



# EUropean Cities serving as Green Urban Gate towards Leadership in Sustainable Energy

FP7 2012. Smart Cities call.

Demonstration of nearly Zero Energy Building Renovation for  
cities and districts



## Scientific and technological goals of the Smart Cities call:

- To demonstrate innovative technical, economical and financial solutions to increase overall energy efficiency of cities and districts.
- Renovation of districts of existing buildings (special focus on residential buildings), supporting Smart Cities.
- A systemic approach is expected. Efficient urban planning should be considered.
- Energy efficiency and sustainability through integrated design and planning. Cost effective solutions. Return of investments under current market standards.
- Innovation relies on technologies to be demonstrated and innovative integration in the whole district.

## Expected impact of the Smart Cities call:

- Cost effective and highly energy efficient practices, devices and techniques implemented.
- Acceleration of the market uptake of most innovative tools for efficient city management.
- Creation of best practice examples for the construction sector, based on innovation and competitiveness.
- Contribution to raise the performance standards and regulations on EU, national or regional level in the urban design and construction sector.
- Expected high potential of replication, double EU average.
- Ambitious dissemination and market deployment programme and detailed metering/monitoring programme

# EU-GUGLE

is currently the biggest and more ambitious project of urban renovation and energy building refurbishment in Europe

Total budget of the project: 30.140.289 €

Total gross area to retrofit: 226,000 m<sup>2</sup>

2 other granted projects in the same call:

- ZenN: 4 pilots. 107.313 m<sup>2</sup> to be refurbished
- R2CITIES: 3 pilots. 167.000 to be refurbished

## EU-GUGLE project:

- **EU-GUGLE** project mobilizes public / private resources to build 6 pilots with **226,000 m<sup>2</sup>** of cost-efficient Nearly Zero Energy Building Renovation models in Austria, Finland, Germany, Italy, Slovakia and Spain (and 2 associated cities: Gothenburg (Sweden) and Gaziantep (Turkey) with a large and immediate potential for replication at European scale.
- The 6 EU - GUGLE district pilots are independent from each other, being designed to fulfill local end-users needs and utilizing local resources, but with a **common and holistic approach** motivated by a shared commitment to sustainability and a common vision, the **EU-GUGLE concept**.

## EU-GUGLE project: OBJECTIVE:

- To achieve 40 - 80 % primary energy savings per district, and to increase 25 % the share of renewable supplied in the buildings,
  - Sharing latest research results especially of retrofitting technologies and intelligent RES integration into buildings.
  - Taking the building-users and its public space as the connective environment to the project, with special attention to vulnerable groups and behavioral challenges.
  - Establishing adequate business environment favorable for Smart City demonstrations

# EU-GUGLE - Cities



Suomi  
Finland

Tampere



Sverige

Göteborg



Aachen



Wien



Bratislava

Sestao



Mailand



Gaziantep



## EU-GUGLE PARTNERS:

RENEWABLE ENERGY NATIONAL CENTRE - CENER	SPAIN
MAGISTRAT DER STADT WIEN	AUSTRIA
UNIVERSITAET FUER BODENKULTUR WIEN BOKU	AUSTRIA
STADT AACHEN	GERMANY
STADTWERKE AACHEN AKTIENGESELLSCHAFT	GERMANY
GEWOGES AG GEWOGES	GERMANY
TAMPEREEN KAUPUNKI	FINLAND
TEKNOLOGIAN TUTKIMUSKESKUS VTT	FINLAND
HLAVNE MESTO SLOVENSKEJ REPUBLIKY BRATISLAVA	SLOVAKIA
TECHNICKY A SKUSOBNY USTAV STAVEBNY	SLOVAKIA
SLOVENSKA RADA PRE ZELENE BUDOVSY SKGBC	SLOVAKIA
COMUNE DI MILANO	ITALY
AZIENDA LOMBARDA EDILIZIA RESIDENZIALE MILANO ALER	ITALY
POLITECNICO DI MILANO	ITALY
SESTAO BERRI 2010	SPAIN
GOTEBORGS KOMMUN	SWEDEN
GAZIANTEP BUYUKSEHIR BELEDIYESI	TURKEY
Greenovate! Europe	BELGIUM
IC CONSULENTEN	AUSTRIA
ENTE VASCO DE LA ENERGIA	SPAIN



