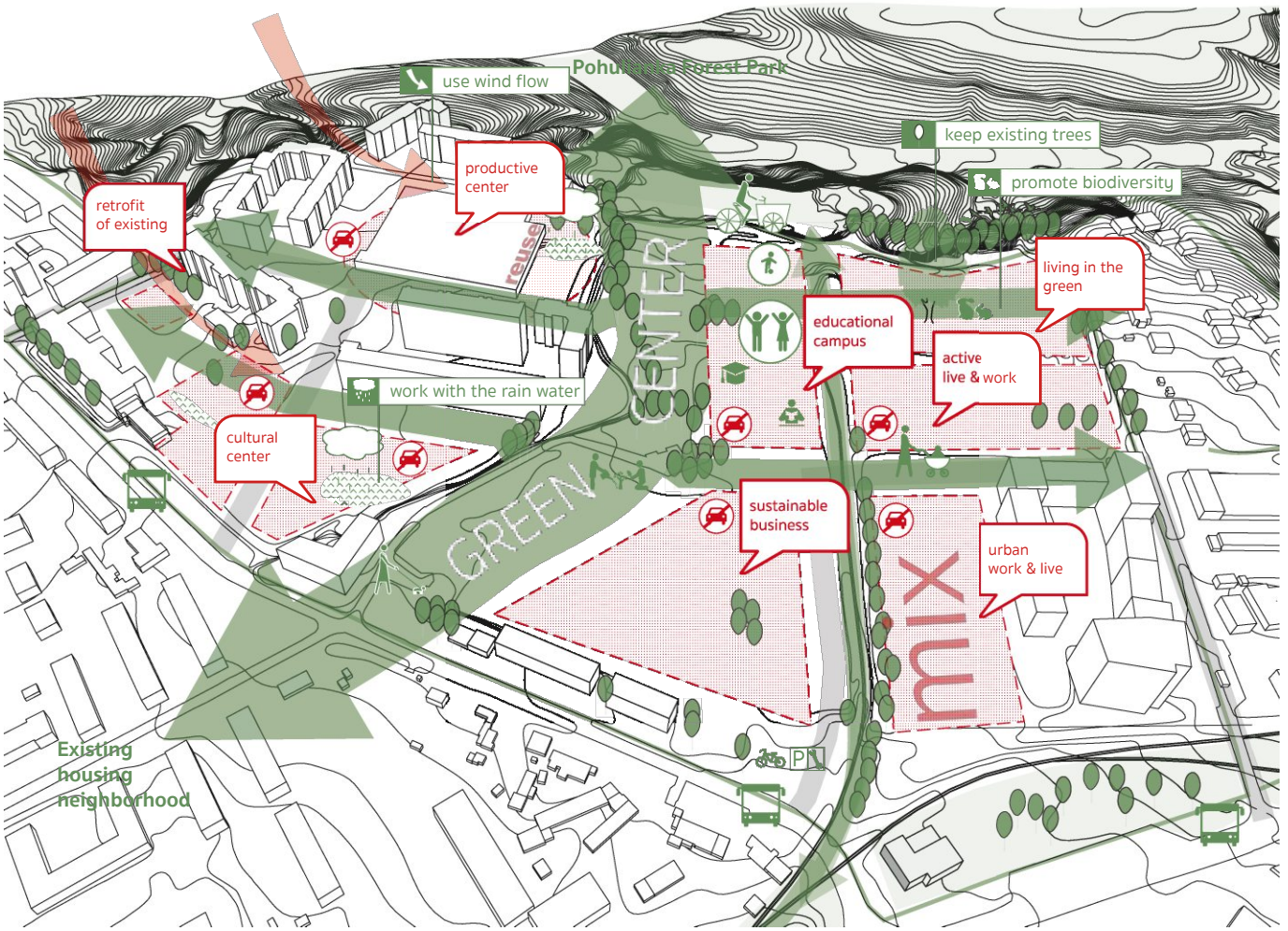


Fig. 169 Concept for Pohulianka

Fig. 170 Development plan

Project development steps

Decisioin-making: existing buildings

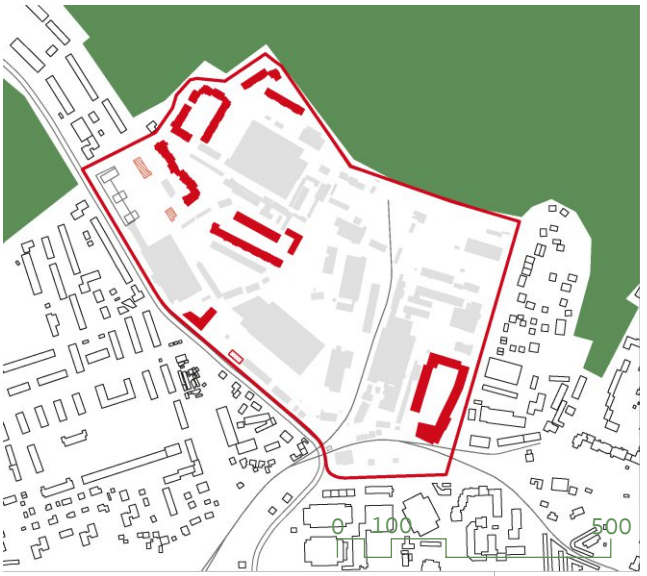


Fig. 171 Decision-making: residential buildings

stay

stay*

will be replaced

Fig. 172 Residential buildings to demolish

16 + 6 apartaments will be replaced in new development

Housing estate built from 2008 upwards, partly in need for retrofit due to accessibility, outdoor space design, insulation of the building, etc.

* two buildings stay on the site due to architectural characteristics

Fig. 173 Residential buildings to presrve

Fig. 174 Decision-making: other buildings

new buildings

existing buildings, that stay

buildings for reuse
(as material after demolishing or adapted to the concept)

There is no access to most of the industrial areas on the site. Therefore, it is impossible to determine the actual condition of the buildings. The decision-making process was based on data from detailed territorial plan, site studies and aerial surveys. The concept developed for the area and the efficient use of the territory take precedence in the decision-making process. There will be a mix of functions in the area, including production, but large-scale production, which could be harmful for residents, will be moved to an industrial area on the west of the city that offers better infrastructure for production.

In the next phases of the project, existing structures should not be demolished but investigated and reused as building material or renovated and adapted to the concept. It is important that not less than 70 % of the existing structure is reused.

Project development steps

1

existing residential buildings

existing buildings with different functions, that will stay

buildings, that will be demolished and 70% of materials will be reused

Fig. 175 Starting point: existing buildings and surrouding

2

Use existing trees as green structure for future development, taking advantage of mature trees that provide shade and have a great ecological impact.

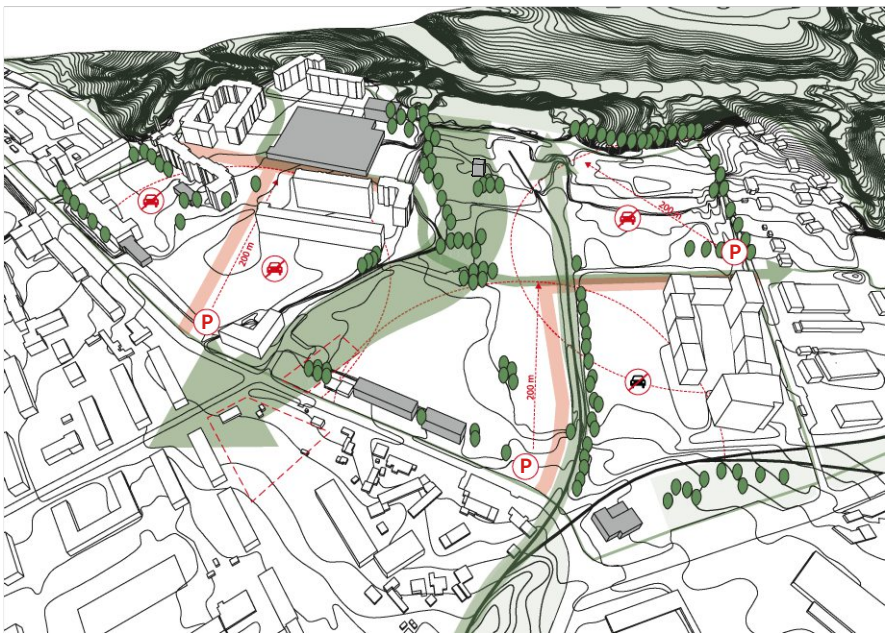
Fig. 176 Preserve: existing trees

3

Creation of a green center and use of the old railroad line as a green connection on a city scale, as well as creation of a new west-east connection through the entire development area, and also creation of a barrier-free connection around the area, linking it with the surrounding neighborhoods and the Pohulianka Forest Park.

Fig. 177 Connect : green

4



Create two main streets accessible to cars, bicycles and pedestrians. For both streets, a parking garage is planned at the entrance to take cars off the streets and create space for public space. Another streets is intended for pedestrians, but can also be used for delivery services, ambulances and firefighters.

Fig. 178 Create: auto-free pedestrian-oriented surrouding

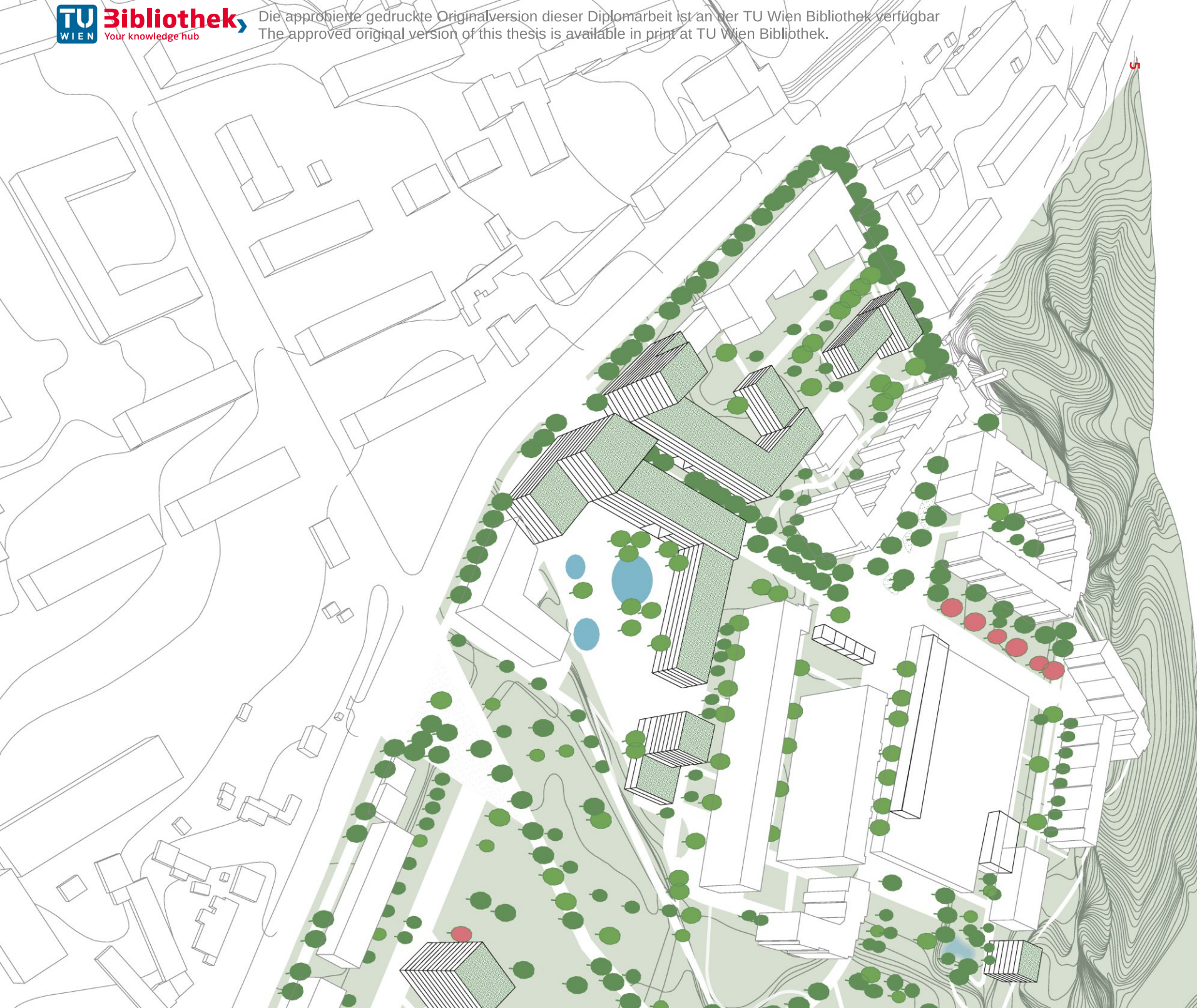


Fig. 179 Axonometry: new building structures and open space design

1

Fig. 180 Existing buildings

Status quo.

