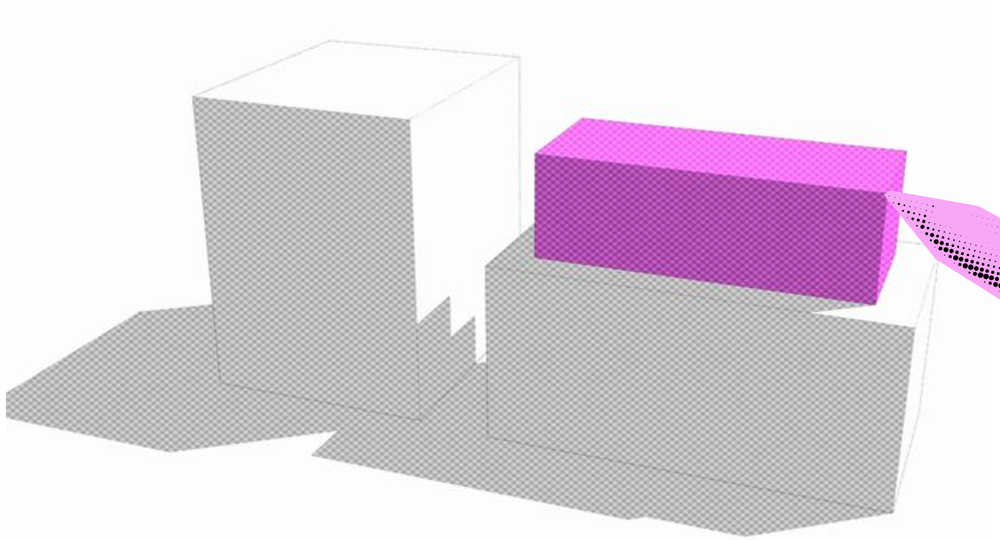
# BUILDINGS VERTICAL EXTENSIONS IN POLISH HOUSING RESOURCES

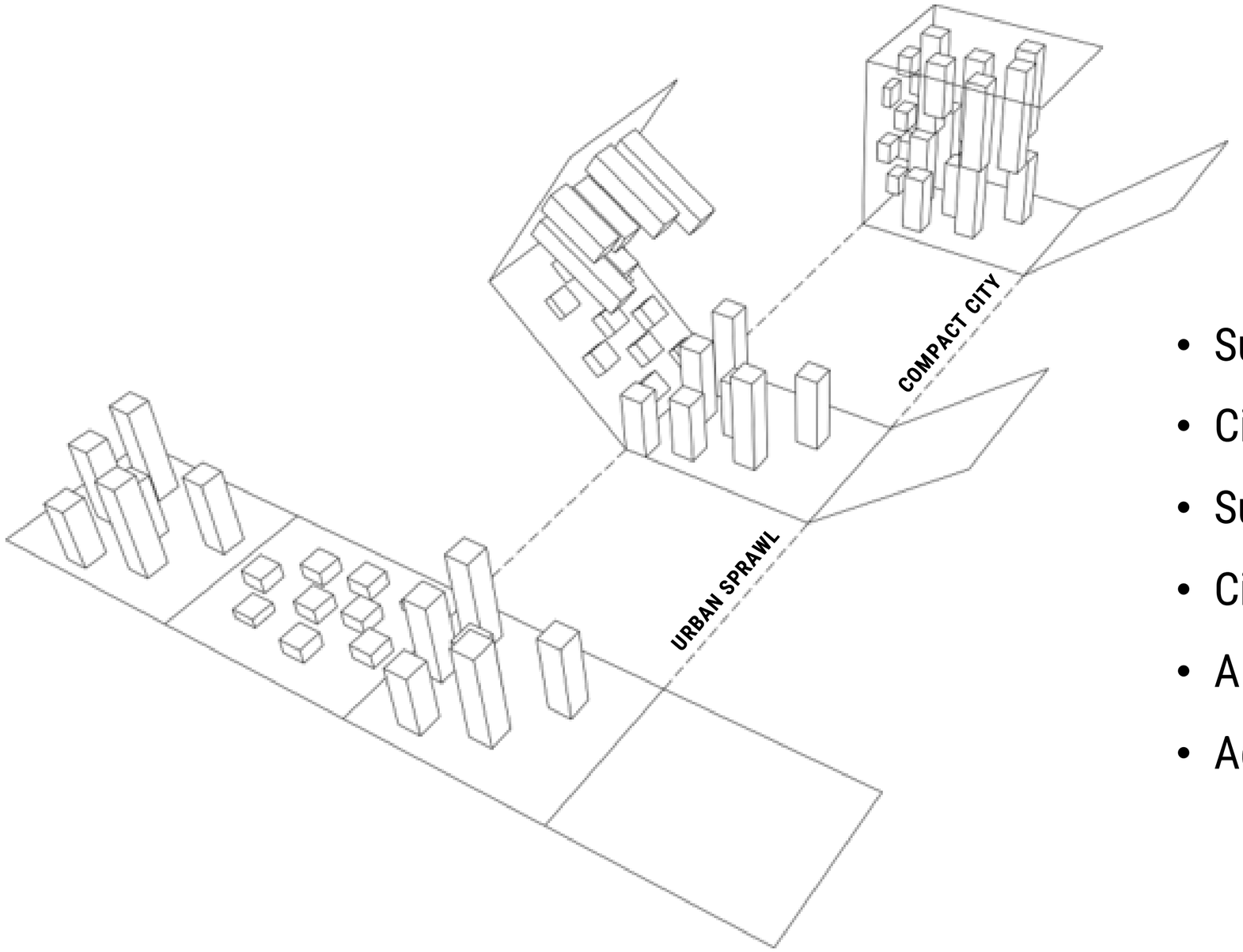
## RESEARCH CASE STUDY



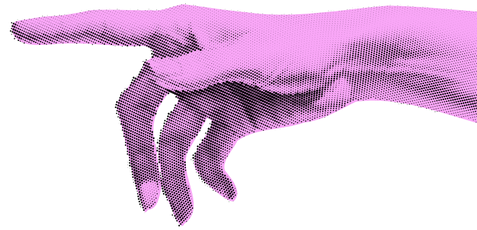
Wrocław University of Science and Technology

**PHD.ENG.ARCH. ZUZANNA NAPIERALSKA**

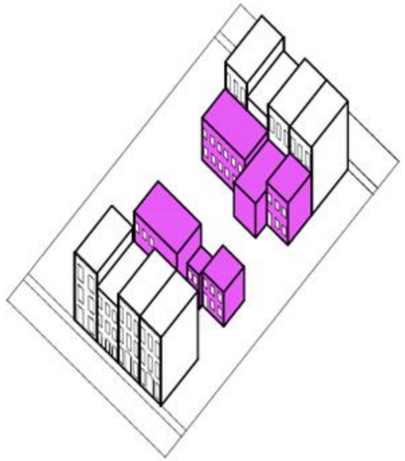
**AIMING HIGH** - THE POWER OF VERTICAL EXTENSIONS - CONFERENCE, BRUSSELS 13TH OF MAY 2025



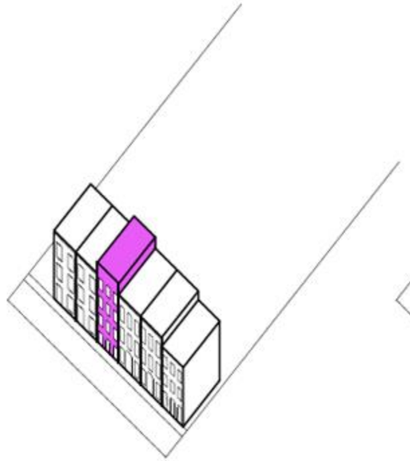

# CURRENT URBAN TRENDS



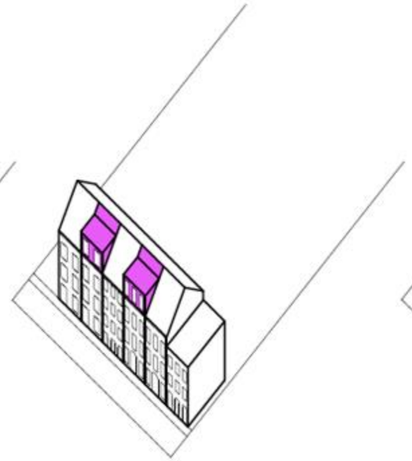
- Sustainable development of urban areas
- Circular Economy
- Sustainable housing policy
- Circularity in construction
- A compact city
- Adaptability and resistance to change



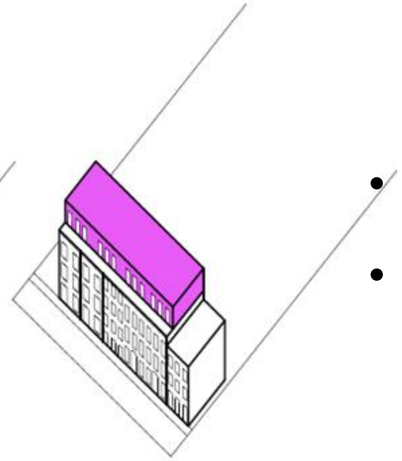
FILLING BACKYARD



INFILL BUILDING

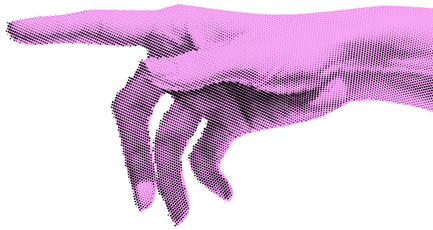


ATTIC EXCHANGE & ADAPTATION



BUILDING VERTICAL EXTENSION

## INCREASING THE URBAN DENSITY



- Use of existing infrastructure
- Renovation, modernization of existing buildings, improvement of its accessibility
- Possibility of adapting the building to a new function
- Location in a easily accessible part of the city (public transport)
- Reduction of construction waste, reduction of material consumption

# APPLICABLE STANDARDS AND DIRECTIVES

*... HOW VE MEETS TRENDS*

## The Energy Performance of Buildings Directive (EPBD)

**The EPBD (Energy Performance of Buildings Directive) introduces significant changes in the approach to building energy efficiency**, which also impacts the extension and expansion of existing structures.


## EU Taxonomy and ESG (Environmental, Social, Governance)

**The EU Taxonomy is the European Union's regulatory framework that defines and standardizes economic activities in line with sustainable development principles. ESG** represents the criteria for assessing corporate sustainability, covering three main areas:

- **Environmental (E):** Concerns the impact on the environment, including greenhouse gas emissions, energy consumption, water conservation, and biodiversity protection.
- **Social (S):** Encompasses issues related to employees, human rights, and relationships with local communities.
- **Governance (G):** Relates to management structures, transparency, and corporate responsibility.