## EU-GUGLE smart cities districts:

- Vienna (AT). Penzing district
    - 66.608 m<sup>2</sup> to be refurbished. 55% - 65% savings expected
  - Aachen (DE) North district
    - 41.688 m<sup>2</sup> to be refurbished. 77% - 85% savings expected
  - Tampere (FI) Tammela district
    - 30.000 m<sup>2</sup> to be refurbished. 46% savings expected
  - Bratislava (SK) Petrazalka district
    - 13.648 m<sup>2</sup> to be refurbished. 35% - 45% savings expected
  - Milano (IT) Zone 4
    - 8.382 m<sup>2</sup> to be refurbished. 50% savings expected
  - Sestao (ES)
    - 4.509 m<sup>2</sup> to be refurbished. 40% savings expected
- Associated cities: Gothenburg (SE) and Gaziantep (TR)

## EU-GUGLE expected impact:

- Primary energy savings of 25,6 GWh/y for heating energy and 2,5 GWh/y for electrical energy and 5.600 t CO<sub>2</sub>/y.
- EU-GUGLE will point out the most cost-effective solutions for building and district refurbishment on different climatic, economic and socio-cultural conditions.
- Transforming the existing building stock towards Nearly Zero-Energy Buildings, by means of cost effective energy renovation and large scale uptake of renewable energy heating and cooling systems.
- Acceleration of the market uptake of the most innovative ITC tools for efficient energy management at building and urban level.
- Contribution to raise the performance standards and regulations in the urban design and construction sector, through the best practice examples.

## Technical cross-cutting issues between EU-GUGLE district pilots:

- Methodology for a systemic approach for energy efficient district retrofitting.
- Standardized Energy performance evaluation procedures for district energy performance
- Building information modeling tools
- Improved ICT Control Strategies from a district point of view.
- Context-sensitive identification of most widely accepted retrofitting techniques
- Providing the construction sector with specific abilities
- Common monitoring data structure and sharing of monitoring results between the different projects