2

Fig. 181 Trying new structures

First ideas for the structural development of the site.

3

Fig. 182 New buildings

Detailed development in relation to the concept and building structures study.

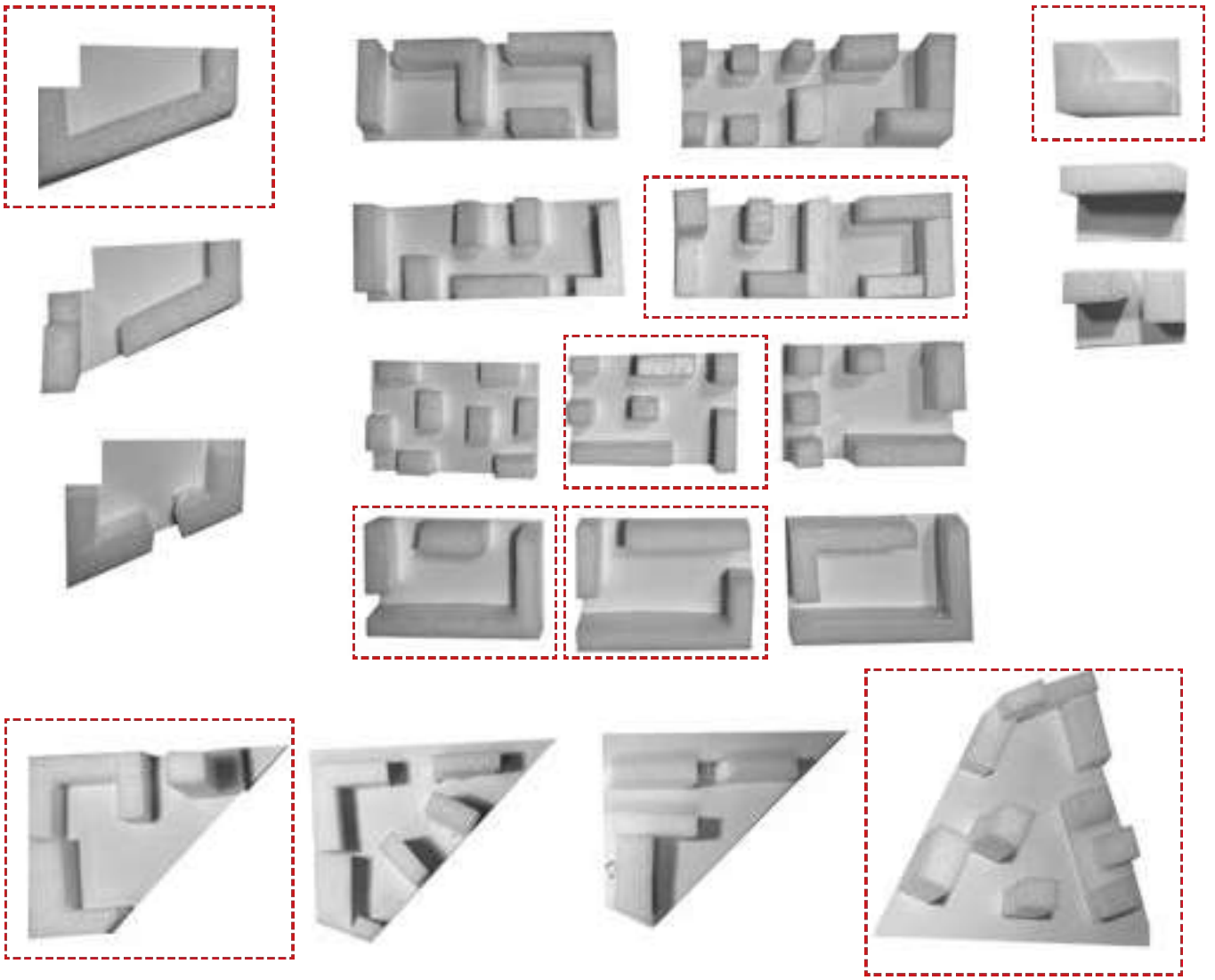
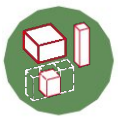


Fig. 183 Building structure development on the working model

selected structures for further development

Functional MIX

create mix of live, work and urban functions



develop variable und flexible typologies

activate ground floor areas for trade, social and cultural infrastructure

define ground floor hight

give preference to smaller division activate public spaces

include green mobility, esp. bicycle infrastructure facilities

activate public spaces

Fig. 184 Functional mix principles

linear follwing the street:

small-scale spaces for different functions: workshops, small offices, coffee-houses, restaurants

active edges:

bigger-scale functions, providing the neighborhood with the necessary services: supermarket, post, bank

magnet buildings with special function:

full-fill the neighborhood with cultural and social functions

Fig. 185 Concentration of functions

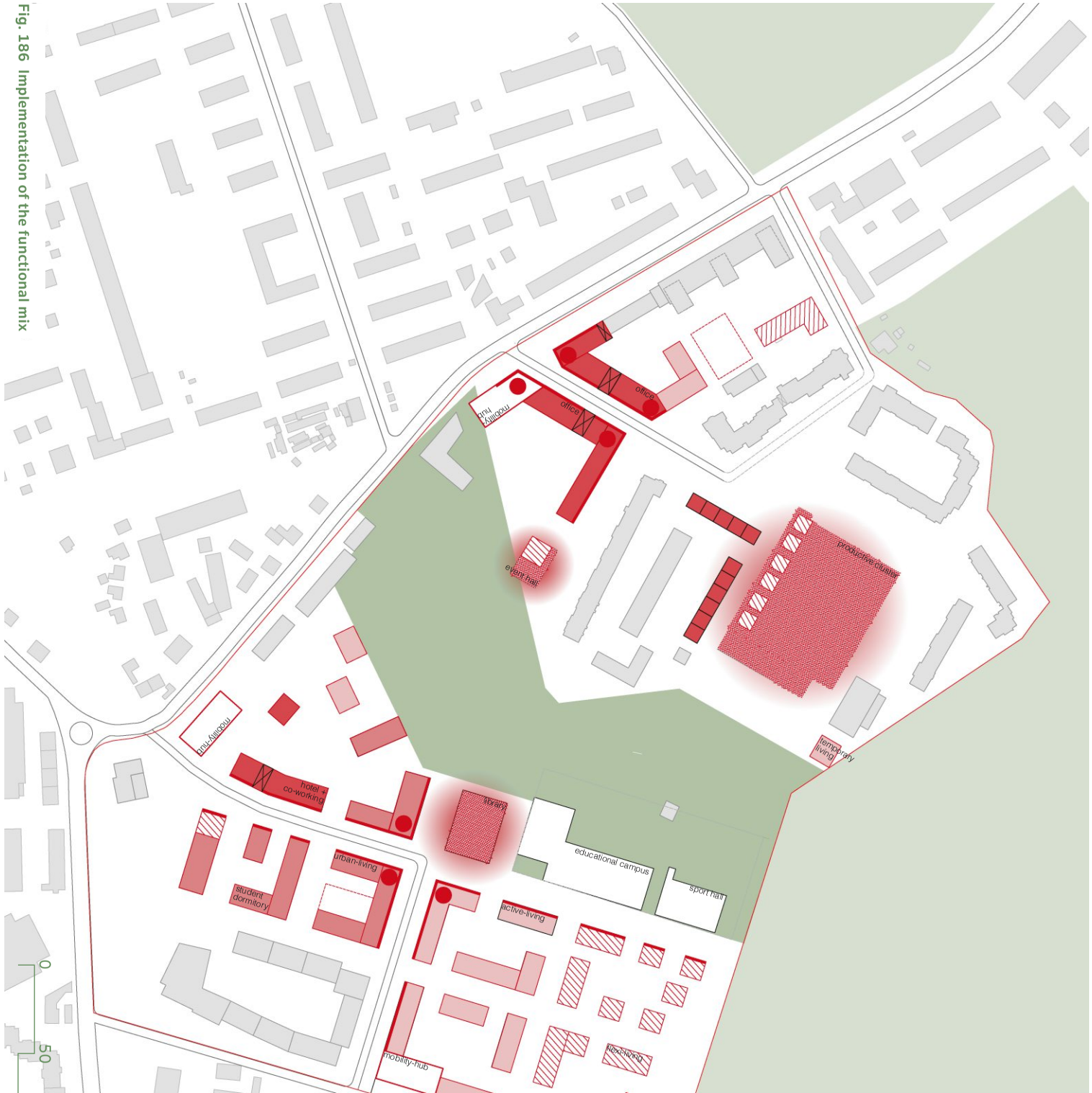
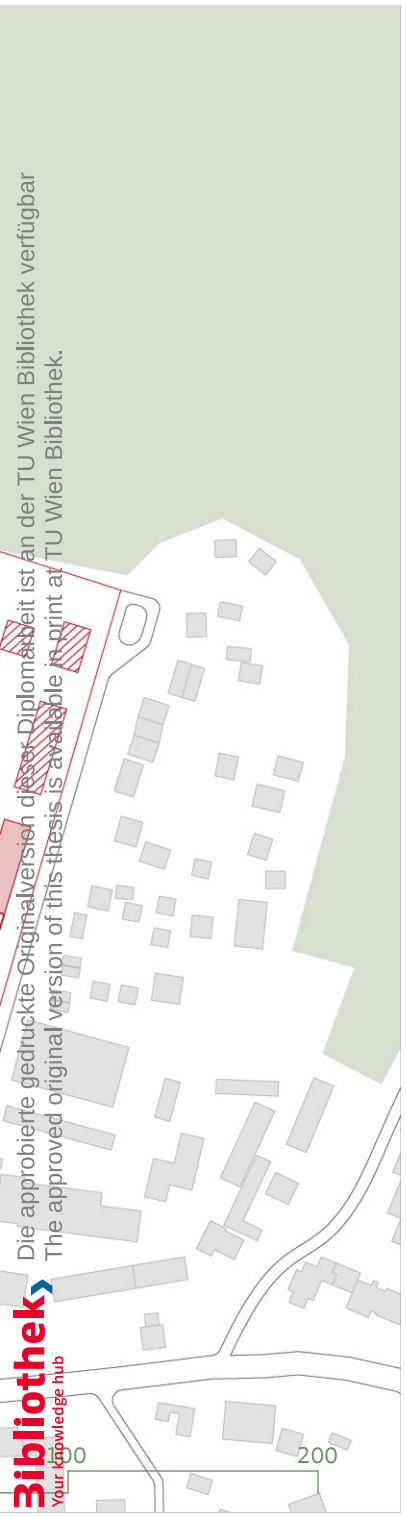


Fig. 186 Implementation of the functional mix



The functional MIX on the site is developed through the principles and concentration measures that have been described. There are two main streets: Productive and Creative, leading to the production centre in the west, and Attractive and Vibrant, leading to the education campus in the east and the Pohulianka forest park path (p.232,238). A linear concentration of functions is proposed along these streets, with active edges at the corners with important infrastructure for daily life, such as bank, post office, shops, etc. Three magnet buildings with special functions are located in different parts of the area and provide diverse social, cultural and educational facilities.