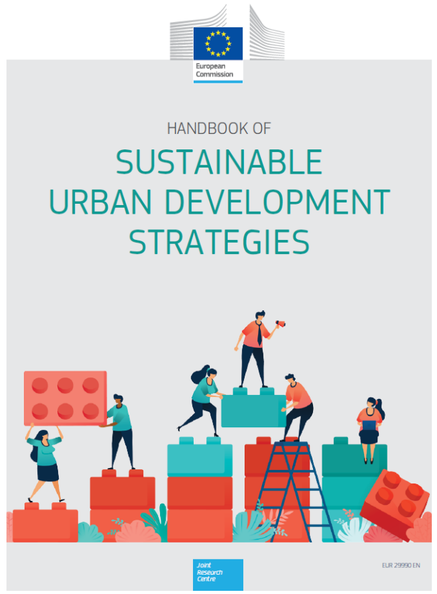
**Impact on Urban Development:**
**ESG strategies contribute to creating more sustainable and resilient cities by promoting investments in green infrastructure, renewable energy, and sustainable urban planning.**

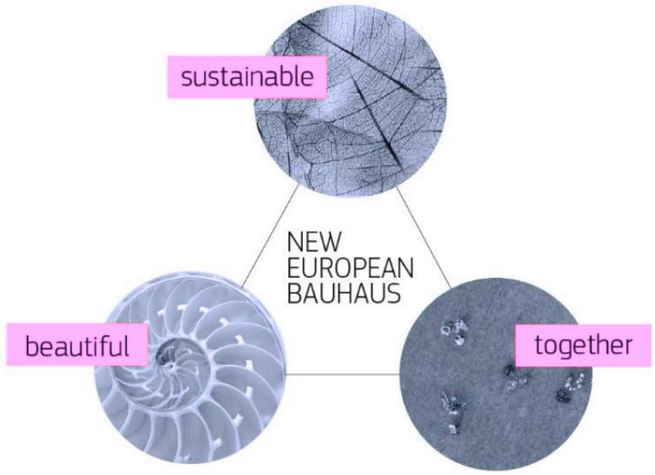
Wrocław University of Science and Technology

## Handbook of Sustainable Urban Development Strategies (2020), European Commision.

This manual was developed by the Joint Research Centre (JRC) in collaboration with the Directorate-General for Regional and Urban Policy (DG REGIO) of the European Commission.

**Its primary objective is to provide knowledge on the implementation of integrated and place-based urban strategies within the framework of cohesion policy.**




## The New European Bauhaus and the Possibilities of Designing Building Extensions

**The New European Bauhaus (NEB) is a European Commission initiative that could significantly impact the design of building extensions in the context of sustainable urban development. NEB emphasizes sustainability and the circular economy.**

**In the context of vertical extensions, this means:**

- Utilizing existing building resources
- Designing with a focus on energy efficiency
- Using environmentally friendly and recyclable materials
- Implementing innovative architectural approaches

**NEB encourages the integration of modern solutions with local traditions.**
**In the case of building extensions, this can involve:**

- Harmoniously integrating new elements into the existing urban fabric
- Utilizing innovative construction technologies
- Creating aesthetic and functional spaces

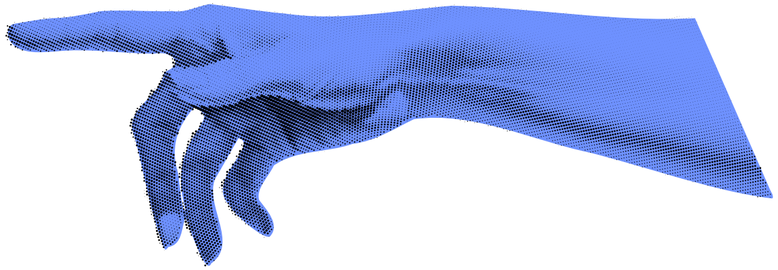
# VERTICAL EXTENSIONS

## DRIVERS AND BARRIERS

Wrocław University of Science and Technology

# VERTICAL EXTENSIONS

## Drivers and barriers categories

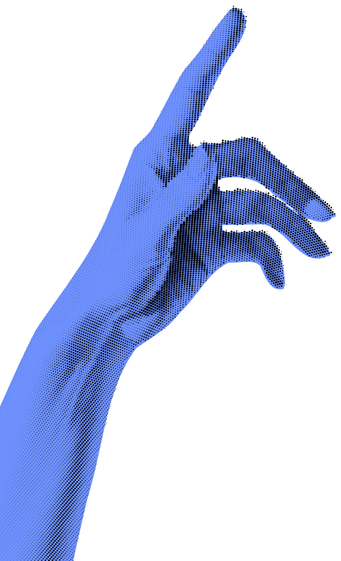


- Constructional
- Financial
- Legislative
- Social & Cultural
- Non structural - technical
- Environmental

# VERTICAL EXTENSIONS

## Drivers and barriers categories

**Constructional**



### Barriers

- Increase in construction loads - technical assessment of the building, analysis of load-bearing capacity, design of reinforcement of the structure and foundations of the existing building
- Design limitation due to existing building structural grids, loading limitations and floor-to-ceiling heights

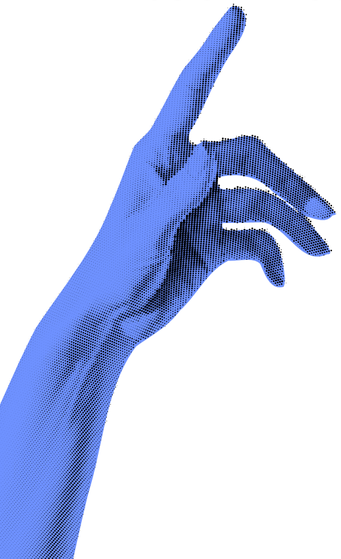
### Drivers

- Analysis of the actual technical condition of the building
- Investor does not have to build new infrastructure, uses the existing one

# VERTICAL EXTENSIONS

## Drivers and barriers categories

**Non structural - technical**



## Barriers

- Construction specialists (shortage of knowledge and skills)
- Shortage of experience and know - how
- Construction logistics - construction on an inhabited building, minimizing construction inconveniences

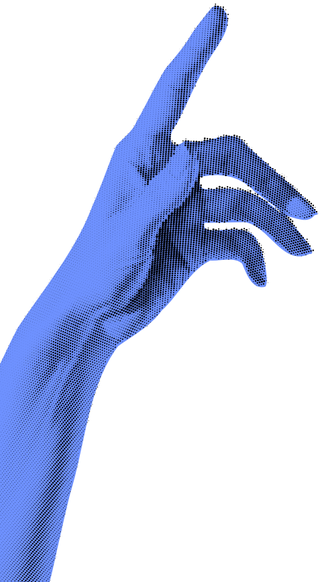
## Drivers

- Development potential for narrow and specific branch in construction industry

# VERTICAL EXTENSIONS

## Drivers and barriers categories

**Financial**



## Barriers

- Uncertain business plan and commercial risk
- The need to invest in building construction analyses and expertise, which may show the lack of possibility of vertical extension - a risk at the start
- Economic factors are significantly more influential than environmental considerations
- Unclear financial case (problem with bank credits) and a lack of market mechanisms

## Drivers

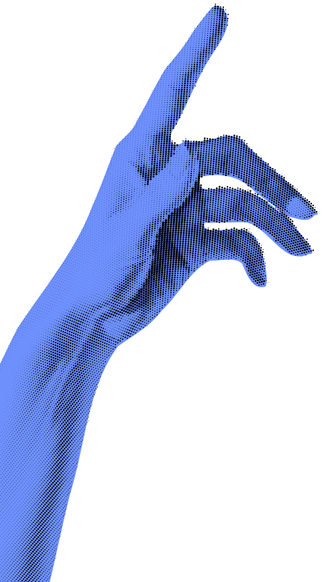
- Reducing maintenance and heating costs.
- Increasing the value of the building.
- Cooperative/residents: additional apartments contribute to the renovation and maintenance budget.

Wrocław University of Science and Technology

# VERTICAL EXTENSIONS

## Drivers and barriers categories

**Legislative**



## Barriers

- Lack of legal status for taking over the roof area by the investor for the period of the investment (when the investor is different from the building owner) - Financing
- Specific ownership legal act for residential buildings
- Urban plan regulations: regulations regarding the number of parking spaces or development intensity indicators
- Fire protection regulations

## Drivers

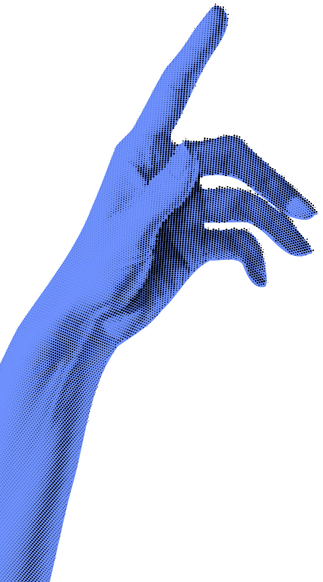
- Changes in legislation in favor of vertical extensions: - UK Statutory Instruments 2020 No. 632, No. 755, The Town and Country Planning (Permitted Development and Miscellaneous Amendments) (England) (Coronavirus) Regulations 2020; - LOI n° 2014-366 du 24 mars 2014 pour l'accès au logement et unurbanisme rénové.