# **PROJECT SMART DISTRICT BRATISLAVA**

**Refurbishment of prefabricated slab dwellings**



Slovakia



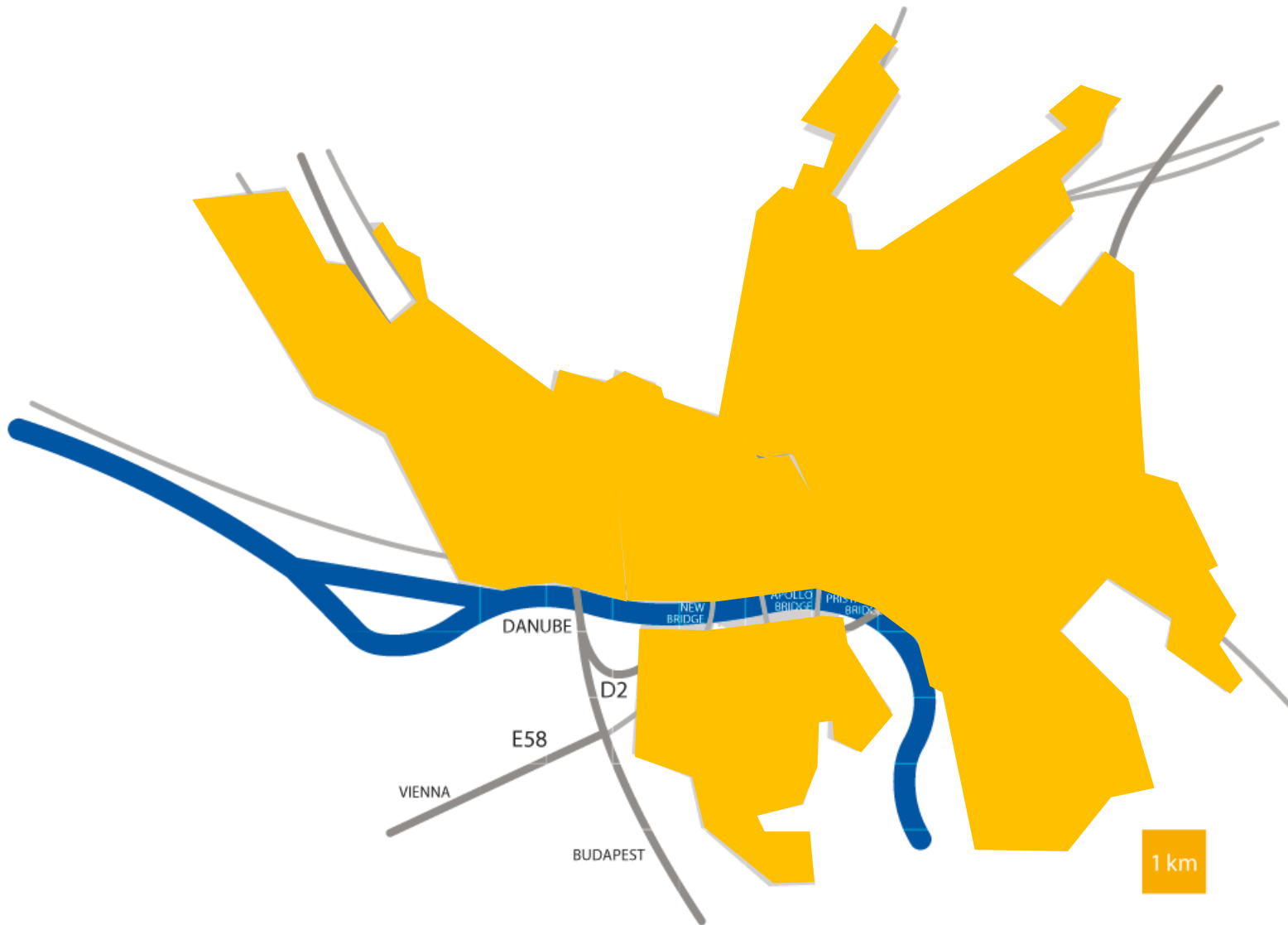


8 Regions

5 milion inhabitants



City: 367 km <sup>2</sup>	462 000 inhabitants
Region: 2054 km <sup>2</sup>	702 000 inhabitants







# THE TASK



# THE TASK

Refurbishment of

**42 000 m<sup>2</sup>**

gross floor space

# THE TASK

**42 000 m<sup>2</sup>**  
=  
8~10 Buildings

**Prefabricated slab dwellings- the most common form of housing in Bratislava**  
with number of **100 000 apartments** built during 20th century

**Significant renovation is necessary for sustainability and efficiency**





## Significant renovation consists of:

- Renovation of urban spaces ( greenery, public spaces, traffic, etc.)
- Reparation of technical defects
- Increase of energy efficiency
- Architectural re-design (facade, colour and material solutions)