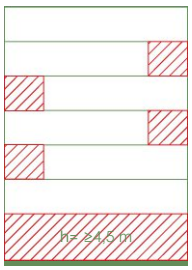
The functional MIX is organised not only on the main streets, but also throughout the neighbourhood in each newly planned building. It is divided into 6 categories: **flexi, active, urban, work, mobility hub and special function**, which ensure a certain percentage of mixed use.

Functional mix categories:

- flexi
- active
- urban
- working
- mobility hub
- special function

1 **flexi**

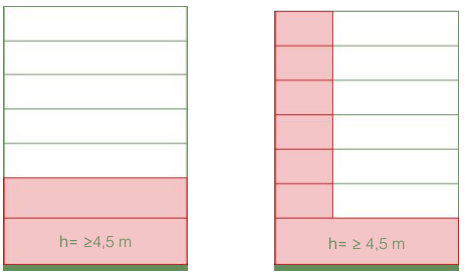
80% / 20%
live work



Residential building with predominant living function, with social infrastructure on the ground floor and flexible floor plan, that allow to organize working space, atelier, elderly care, private space for grown-up or additional space for big families, wich has additional entrance and can be separated or directly connected to apartment. Private garden on the ground floor and terraces on the roof are special in this type of living.

2 **active**

70% / 30%
live work

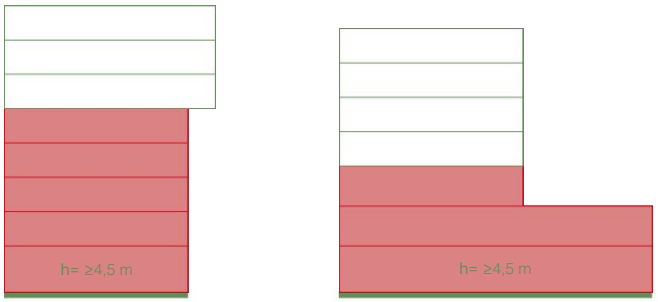


Mixed-use building with social infrastructure on the ground floor, small businesses and ateliers on the ground floor or/and integrated workspaces/ studios on the upper floors; living on the upper floors.

Fig. 187 Functional mix categories: flexi, active

3 **urban**

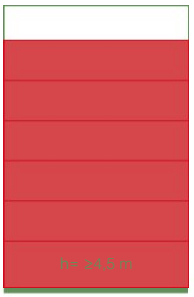
50% / 50%
live work



Mixed-use building with equal space for living and working, social infrastructure on the ground floor, small and bigger businesses, ateliers, co-working spaces ground and upper floors, living in the upper levels.

4 **working**

5% / 95%
live work



Buildings with different working spaces: offices, co-working spaces, ateliers, studios, doctor's offices, production, etc. Ground Floor has a social function and is open to the neighborhood, penthouses can be realized on the upper floors.

Fig. 188 Functional mix categories: urban, working

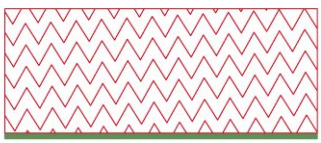
5 **mobility hub**

100%
infrastructure

mobility hub is flexible building, that for now is planned for bicycle and cars parking, car- and other vehicles sharing. It can be combined with supermarket and other function. The building itself can be transferred into office/ residential/mixed-use building in the future

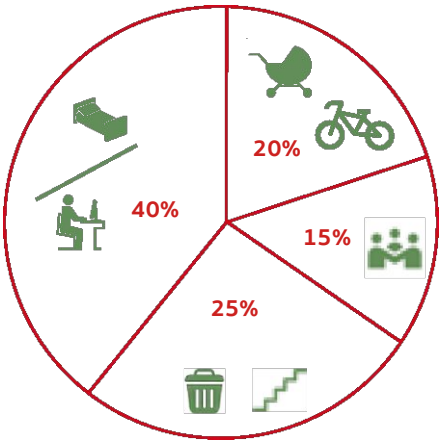
6 **special functions**

50% / 50%
leisure work



special building fills the neighborhood with social/cultural offer, and is a magnet for people, requires well-organized public space around

Fig. 189 Functional mix categories: mobility hub, special function



40% live/work space
25% entrance,garbage room, driveways
20% baby carriages, bicycle storage
15% community space

Fig. 190 Division of space on the ground floor

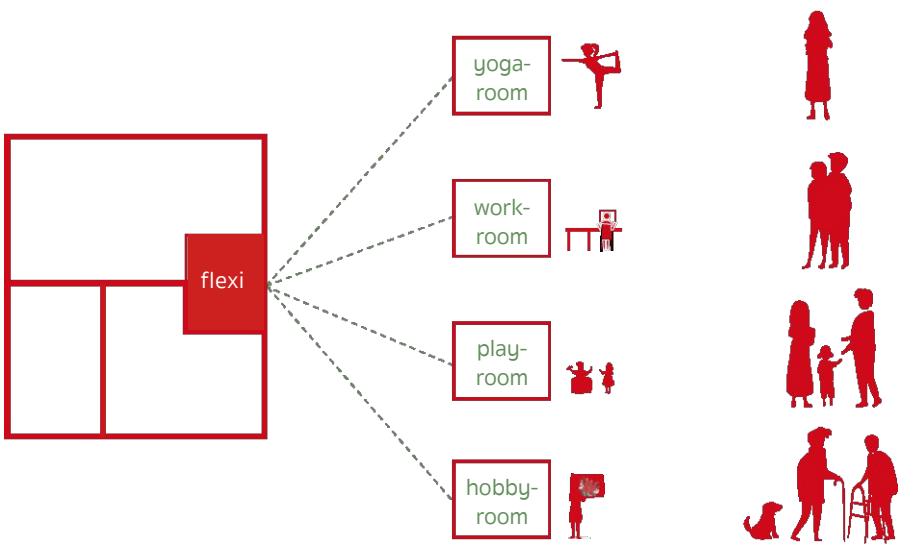


Fig. 191 Proposal of adaptable space for apartment for different phases of life

Fig. 192 View to the cultural center, mobility hub, event space and residential building

Transition to low carbon mobility

focus on pedestrians and cyclists

create «10 minutes city» with comfortably organized routes

provide sharing offers: cars, bicycles, micro mobility

include infrastructure for bicycles: parking and repair stations

elocate mobility hubs in 200m reachability

promote electric and public transport

Fig. 193 Low-carbon mobility principles

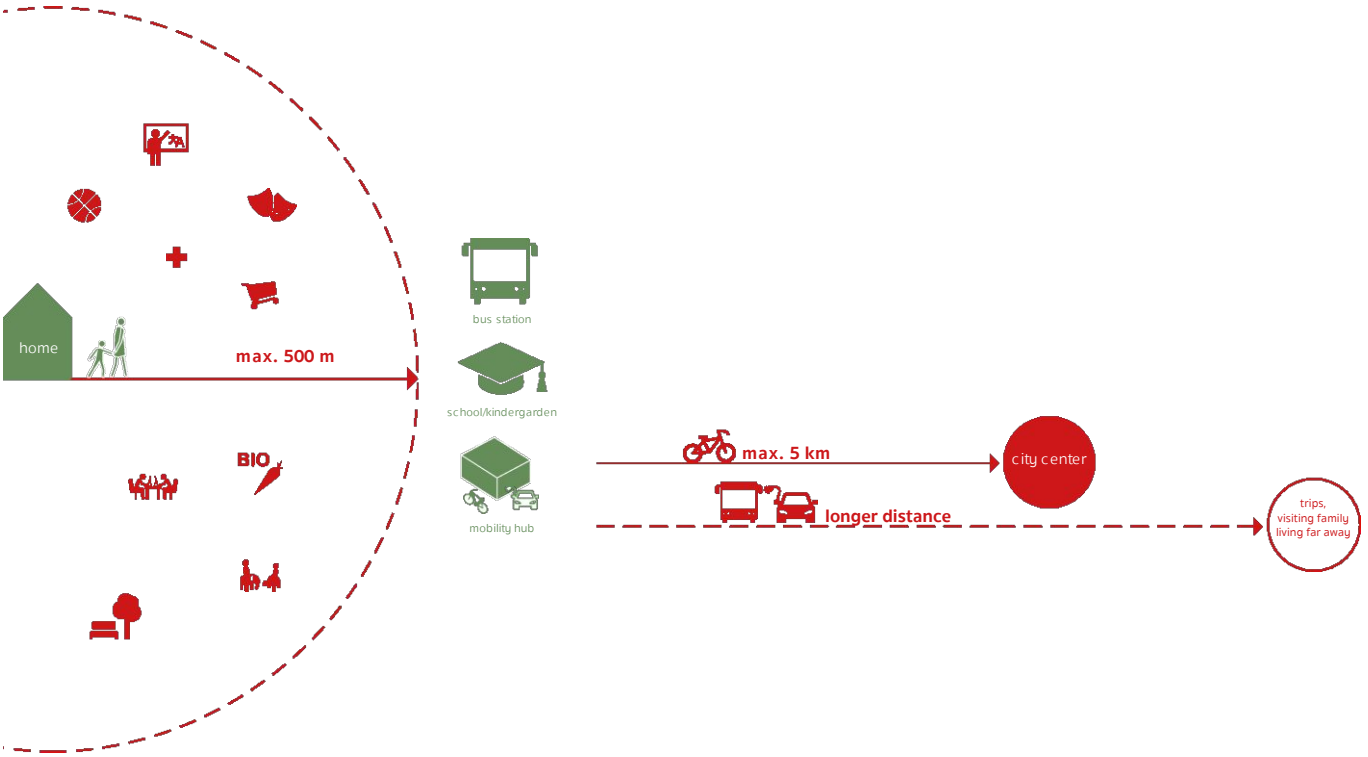
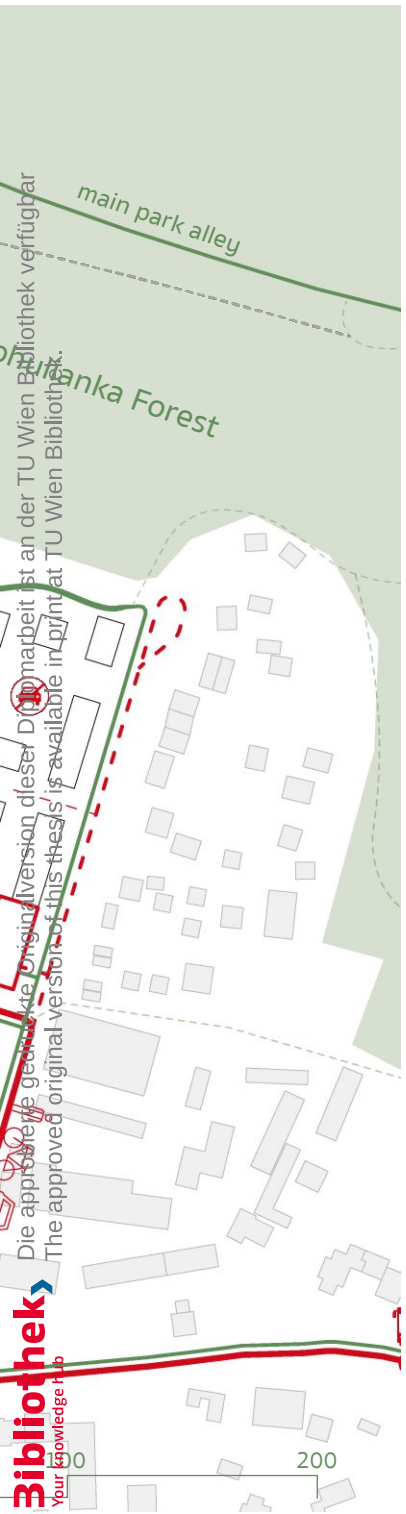