Wrocław University of Science and Technology

# VERTICAL EXTENSIONS

## Drivers and barriers categories

**Environmental**



### Barriers

- Economic factors are significantly more influential than environmental considerations
- Insufficient consideration of the building life cycle (LCA)

### Drivers

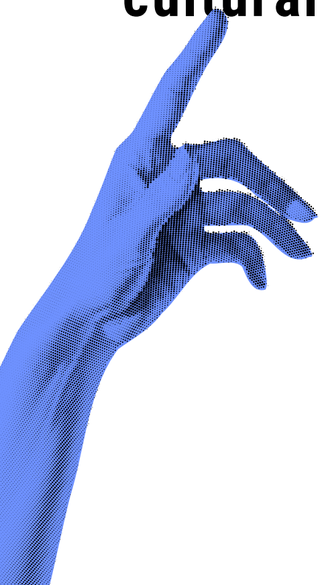
- Vertical extensions to have the lowest environmental impact and highest return on investment
- Improving the building energy parameters
- Adapting and reusing buildings rather than demolishing and replacing them is one of the most effective CE (circular economy) strategies as it ensures a maximum amount of material is retained in its most useful form

Wrocław University of Science and Technology

# VERTICAL EXTENSIONS

## Drivers and barriers categories

**Social & cultural**



### Barriers

- Lack of information campaign,
- Lack of good examples of realization of building vertical extensions,
- resistance from residents to superstructures, fear of change
- NIMB phenomenon - not in my backyard

### Drivers

- Building modernizing, (elevators)
- lower costs of building maintaining = living condition improvement

# VERTICAL EXTENSION

## RESEARCH THREE STAGE

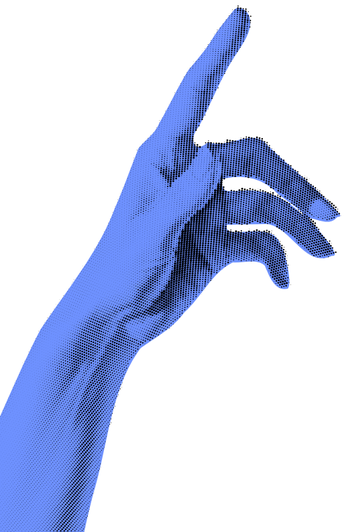
## BUILDING QUALIFICATION CRITERIA

Wrocław University of Science and Technology

# VERTICAL EXTENSIONS

## Three stage building qualification for a vertical extension

### First stage criteria



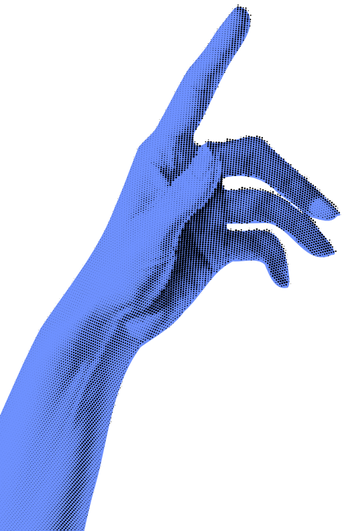
- Building qualifies as low or medium-rise hight
- Height (above ground) of the building with an extension will not exceed nine - storey or 25 m (fire protection regulations)
- Building is not a historical monument
- Optimal buildings for extension are those built in the 1960s - 1990s using industrialized large-panel technology (due to previous research)
- Building location (technical infrastructure, access to public transport, services)
- Roof volume (flat roofs)

Wrocław University of Science and Technology

# VERTICAL EXTENSIONS

## Three stage building qualification for a vertical extension

**Second stage criteria (after initial selection of the building)**



- Presence of a lift in the building, if not - is it possible to add a passenger lift
- Local spatial development plan for this location? The provisions of the development plan (VE context):
  - whether it allows for higher buildings,
  - whether the building intensity limit will be exceeded,
  - providing parking spaces on the plot for the new volume
  - the distance between the buildings allows for superstructure (covering and shading)

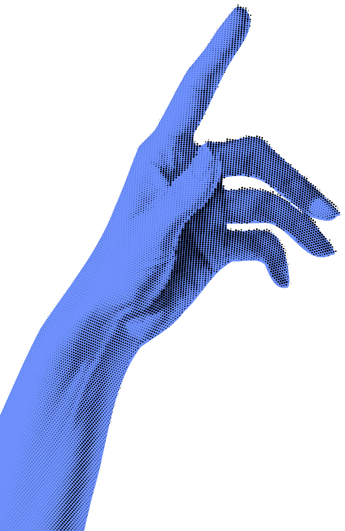
Wrocław University of Science and Technology

# VERTICAL EXTENSIONS

## Three stage building qualification for a vertical extension

**Third stage criteria (after positive verification 2nd stage criteria)**

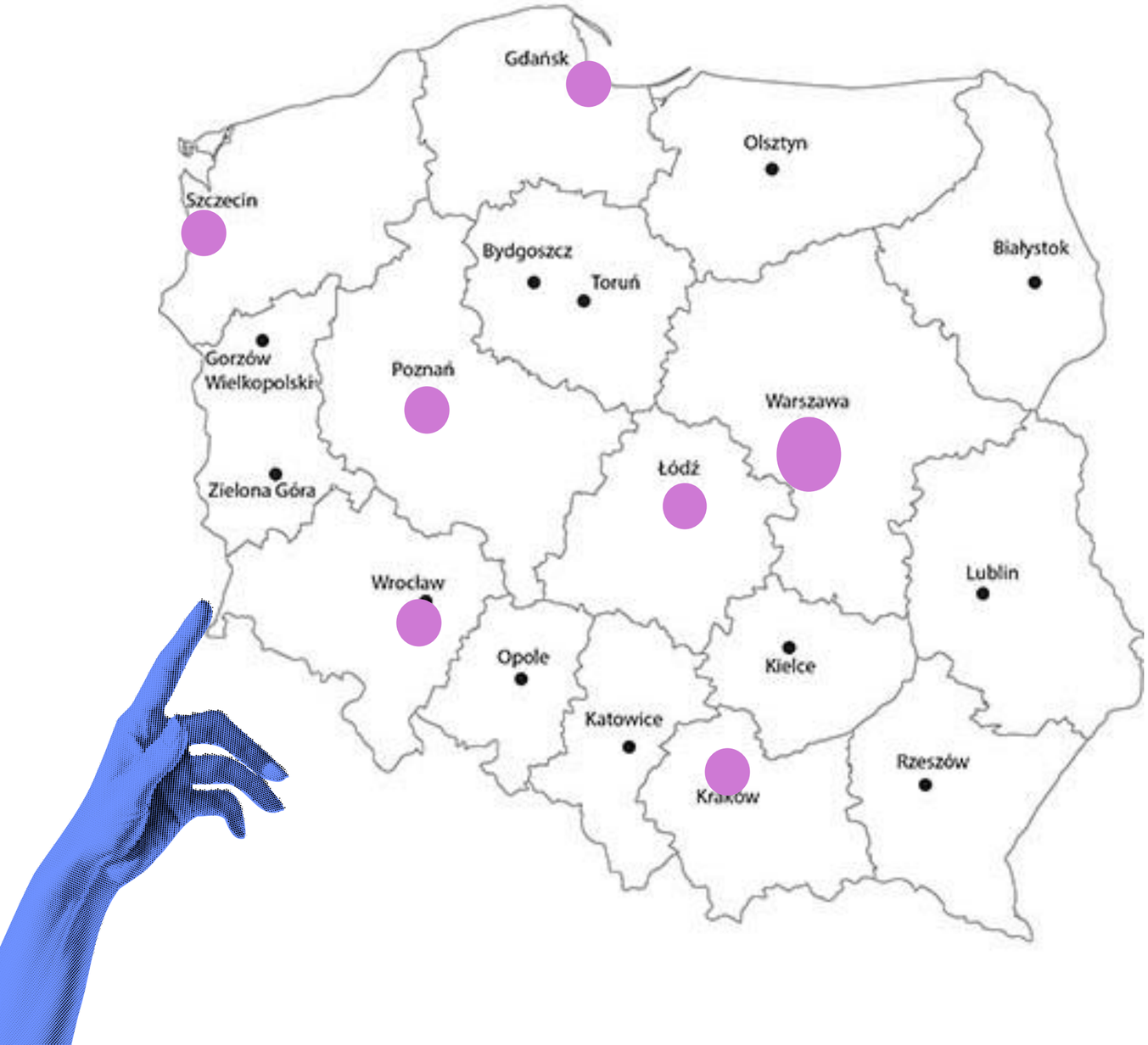
- technical expertise of the building (load-bearing capacity, technical conditions of the building structure, foundations, load-bearing capacity of the soil)
- selection of the superstructure construction system
- building shadow analysis with additional volume
- determination of the optimal number of superstructure storeys after characterizing the load-bearing capacity of the building, shadow analysis and provisions of the local spatial development plan



# VERTICAL EXTENSION

## RESEARCH SCOPE


Gdańsk
Olsztyn
Szczecin
Bydgoszcz
Toruń
Białystok
Gorzów Wielkopolski
Poznań
Warszawa
Łódź
Zielona Góra
Lublin
Wrocław
Opole
Kielce
Katowice
Rzeszów
Kraków




# Polish biggest cities

- **Warsaw (capital):** 1 861 975 inhabitants
- **Kraków:** 803 283 inhabitants
- **Wroclaw:** 675 079 inhabitants
- **Łódź:** 658 444 inhabitants
- **Poznań:** 541 316 inhabitants
- **Gdańsk:** 486 345 inhabitants
- **Szczecin:** 486 345 inhabitants

# Polish facts

**60,000 buildings** constructed using large-panel technology from 70. - 90. Of 20th century

**4 milions flats** in buildings using large-panel technology from 70. - 90. Of 20th century

In 2016–2018, the Building Research Institute, commissioned by the Ministry of Development and Technology, conducted a study of large-panel buildings in Poland, the aim of which was to determine their technical condition and, consequently, to check whether they are still safe and durable. It was assessed that **they meet the requirements for structural strength and durability also for vertical extensions**.