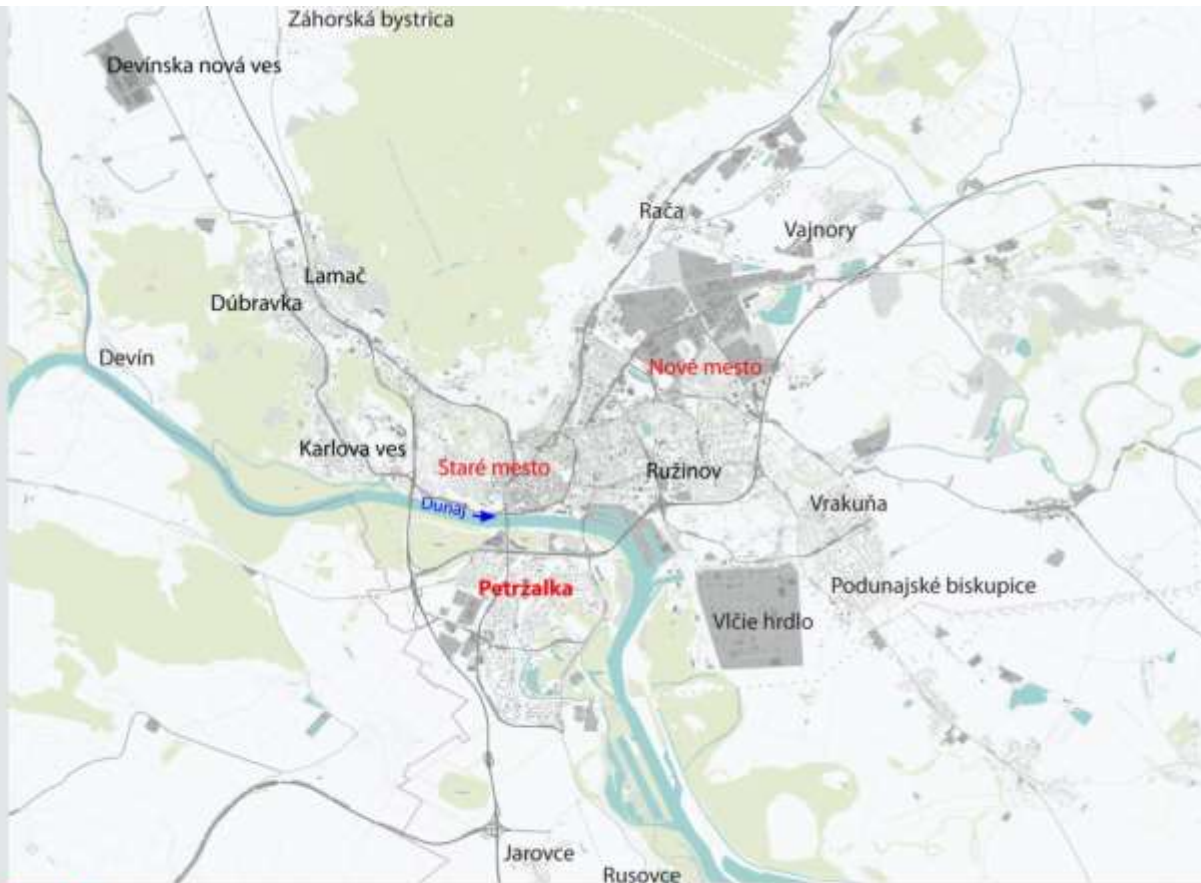




- Renovation of urban spaces ( greenery, public spaces, traffic, etc.)
- Reparation of technical defects
- Increase of energy efficiency
- Architectural re-design (facade, colour and material solutions)



Foto: [http://eo.wikipedia.org/wiki/Dosiero:Ato\\_chorvatske\\_rameno.jpg](http://eo.wikipedia.org/wiki/Dosiero:Ato_chorvatske_rameno.jpg)



Projected area in the city of Bratislava:

**42 000 m<sup>2</sup>  
gross floor space**

**1. Bratislava – Petržalka**

The largest residential structure on the territory of Slovakia, consisting of prefabricated slab dwellings build from 1960