Fig. 194 Concept of accessibility

To achieve low-carbon mobility in the area, accessibility plays the main role. When the infrastructure for everyday life is within walking distance, people no longer have to drive around the city to meet their daily needs. To give local people the opportunity to use low-carbon mobility, the **mobility hub** (p.221) was created. The project area is located 4 km from the city centre. This is a very convenient distance that can be reached by bicycle or public transport.

Fig. 195 Accessibility plan



Main routes differentiation:

- with access for cars
- limited access(only for residents)
- limited access (delivery in restricted time)
- main bicycle routes
- main pedestrian routs
- existing parking building
- mobility hub
- public transport stop
- car-free surrouding

Mobility

appropriate mobility solution and service

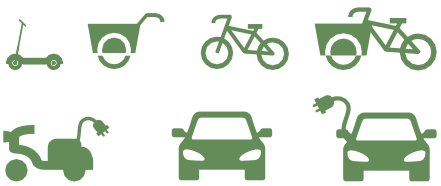


Fig. 196 Variety of mobility and services offer in mobility hub

bicycle	parking repair sharing
car	parking charging sharing
micro mobility	sharing

+ Functions

additional non-mobility services

Fig. 197 Additional functions in mobility hub

bank
post
delivery services
supermarket
co-working
indoor public space
bakery
etc.

Flexibility

building structure and usage

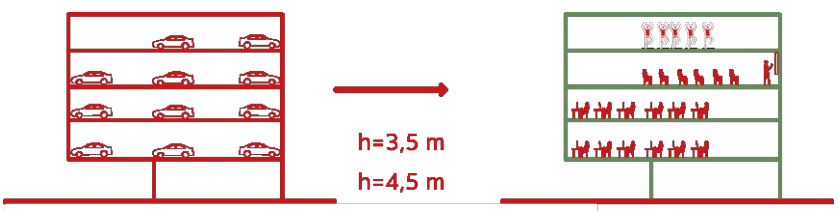


Fig. 198 Flexible building of mobility hub

Flexible structure and floor hight give the opportunity to easily change the function of the building in the future, when there will be no need to park so many cars

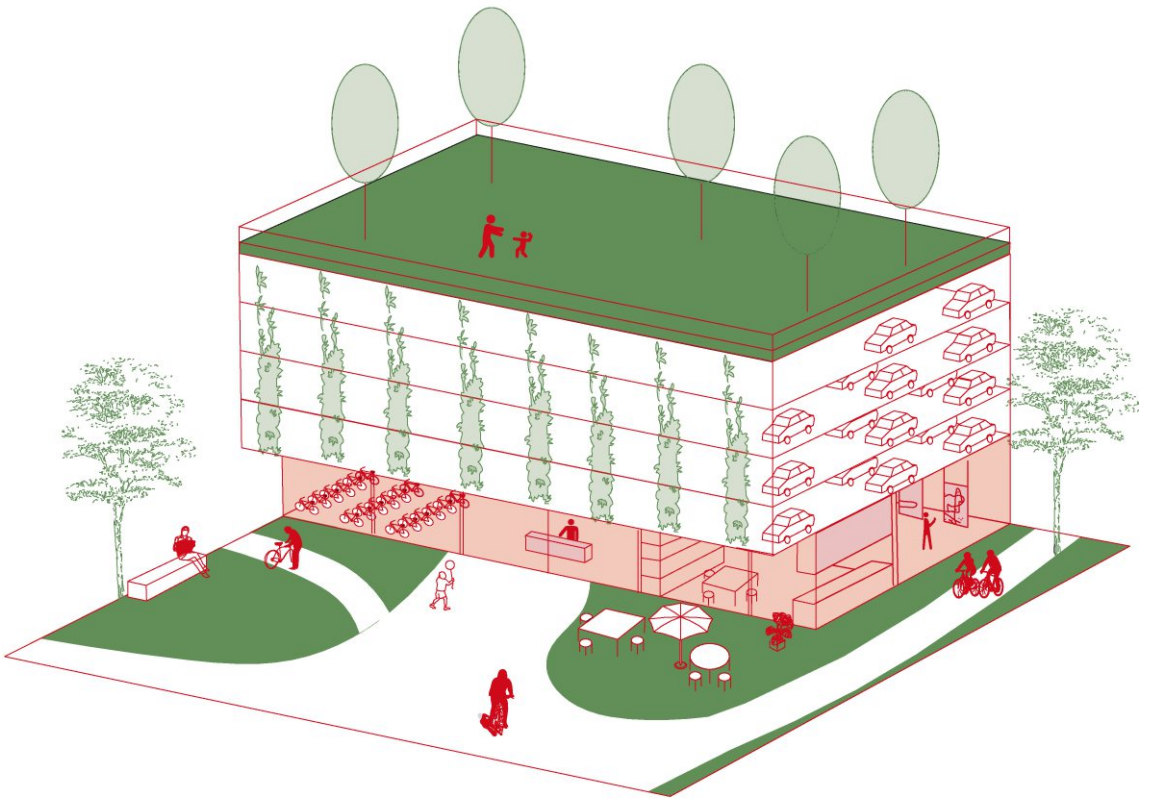


Fig. 199 Mobility hub vision

Blue-green infrastructure

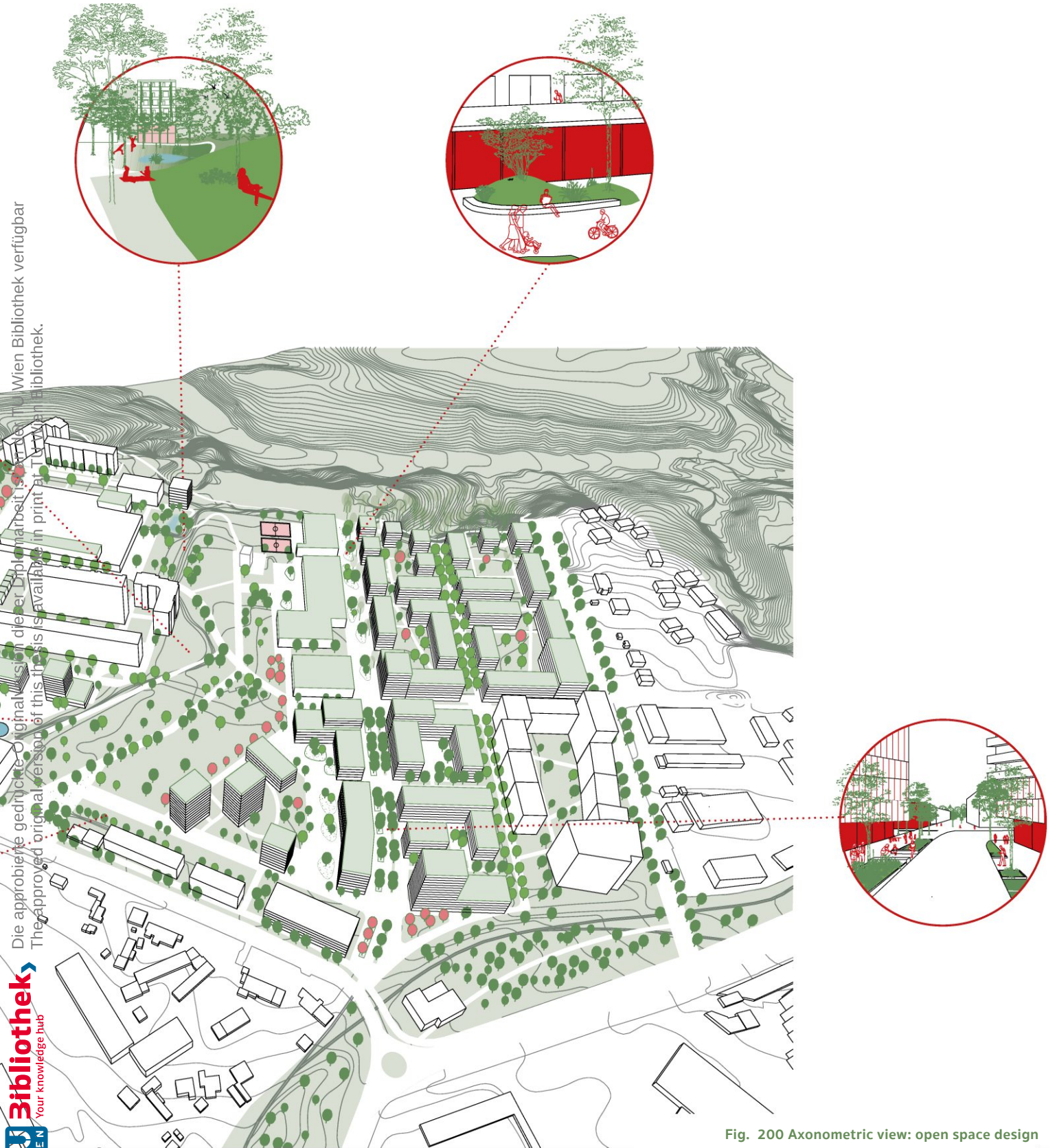
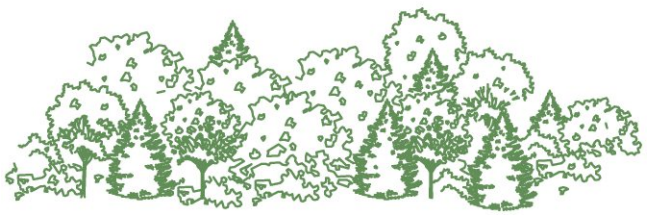