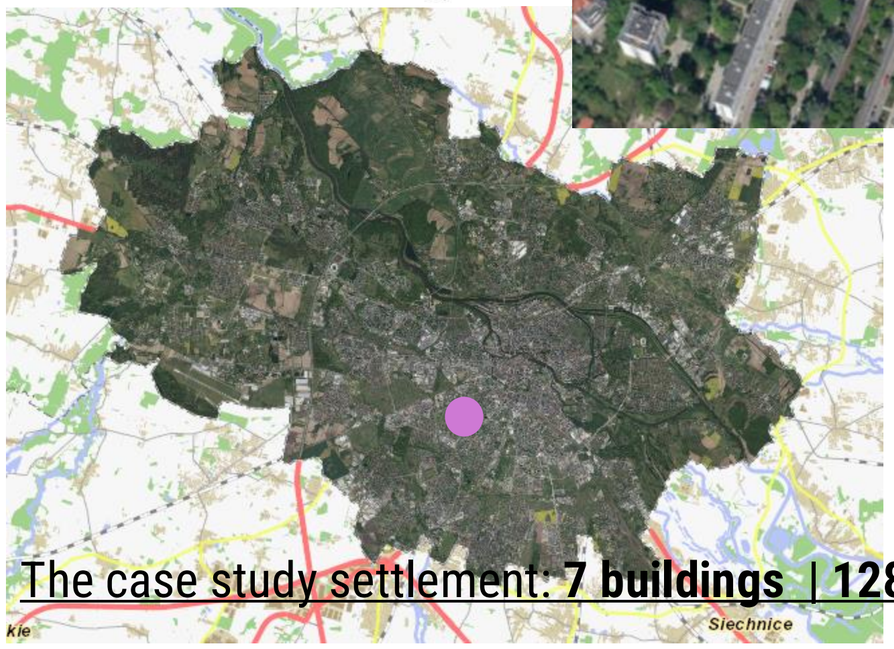
# CASE STUDY – VERTICAL EXTENSION

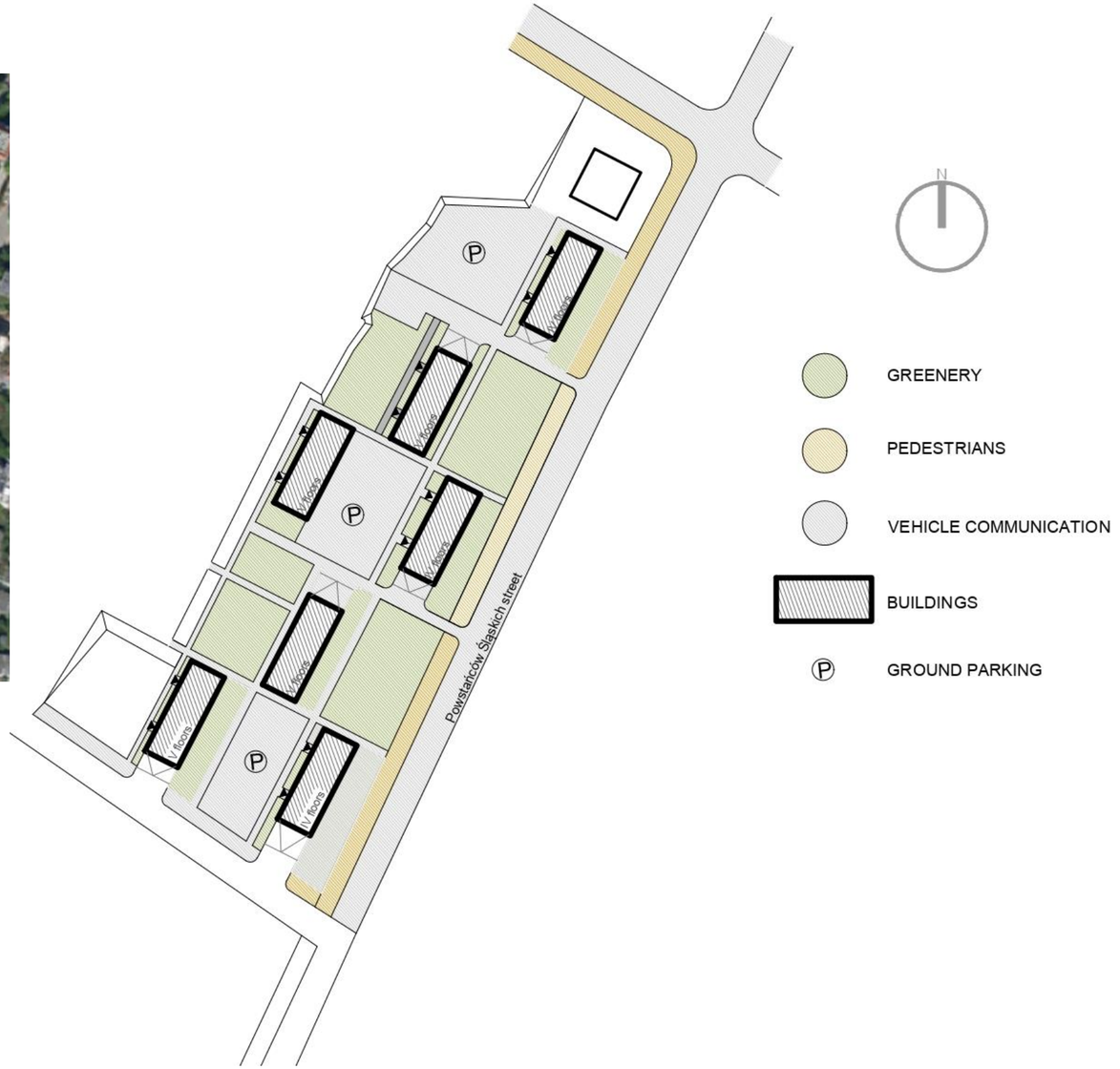
## WROCŁAW, POWSTAŃCW ŚLASKICH STREET, 165-167

Wrocław University of Science and Technology

## CASE STUDY:

Poland, Wrocław city, Powstańców Śląskich st. 165 - 167 , residential buildings


The case study settlement: **7 buildings** | **128 flats** | **7128,8 m2** of residential surface

Wrocław University of Science and Technology

**CASE STUDY:**
Poland, Wrocław city, Powstanców Śląskich st. 165 - 167 , residential buildings

## 1st stage

- ✓ Building qualifies as low or medium-rise hight
- ✓ Height (above ground) of the building with an extension will not exceed nine - storey or 25 m (fire protection regulations)
- ✓ Building is not a historical monument
- ✓ Optimal buildings for extension are those built in the 1960s - 1990s using industrialized large-panel technology (due to previous research)
- ✓ Building location (technical infrastructure, access to public transport, services)
- ✓ Roof volume (flat roofs)

## 2nd stage

- ✓ Presence of a lift in the building, if not - is it possible to add a passenger lift

No local spatial development plan in force

**CASE STUDY:**

Poland, Wrocław city, Powstanców Śląskich st. 165 - 167 , residential buildings

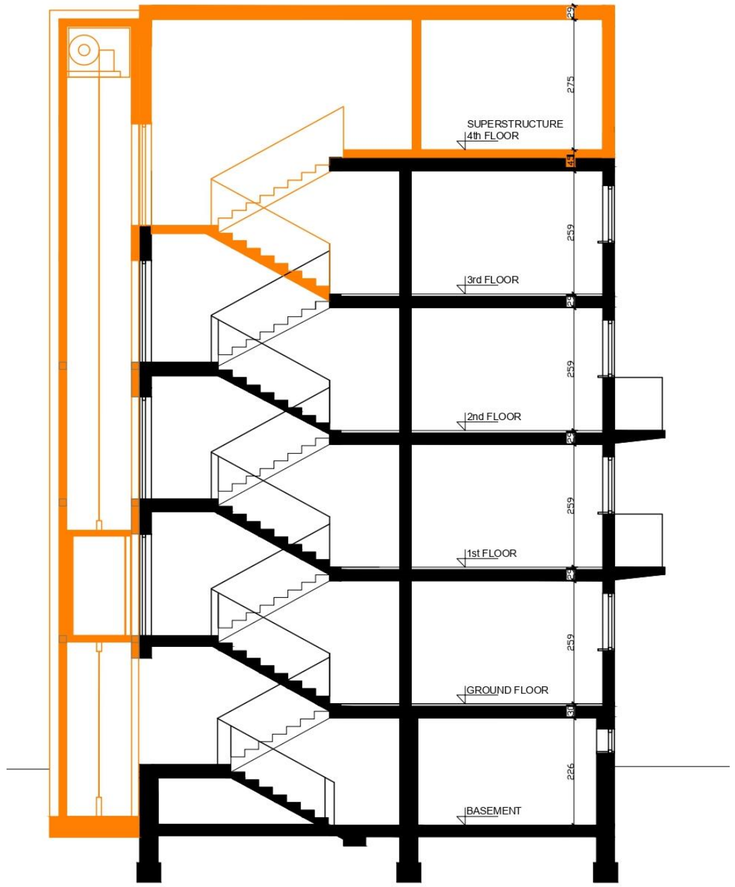
Photographic inventory of the case study

Wrocław University of Science and Technology

## CASE STUDY:

Poland, Wrocław city, Powstanców Śląskich st. 165 - 167 , residential buildings


**Ground floor plan + VE**



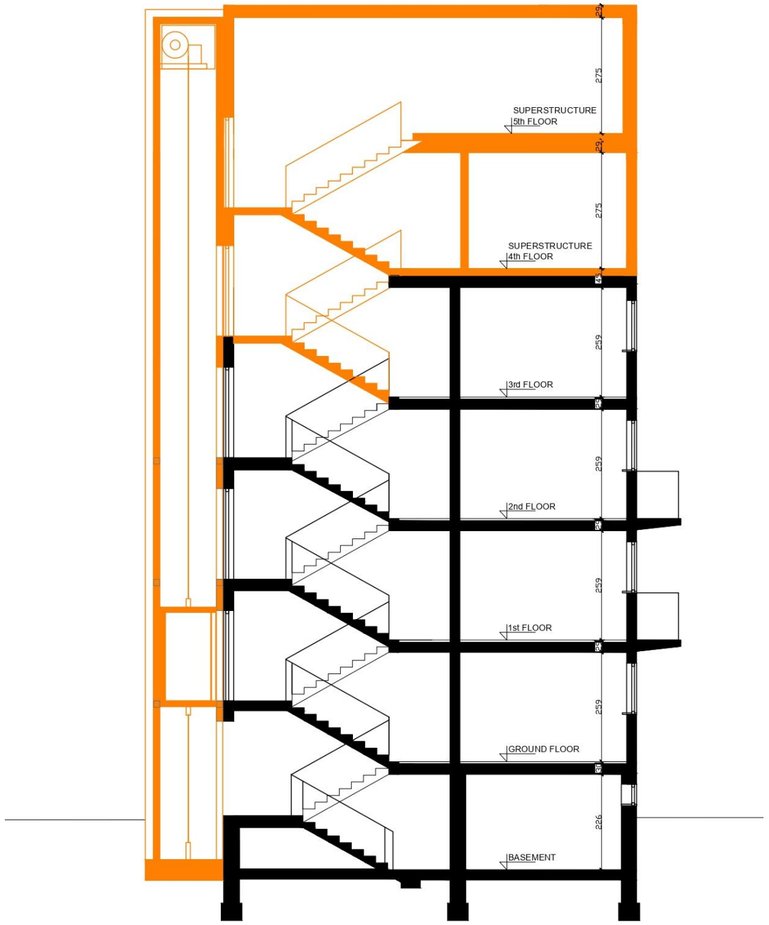

**Current ground floor plan**

**Section + extension**

Wrocław University of Science and Technology

Case study:
Poland, Wrocław city, Powstanców Śląskich st. 165 - 167 , residential buildings

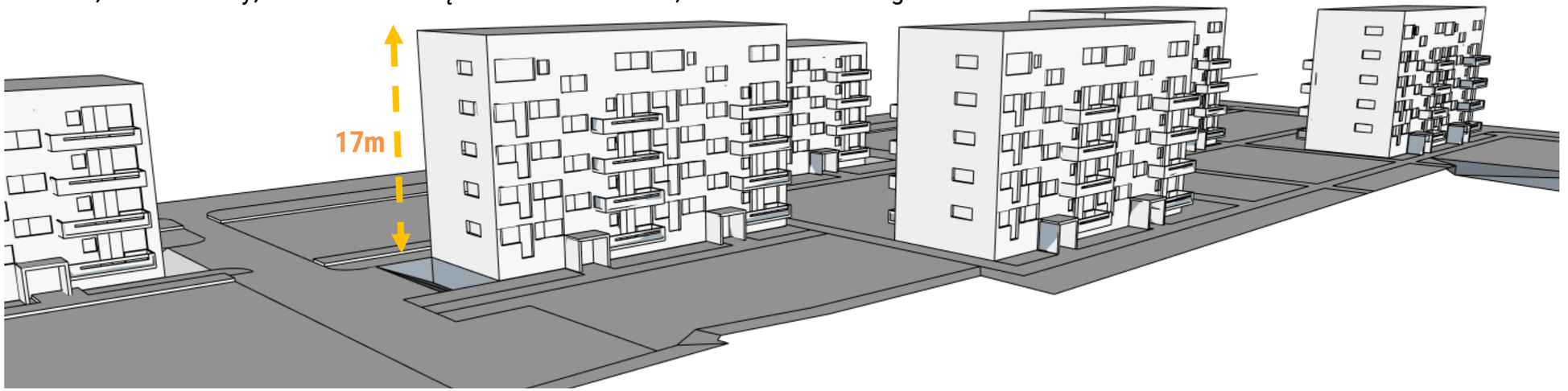

**Vertical extension floor plan**



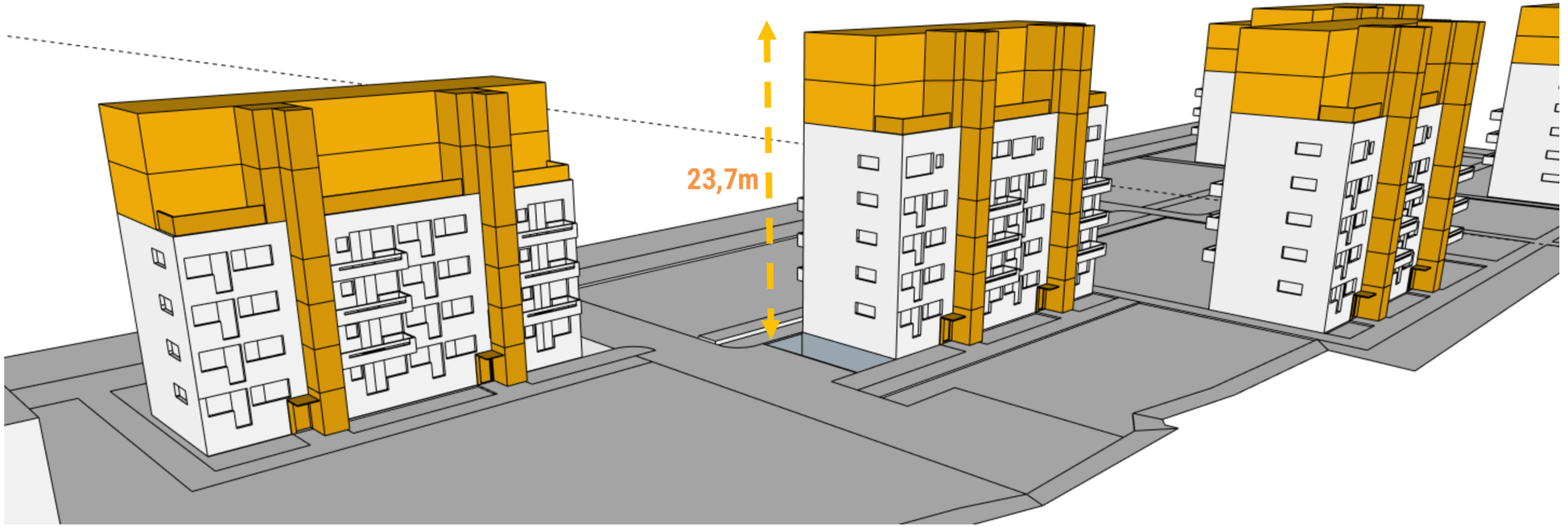

**Section + extension**

Wrocław University of Science and Technology

Case study:
Poland, Wrocław city, Powstanców Śląskich st. 165 - 167 , residential buildings




## BEFORE



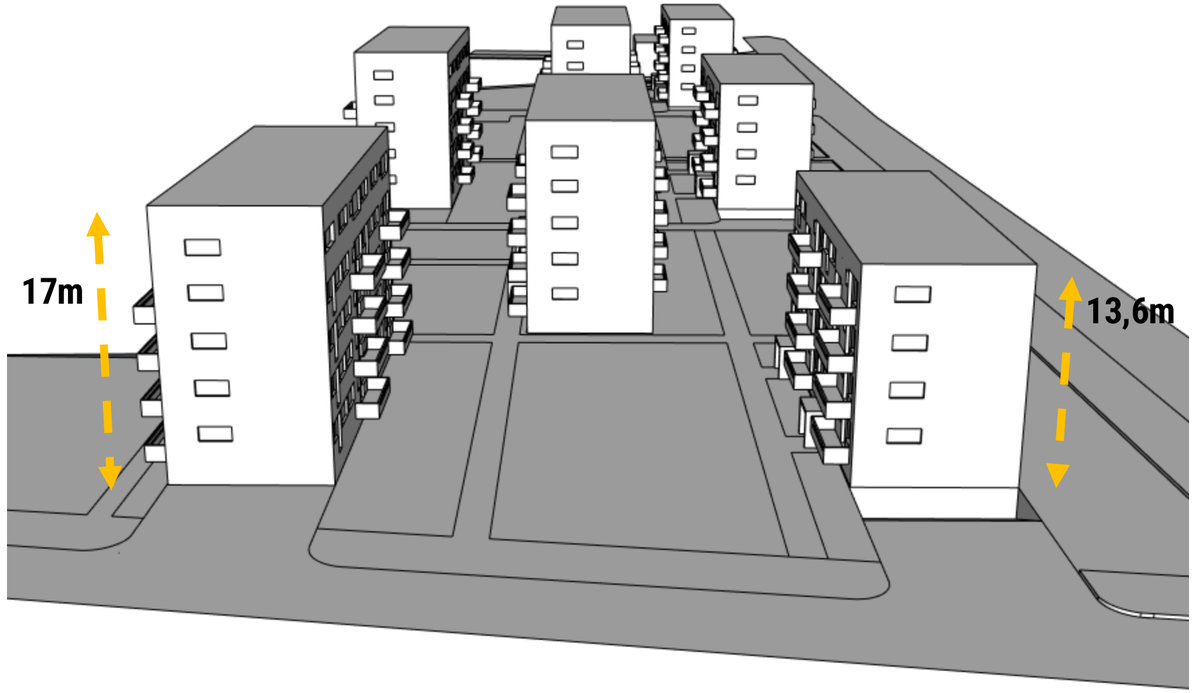

## AFTER VE

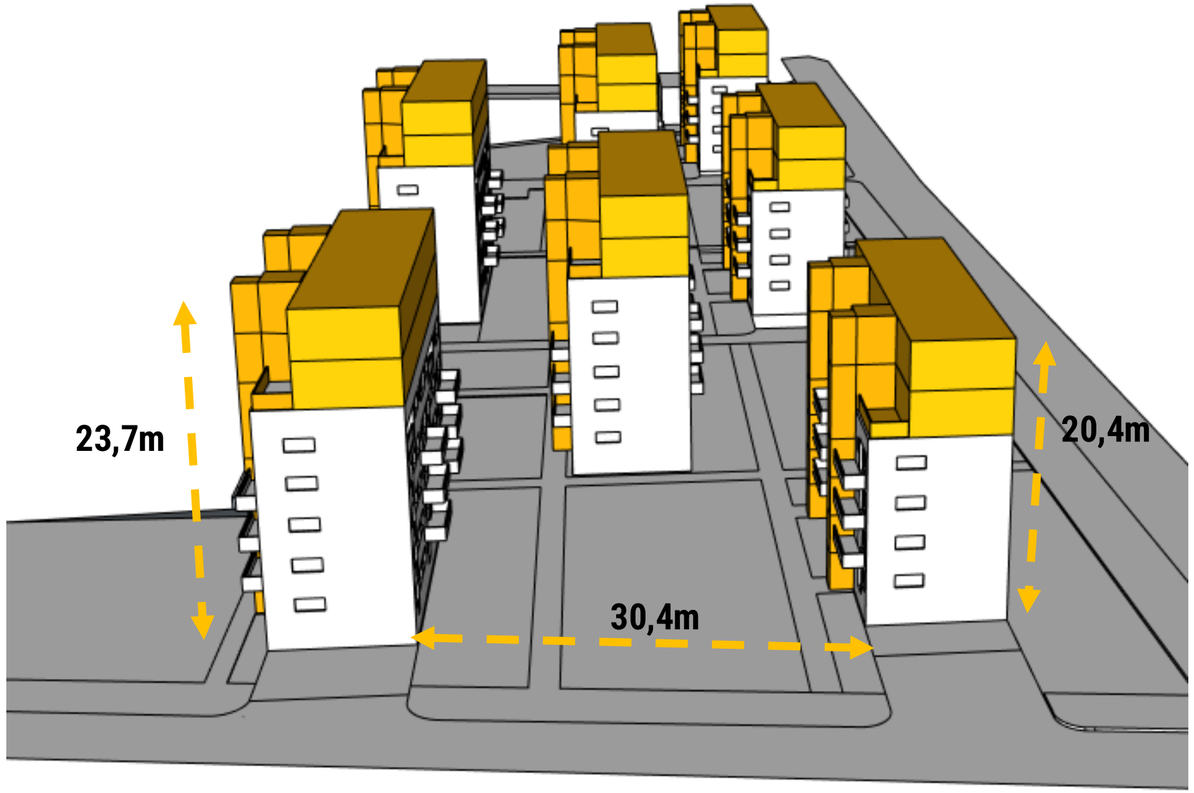
**Applied tools:**

- digital volume,
- Shadow Analysis for SketchUp

Wrocław University of Science and Technology

Case study:
Poland, Wrocław city, Powstańców Śląskich st. 165 - 167 , residential buildings