Fig. 200 Axonometric view: open space design

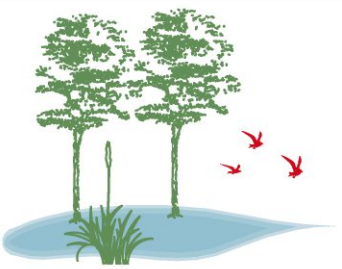
Fig. 201 Blue-green infrastructure principles



use existing green infrastructure

use climate fit trees and plants

plant fruit trees



create natural habitat
for animals and insects

give space for gardening

Fig. 202 Blue-green infrastructure design principles

Fig. 203 View to the lake

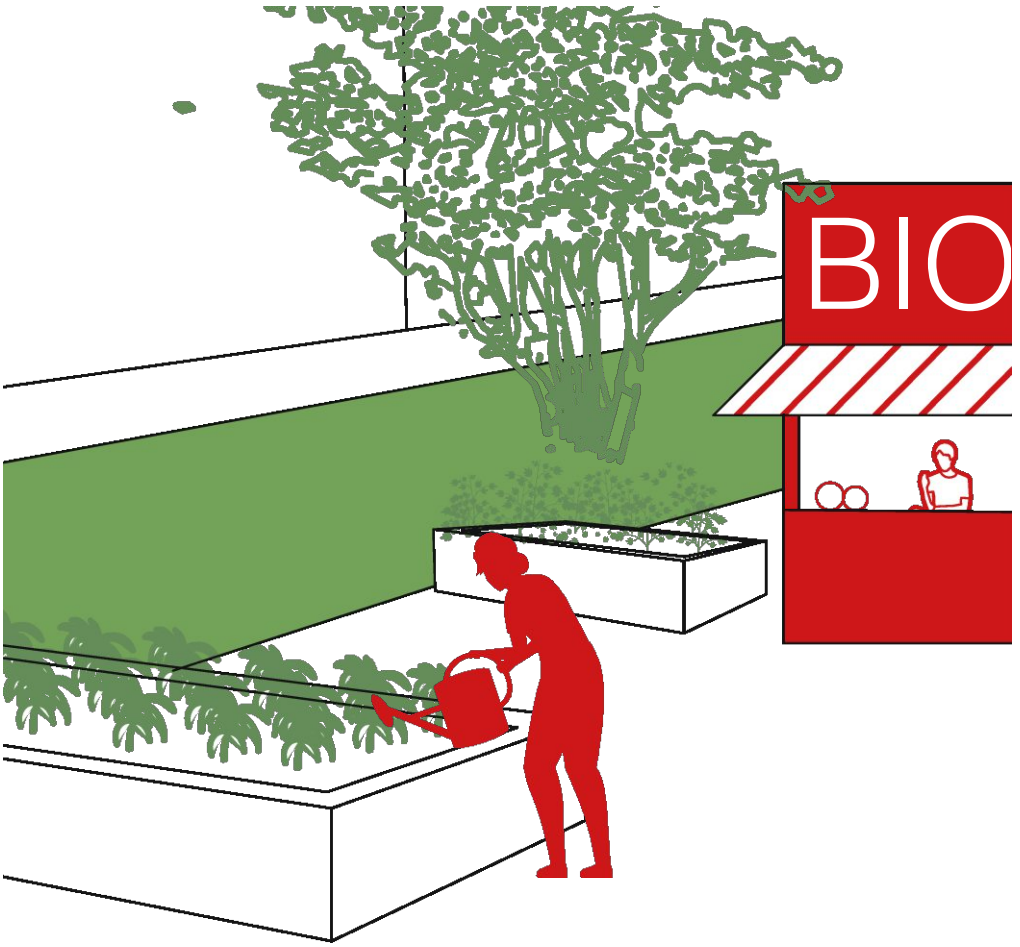


Fig. 204 Urban gardening close to the local market

Blue-green infrastructure elements

Water-sensitive street-forming elements designed for the neighborhood should build healthy, attractive and livable enviroment on newly planned streets and open space.

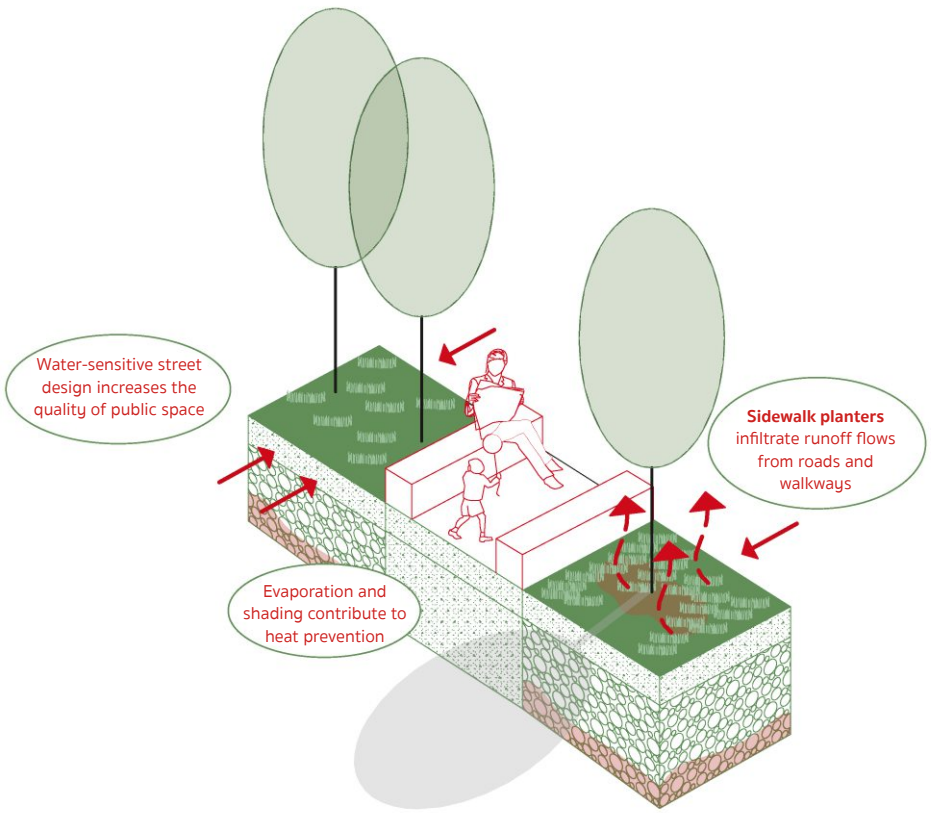


Fig. 205 Blue-green corridor

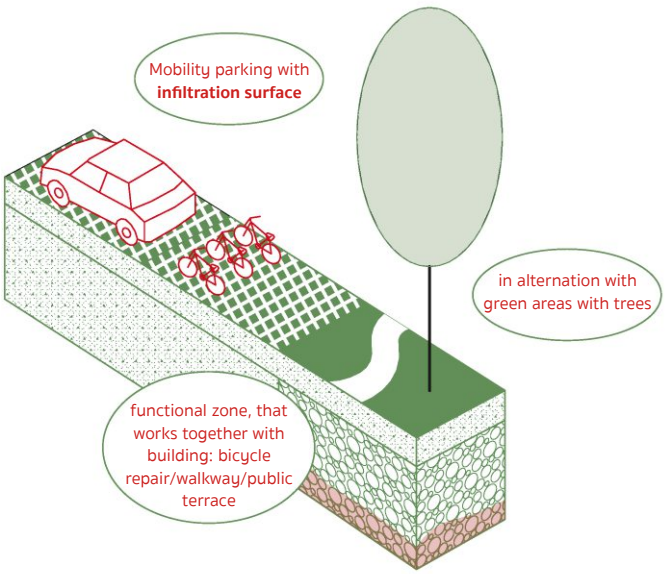


Fig. 206 Flex functional zone

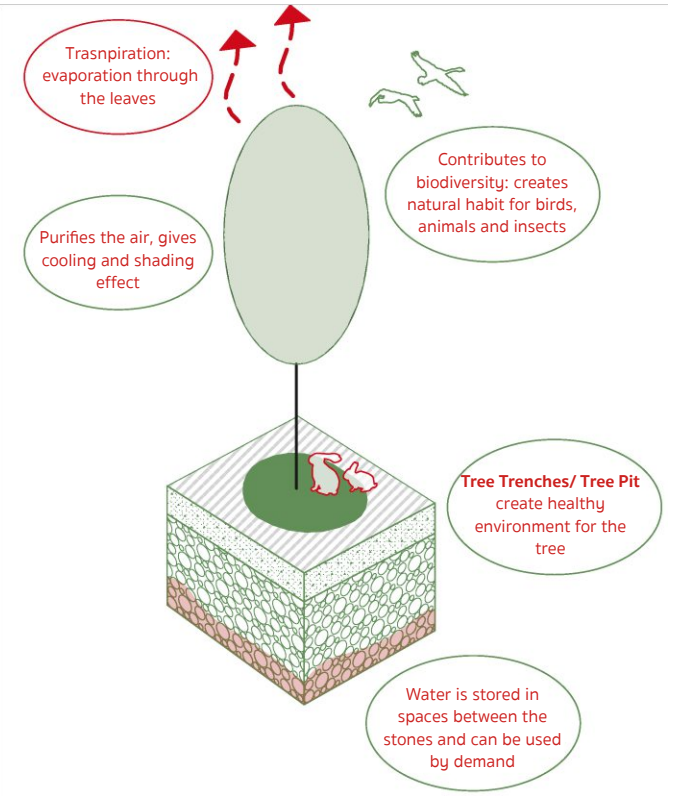


Fig. 207 Vital tree habit

Productive & Creative Street

The street leads to the neighborhood productive center, which is located in a renovated building and is intended to become a magnet for creative industries. The street itself is very busy and creative, people move to their workplaces and pass by to buy creative goods «made in Ukraine». Even in this dynamic situation there is a place for greenery and comfort. Work and produce in a pleasant environment with shade, light, trees and a diverse public space.

At the entrance to the street is a mobility hub that offers both parking and the rental of environmentally friendly mobility services. In the future, when cars will be replaced by another form of transformation, the mobility hub will be transformed into co-working space or residential building.

Fig. 208 Map: allocation productive and creative street

Fig. 209 Graphic: productive and creative street design

irrigation

evaporation

accessibility

collection of solar power

Fig. 210 Model: productive and creative street entrance from Zelena street

Fig. 211 Model: productive and creative street entrance from productive cluster

Fig. 212 View to the productive and creative street direction Zelena street

Attractive & vibrant street

Located on the city's connecting axis, the street offers a variety of active functions for daily life. Mobility hub, hotel, shopping, bank, post office, cafes and restaurants, doctors' offices, office space and co-working spaces are located on the street.

Bright pedestrian walkways provide the opportunity for pleasant urban life and communication. The street leads to the educational campus, making it more active during the day, and is designed with a blue-green corridor that creates a vibrant, fresh and comfortable space to stay.

The street provides short-term parking for cars and bicycles on a permeable surfaces.