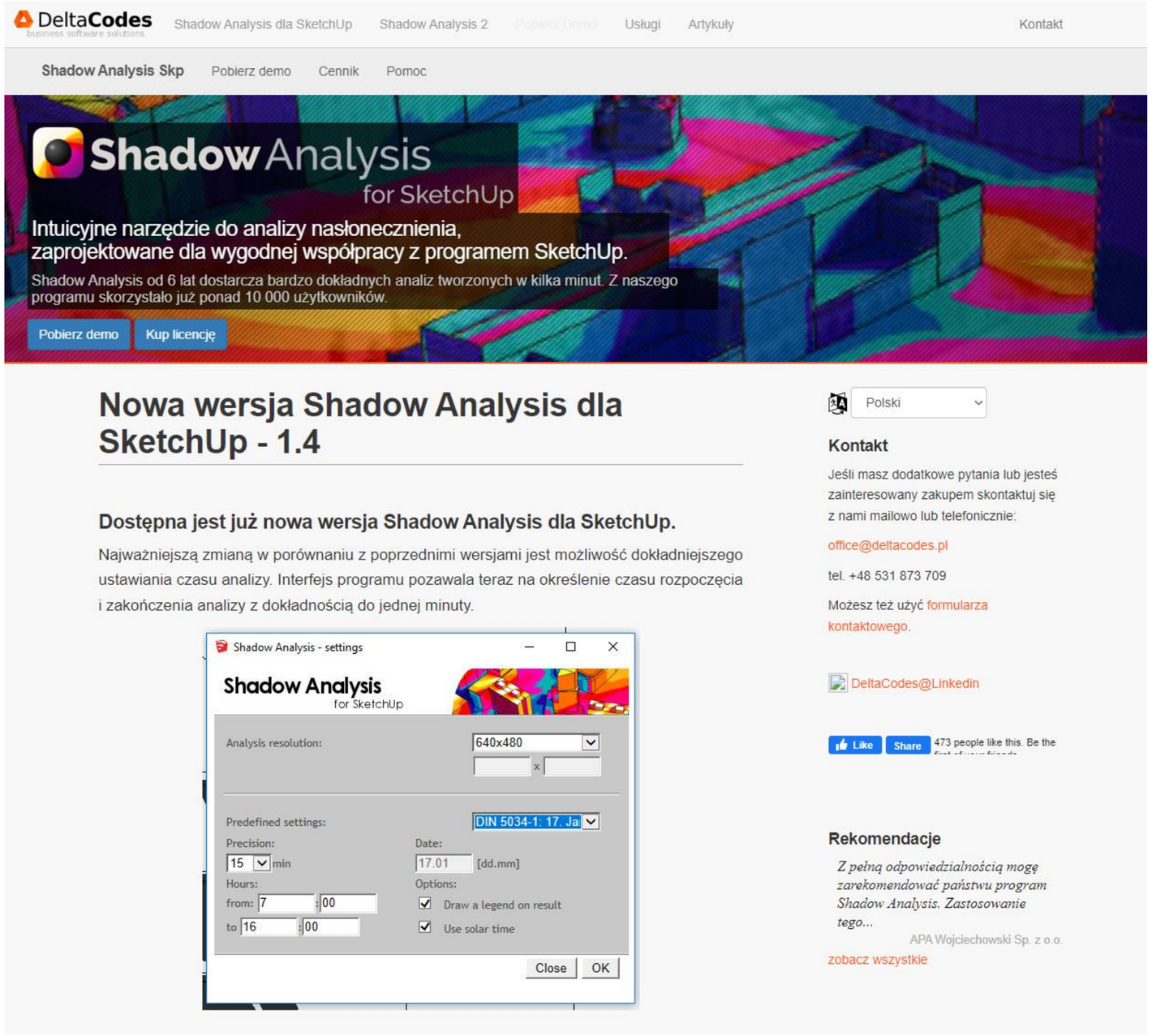



Wrocław University of Science and Technology

## Shadow Analysis for SketchUp

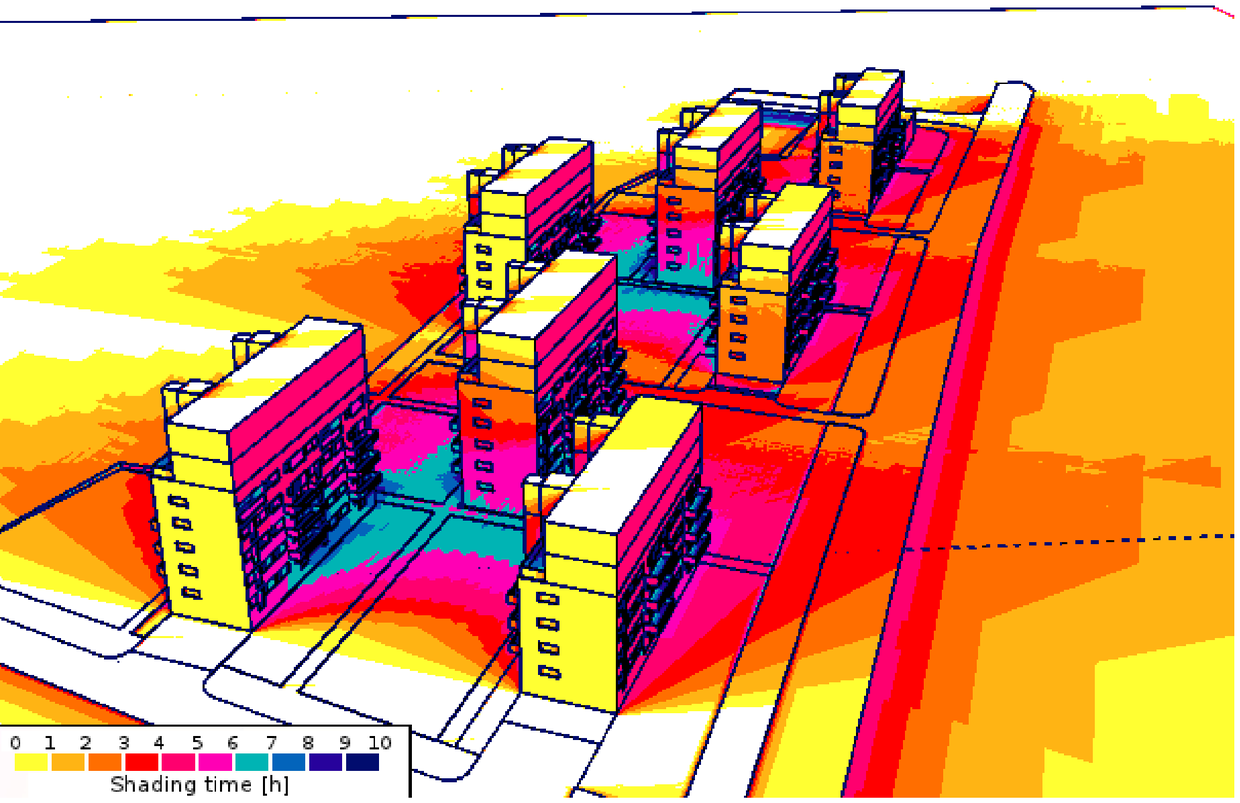
is a plugin used to simulate and analyze shadow behavior in architectural and urban planning projects.

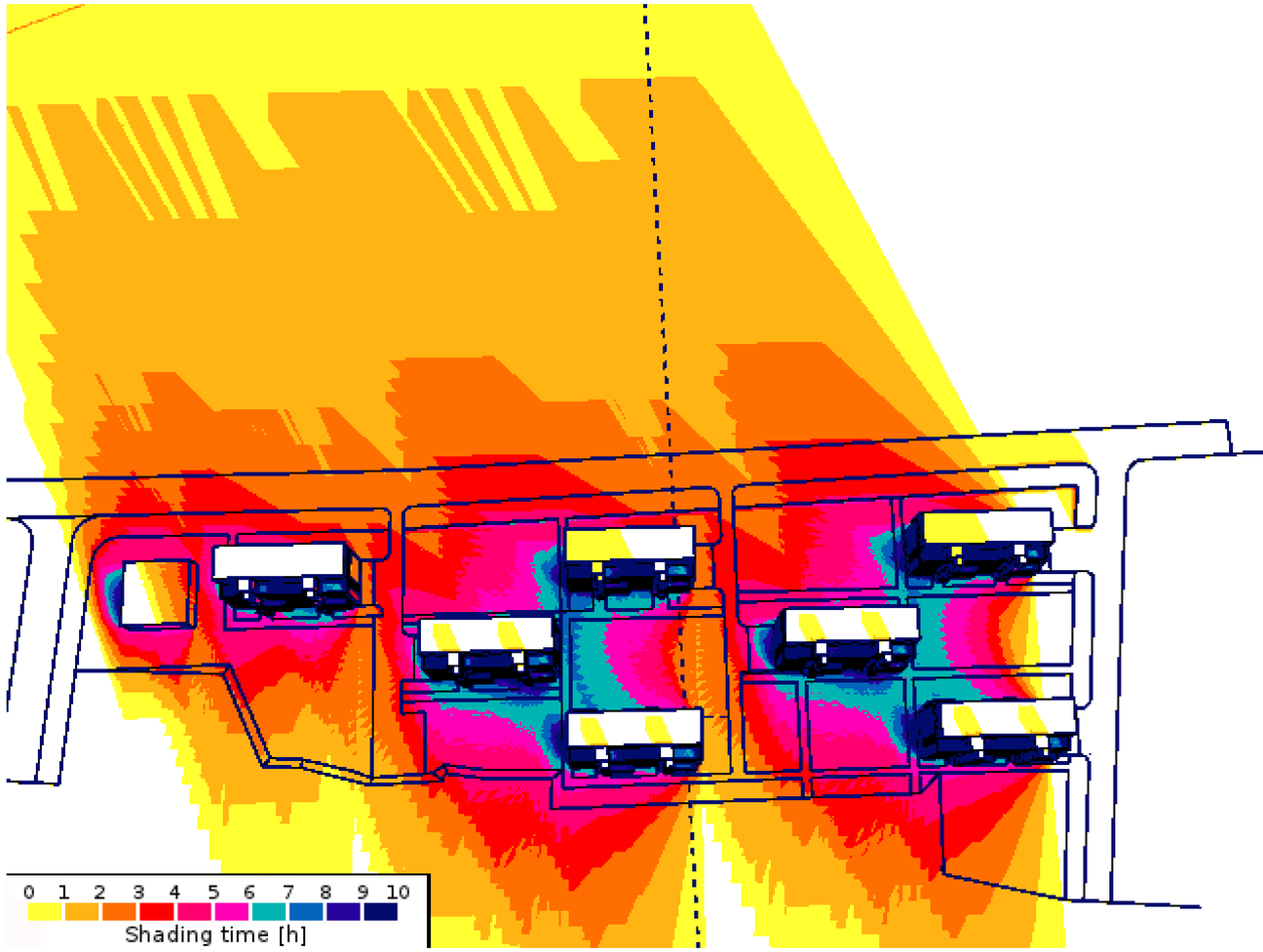
It allows users to assess the impact of sunlight and shading on buildings, optimizing designs for energy efficiency, daylight access, and environmental performance.