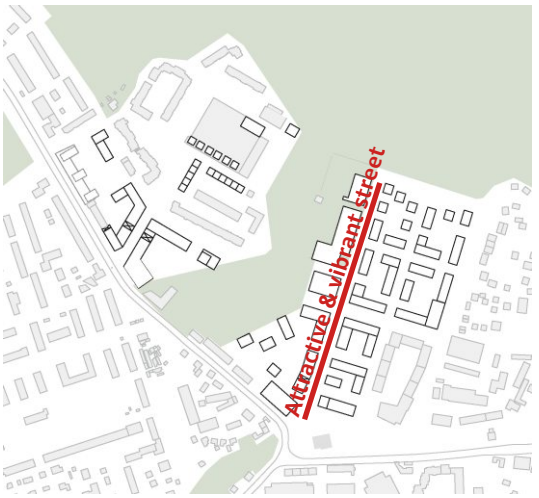


Fig. 213 Allocation attractive and vibrant street

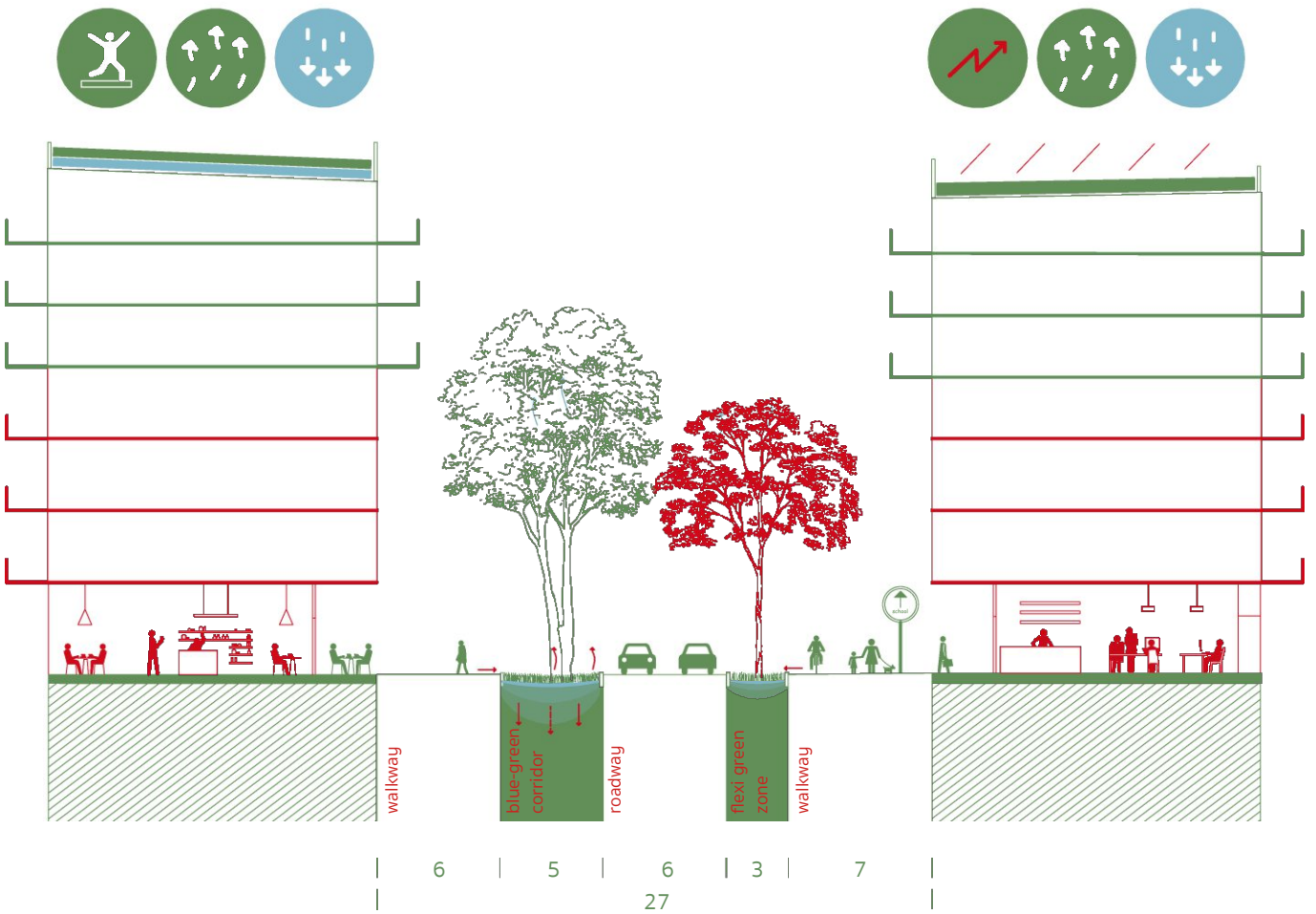


Fig. 214 Attractive and vibrant street design

irrigation

evaporation

accessibility

collection of solar power

Fig. 215 Model: attractive and vibrant street park entrance

Fig. 216 Model: attractive and vibrant street main street entrance

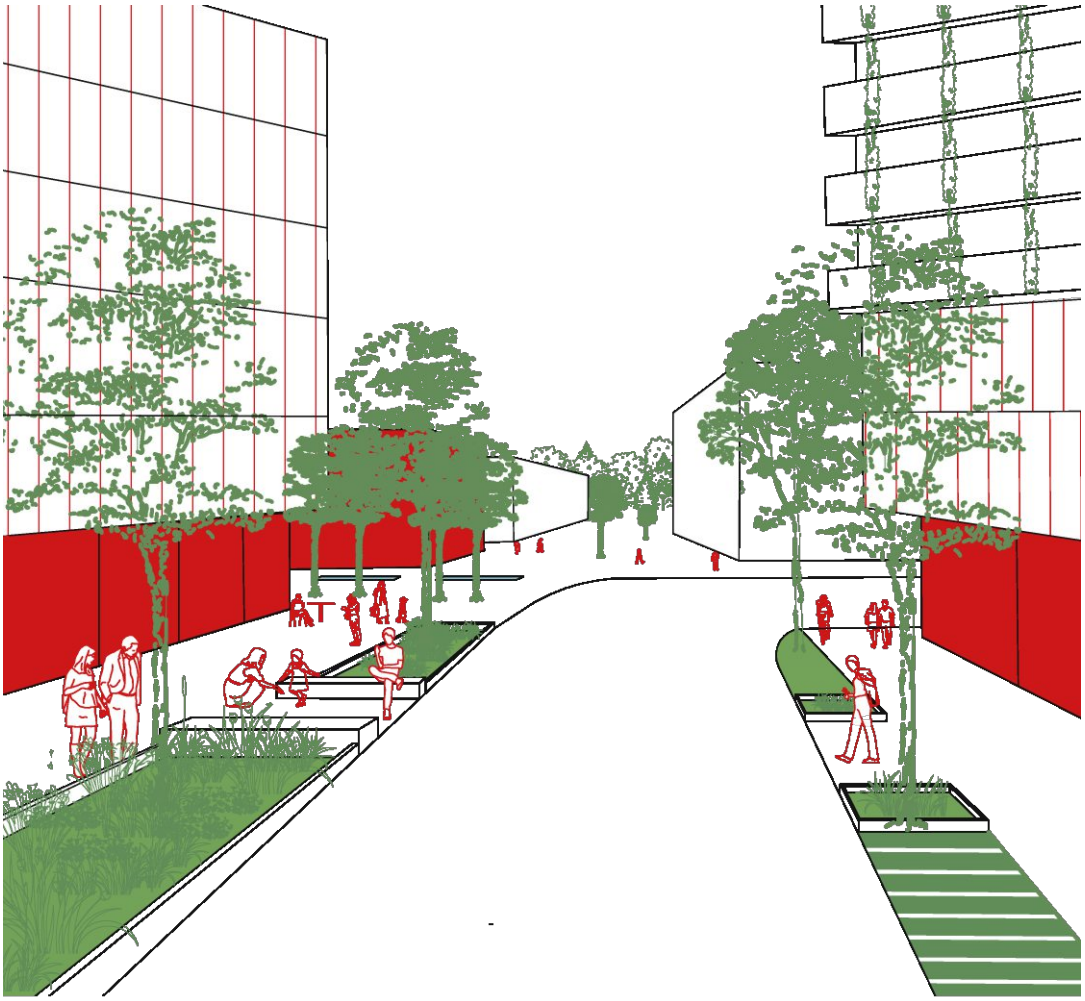


Fig. 217 View to attractive and vibrant street

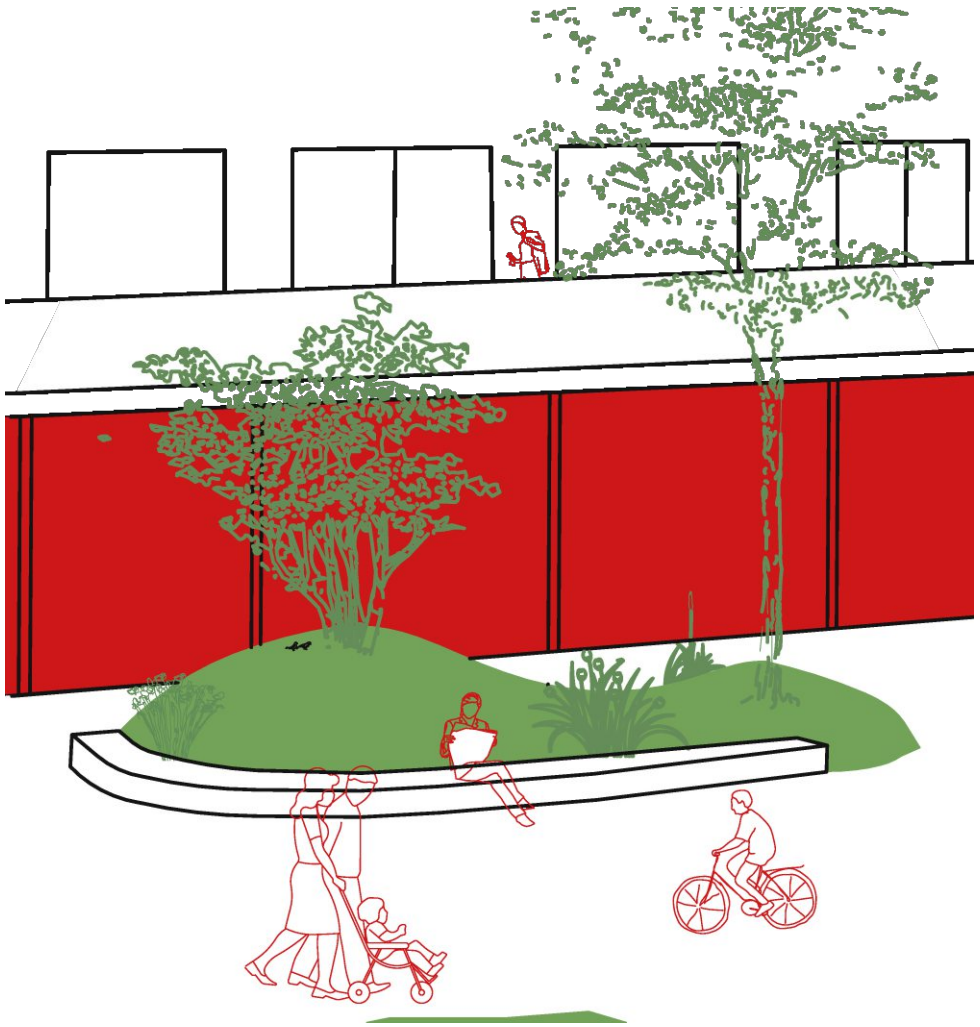


Fig. 218 Open space design element

Green & livable street

Located between flexi and active neighborhood developments, the street creates a green and livable environment that provides a semi-private atmosphere, a safe place for children to play, a comfortable environment for recreation and a natural habitat for animals and insects.

Bicycle traffic on the street is slowed down, access for cars is restricted, only in emergencies it is possible to use the street for ambulances, fire trucks or deliveries.

The ground floor has a height of 4.5 m, which gives the space flexibility. Offices, stores, childcare functions, etc. can be located on the first floor.
The height allows the construction of additional level, which can be expanded individually. Each apartment on the first floor has its own terrace.

Fig. 219 Allocation green and livable street

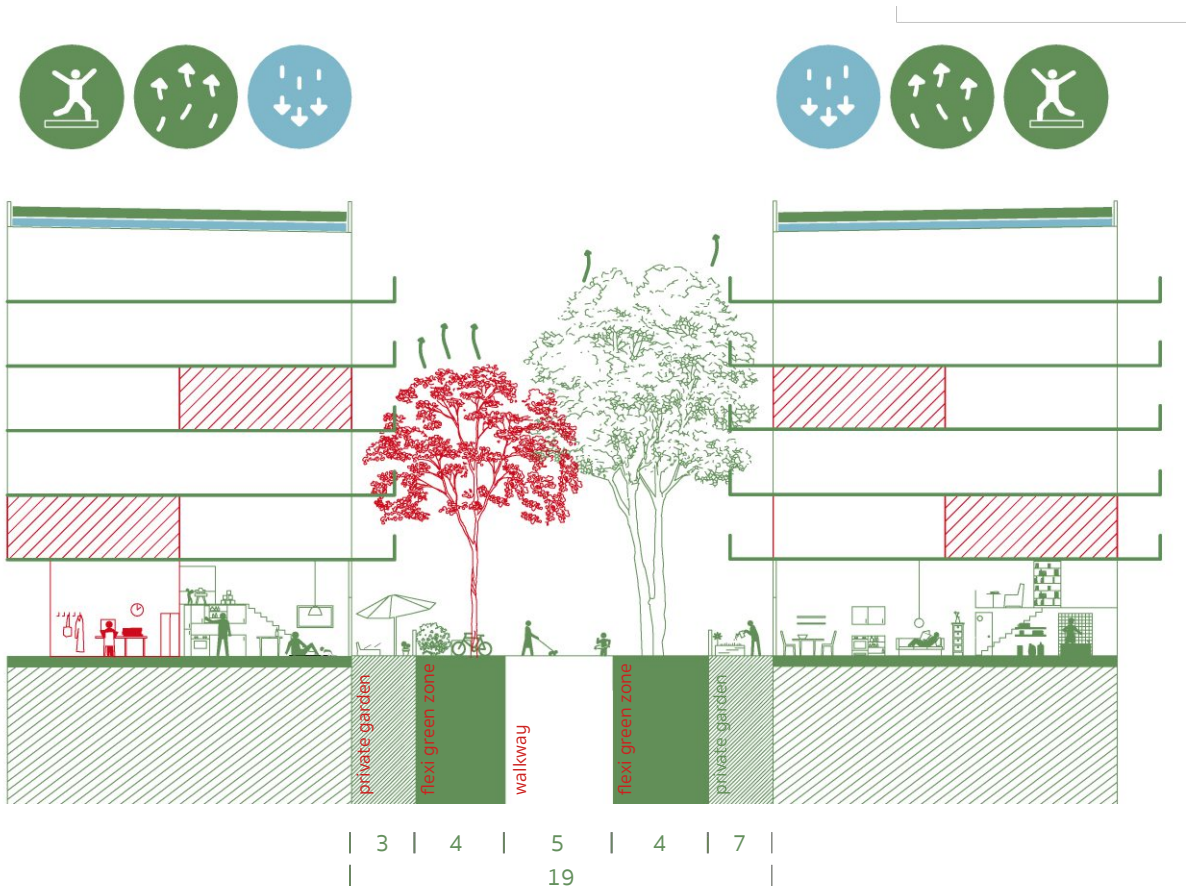


Fig. 220 Green and livable street design

irrigation

evaporation

accessibility

collection of solar power

Fig. 221 Model: green and livable street entrance from the Pohulianka Forest Park

Fig. 222 Model: green and livable street view from the top

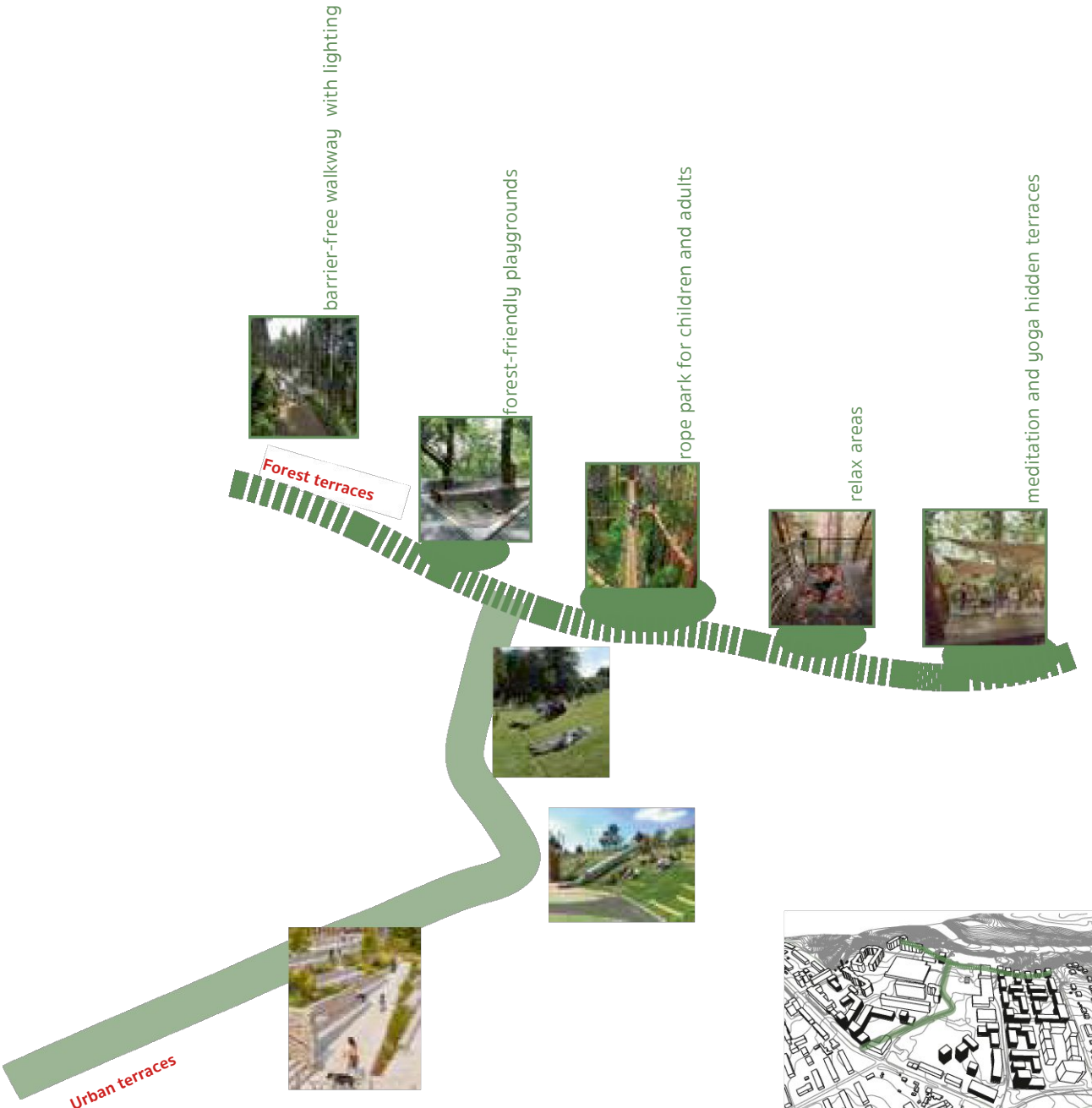


Fig. 223 Connection between newly developed park and Pohulianka Forest Park

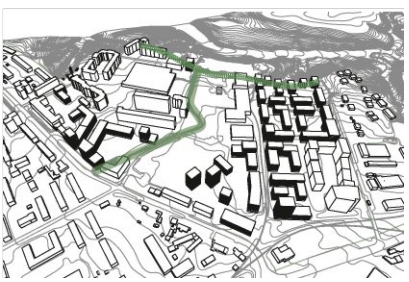


Fig. 224 Allocation

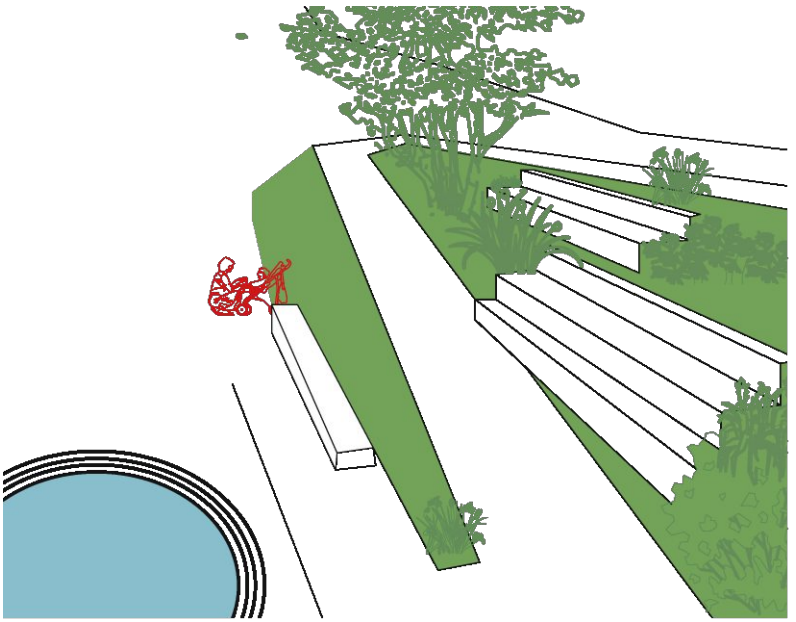


Fig. 225 Barrier-free connection to cultural center

Fig. 226 Playground on the hill

Fig. 227 Entrance to the central park

***Safety measures due to war 2022-2023**

Talking to the people living under the threat of a missile attack, many of them told how difficult it is to hide in the basement during the alarm, and many ignore the risk and stay at home. The basements are not comfortably equipped. For this reason, in my project I was looking for a solution that would allow people to stay safer at home and at the same time give new meaning to Escape Rooms in the basement. It is important that all the necessary facilities are available: Water and food supply, energy reservoir, kitchen, toilet and space for work and leisure.

modern bomb shelter as flexible social infrastructure

self-sufficient resilient energy supply

Safety measures

- foreseeing protective rooms made of reinforced concrete in new buildings;
- arrangement of flexible social infrastructure in each house, that could dean as safe place for work and leisure;
- safe infrustructure for events and communty gatherings;
- arrangement of modern bomb shelters with the possibility of transformation to another function.