Wrocław University of Science and Technology

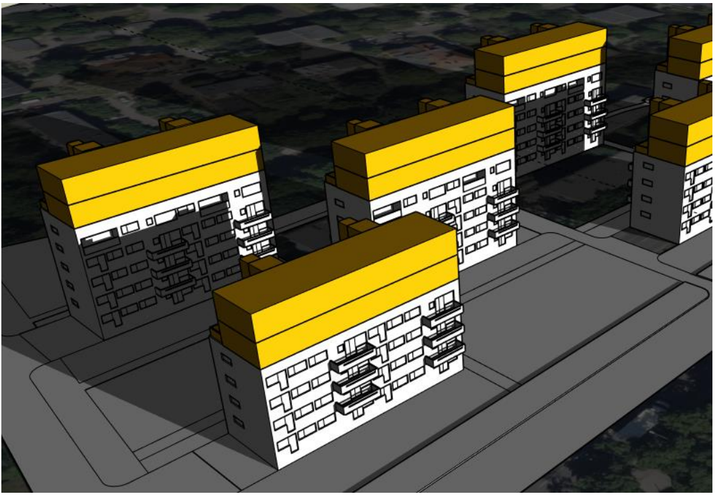
Case study:
Poland, Wrocław city, Powstańców Śląskich st. 165 - 167 , residential buildings



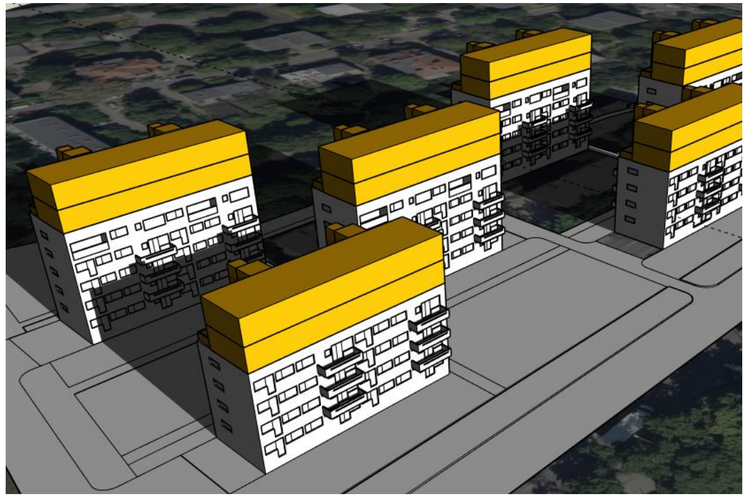



Wrocław University of Science and Technology

Case study:
Poland, Wrocław city, Powstanców Śląskich st. 165 - 167 , residential buildings



**21.03 and 21.09, 07.00 AM**



**21.03 and 21.09, 08.00 AM**

**21.03 and 21.09, 09.00 AM**

**21.03 and 21.09, 11.00 AM**

## Polish regulations for shading in residential buildings:

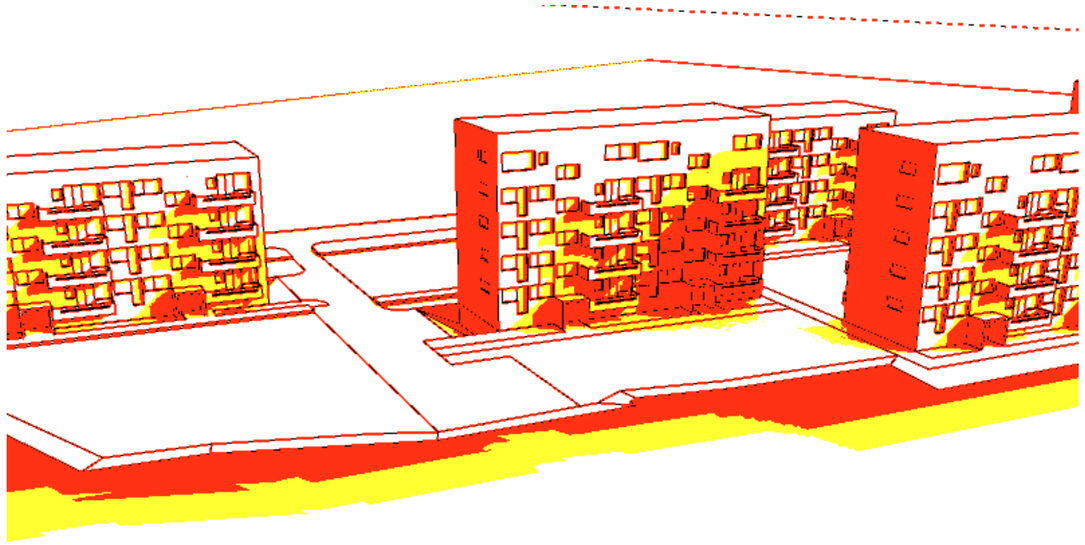
each apartment should be provided with sunshine between 7am and 5pm for at least three hours, but only during the equinoxes, i.e. March 21 and September 21

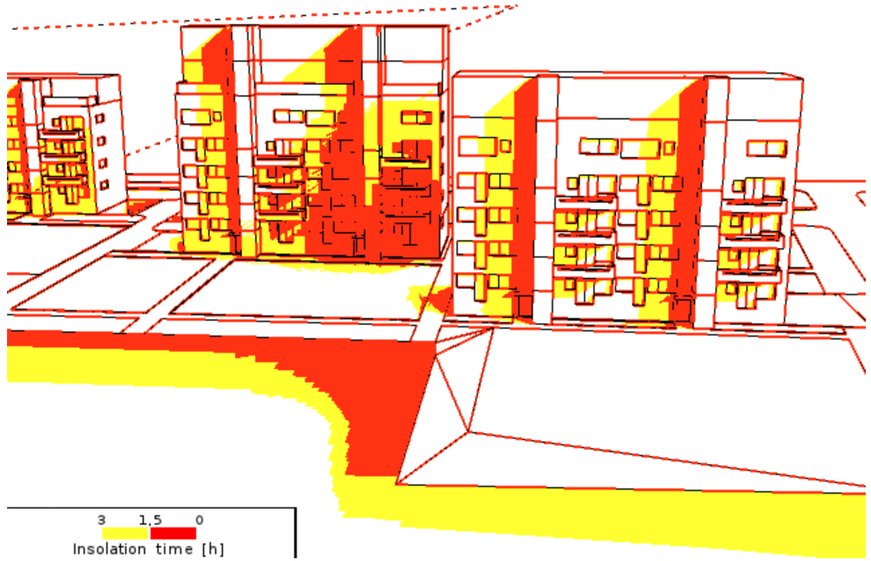
## VE volume optimalisation due to Polish regulations

**21.03 and 21.09, 12.00 AM – 01.00 PM**

Wrocław University of Science and Technology

Case study:
Poland, Wrocław city, Powstanców Śląskich st. 165 - 167 , residential buildings



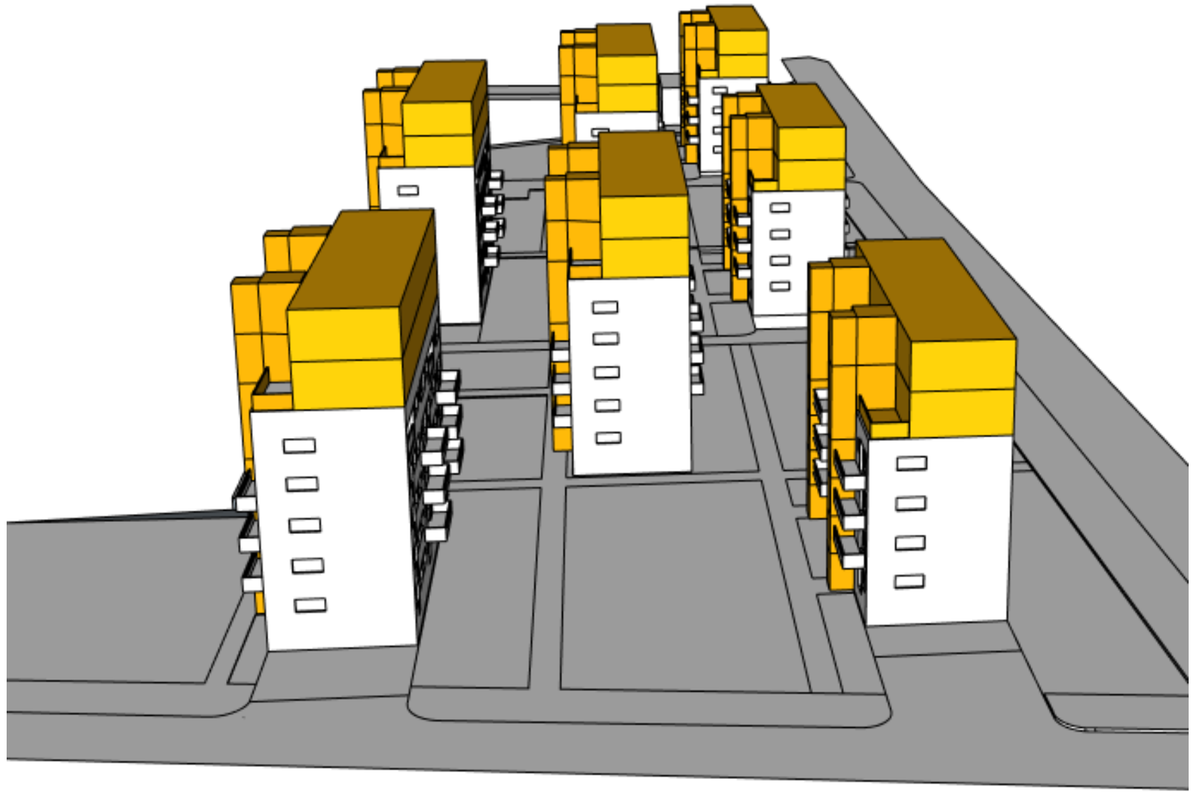



**After shading analysis, it was noted which apartments have the most difficult access to daylight.**
**Before nad after VE**