From flexi to safe (see page 211)

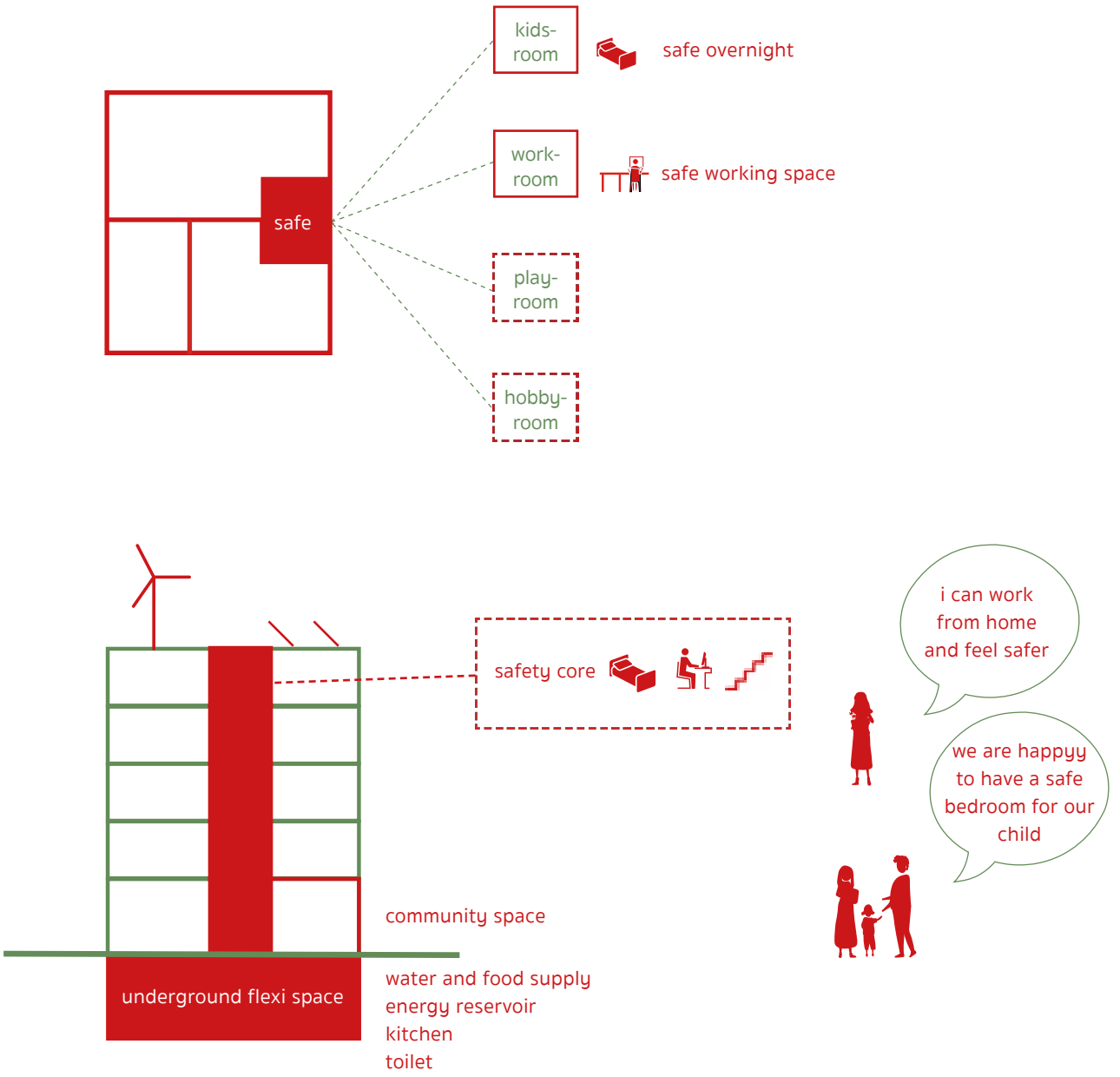


Fig. 227 Safety and resilience measures

Living in Pohulianka neighborhood: before-after

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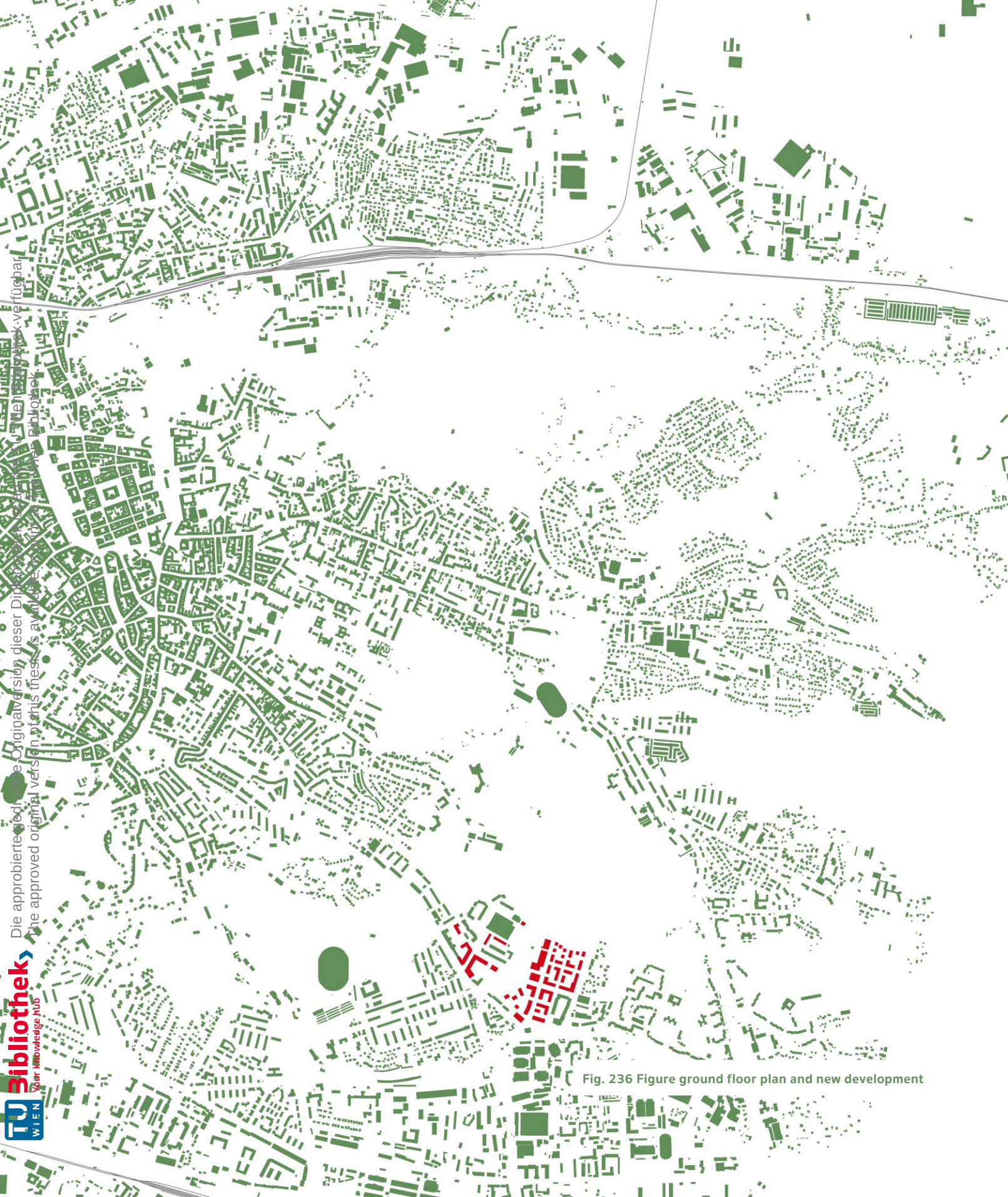

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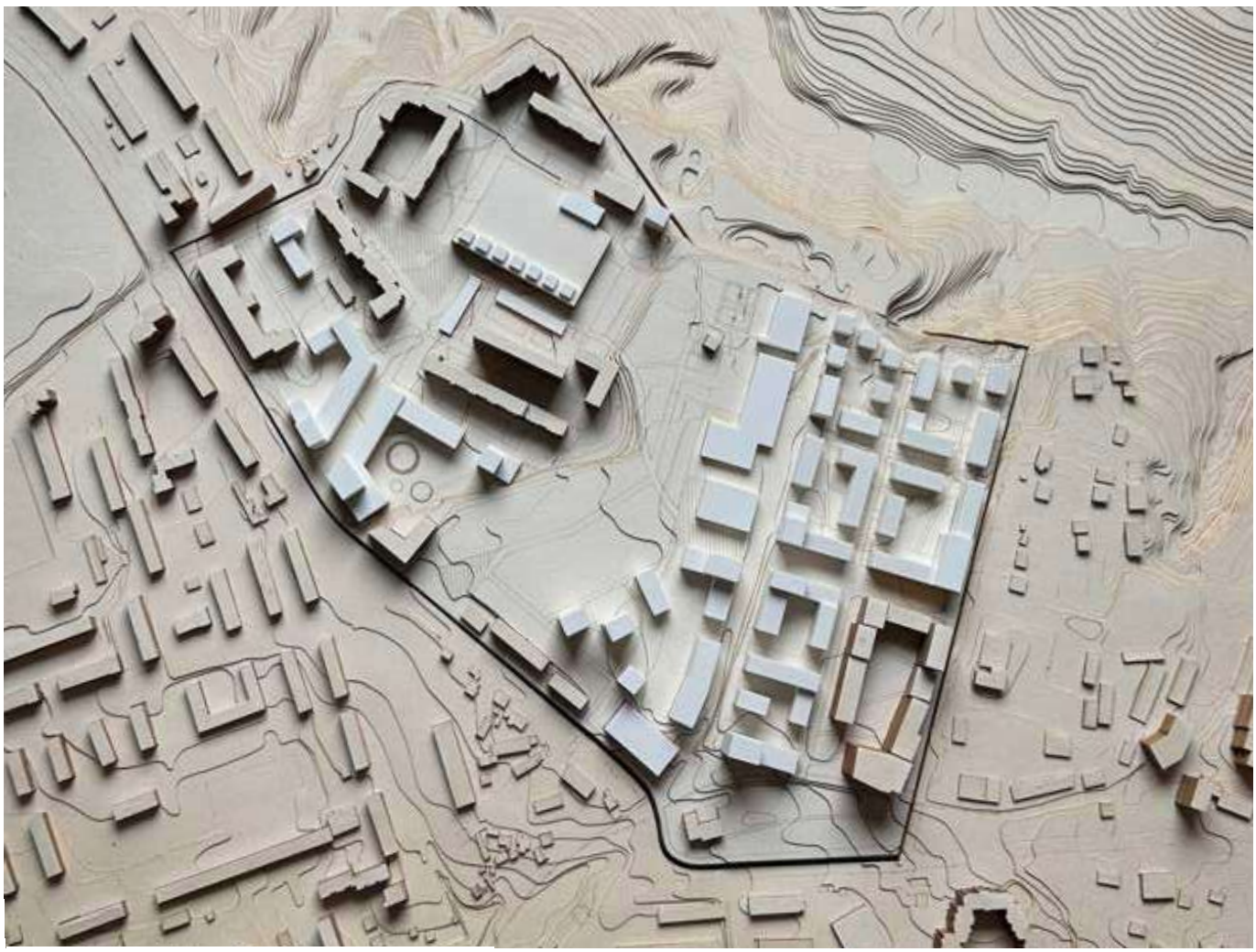

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