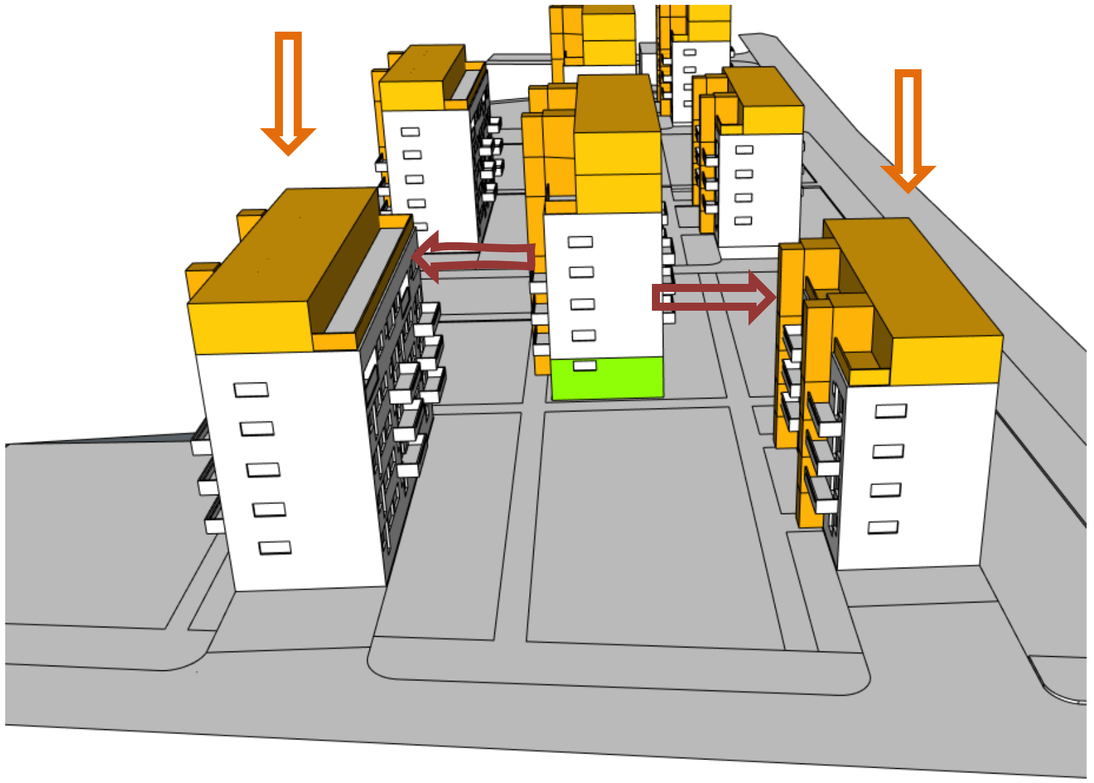
Sunshine between 7am and 5pm for at least three hours, but only during the equinoxes, i.e. March 21 and September 21
**VE volume optimalisation**

Wrocław University of Science and Technology

Case study:
Poland, Wrocław city, Powstanców Śląskich st. 165 - 167 , residential buildings



**VE before shadow analysis and volume optimization – version maximum**



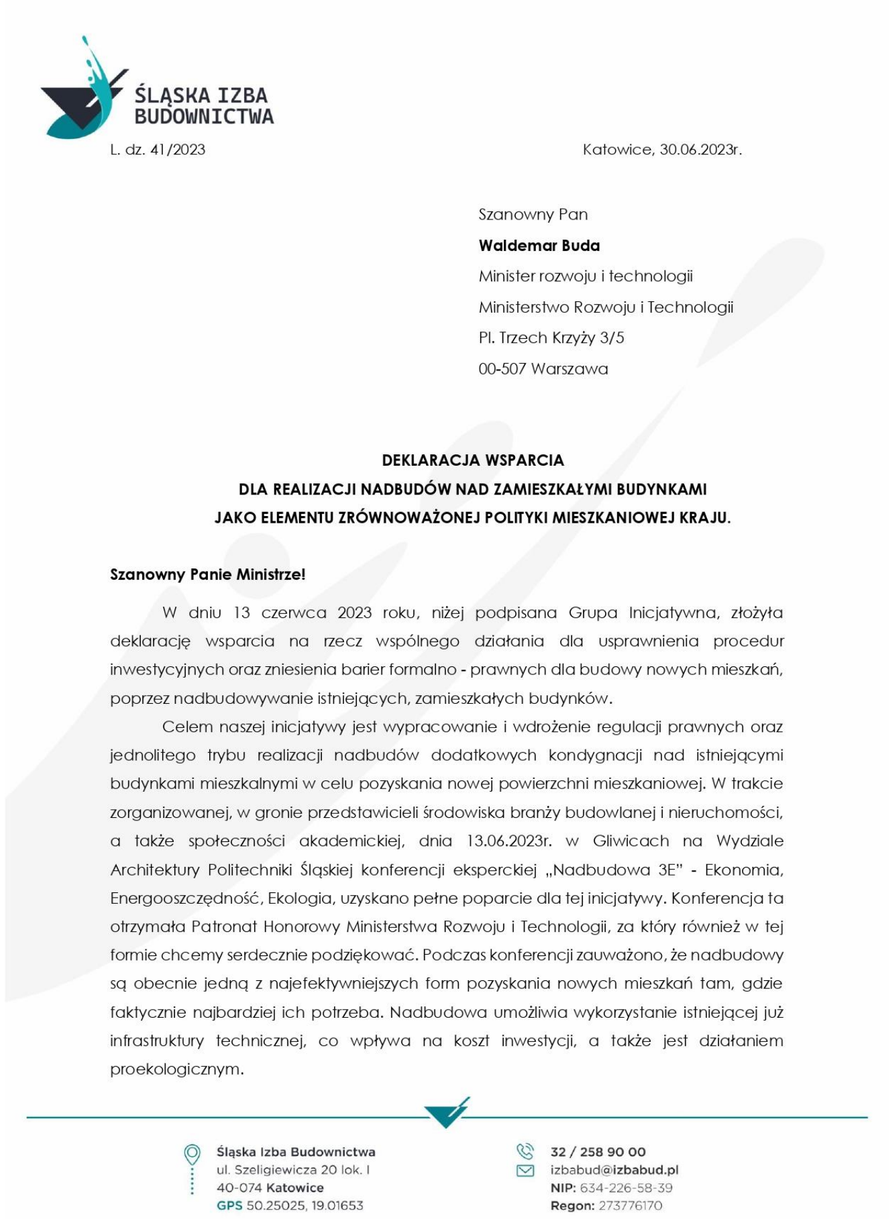
**VE after shadow analysis and volume optimization**

The case study settlement after optimal VE :
7 buildings | 128 **+ 40** flats (30% growth) | 7128,8 m2 **+ 1712,3 m2** of residential surface (24% growth) ☑

# RESEARCH CONTINUATION

## NEXT STEPS

...



ŚLĄSKA IZBA BUDOWNICTWA

L. dz. 41/2023

Katowice, 30.06.2023r.

Szanowny Pan
**Waldemar Buda**
Minister rozwoju i technologii
Ministerstwo Rozwoju i Technologii
Pl. Trzech Krzyży 3/5
00-507 Warszawa

**DEKLARACJA WSPARCIA**
**DLA REALIZACJI NADBUDÓW NAD ZAMIESZKAŁYMI BUDYNKAMI**
**JAKO ELEMENTU ZRÓWNOWAŻONEJ POLITYKI MIESZKANIOWEJ KRAJU.**

**Szanowny Panie Ministrze!**

W dniu 13 czerwca 2023 roku, niżej podpisana Grupa Inicjatywna, złożyła deklarację wsparcia na rzecz wspólnego działania dla usprawnienia procedur inwestycyjnych oraz zniesienia barier formalno - prawnych dla budowy nowych mieszkań, poprzez nadbudowywanie istniejących, zamieszkałych budynków.

Celem naszej inicjatywy jest wypracowanie i wdrożenie regulacji prawnych oraz jednolitego trybu realizacji nadbudów dodatkowych kondygnacji nad istniejącymi budynkami mieszkalnymi w celu pozyskania nowej powierzchni mieszkaniowej. W trakcie zorganizowanej, w gronie przedstawicieli środowiska branży budowlanej i nieruchomości, a także społeczności akademickiej, dnia 13.06.2023r. w Gliwicach na Wydziale Architektury Politechniki Śląskiej konferencji eksperckiej „Nadbudowa 3E" - Ekonomia, Energooszczędność, Ekologia, uzyskano pełne poparcie dla tej inicjatywy. Konferencja ta otrzymała Patronat Honorowy Ministerstwa Rozwoju i Technologii, za który również w tej formie chcemy serdecznie podziękować. Podczas konferencji zauważono, że nadbudowy są obecnie jedną z najefektywniejszych form pozyskania nowych mieszkań tam, gdzie faktycznie najbardziej ich potrzeba. Nadbudowa umożliwia wykorzystanie istniejącej już infrastruktury technicznej, co wpływa na koszt inwestycji, a także jest działaniem proekologicznym.

Śląska Izba Budownictwa
ul. Szeligiewicza 20 lok. I
40-074 Katowice
GPS 50.25025, 19.01653

32 / 258 90 00
izbabud@izbabud.pl
NIP: 634-226-58-39
Regon: 273776170

In 2023 ten different entites have signed a declaration for the Minister of Development and Technology of support for the implementation of VE over inhabited buildings as an element of sustainable housing policy

Framework recommendations from the initaitive group for the processing of a special act on the vertical extensions of residential buildings

Wrocław University of Science and Technology

## Research Basis:

- Identification of **criteria for selecting buildings suitable for vertical extensions**.
- Analysis of the **actual demand for new residential units**.
- Examination of **urban structure** and **social composition** of the city.

## Expected Outcome:

- A **quantitative potential report** on vertical extensions of residential buildings for housing purposes.

## Stakeholder Consultations:

- Discussions with **city officials** and **urban planners** regarding the use of a **map of candidate buildings for vertical extension** within the **City's Spatial Information System (SIP)**.
- These buildings would be selected based on previously developed criteria.

## SIP Integration:

- SIP maps include data on **existing developments** and **zoning plans**.
- These maps would be **updated and supplemented** with information on suitable buildings for extension.

## Purpose and Benefit:

- Adding such data to city mapping resources could **facilitate urban planning decisions** and support **strategic city development**.

Wrocław University of Science and Technology

zuzanna.napieralska@pwr.edu.pl

# THANK YOU FOR YOUR ATTENTION