**2. Bratislava – Nové mesto**

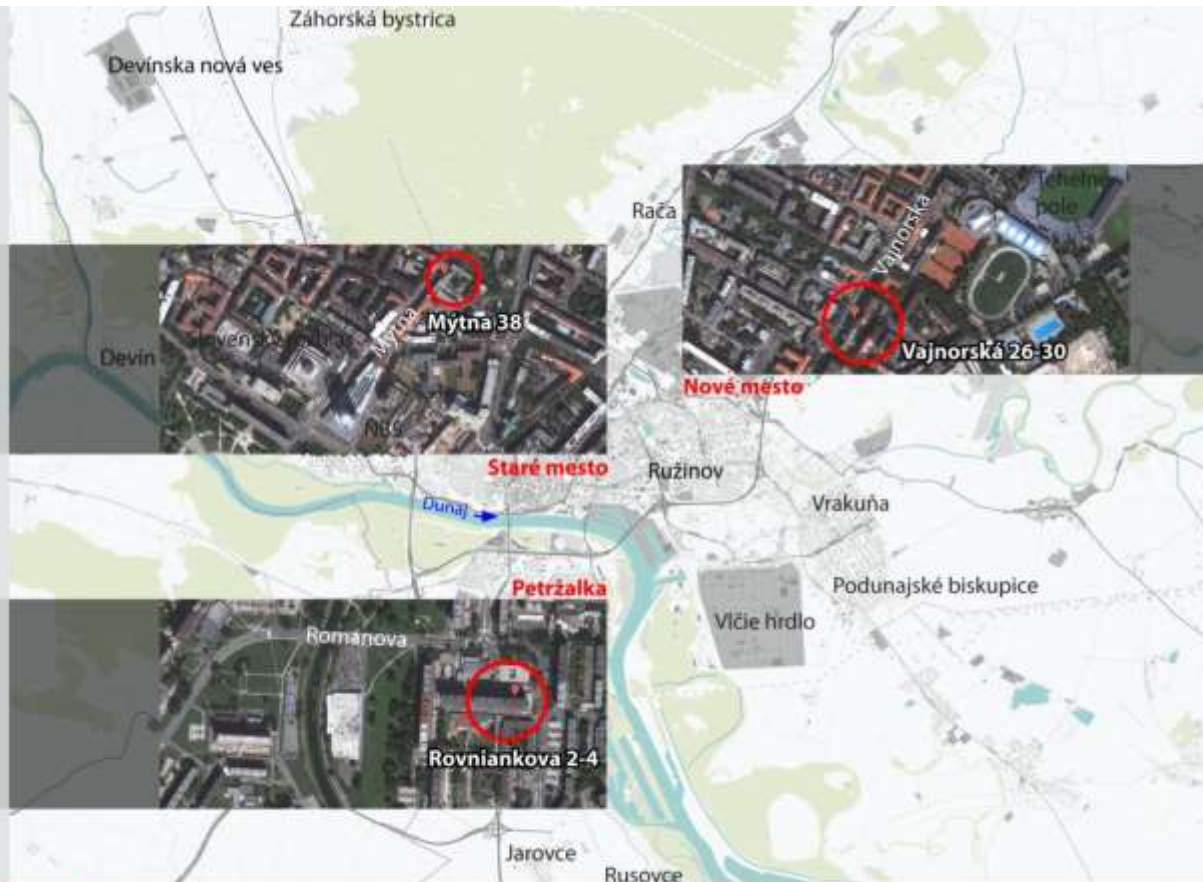
Example of housing construction from 20s and 30s

**3. Bratislava – Staré mesto**

Prefabricated slab dwellings from 50s and 60s



# Suitable locations



Projected area in the city of Bratislava:

**42 000 m<sup>2</sup>  
gross floor space**

**1. Bratislava – Petržalka**

The largest residential structure on the territory of Slovakia, consisting of prefabricated slab dwellings build from 1960

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Example of housing construction from 20s and 30s

**3. Bratislava – Staré mesto**

Prefabricated slab dwellings from 50s and 60s



Foto: Vladimír Slachťovský  
Panelová sústava BA-NKS, Petržalka



Foto: Vladimír Slachťovský  
Panelová sústava P 1.15(P 1.14), Petržalka



Foto: www.tzportal.sk  
Panelová sústava BA, Staré mesto/Nové mesto



Foto: www.vajnorska-6-30.6f.sk  
Tehlový bytový dom, Nové mesto

## BA-NKS (1973-1989)

Gross floor area of prefab slab house with 2 entrances and 12+1 floors: 7811 m<sup>2</sup>

## P1.14/P1.15 (1975-1994)

Gross floor area of prefab slab house with 2 entrances and 8+1 floors: 4048 m<sup>2</sup>

## T – Brick house (1929)

Gross floor area of the brick house with 3 entrances and 5+1 floors: 5250 m<sup>2</sup>

## BA (1955-1959)

Gross floor area of prefab slab house with 2 entrances and 6+1 floors: 3938 m<sup>2</sup>



## **BA-NKS (1973-1989)**

Gross floor area of prefab slab house with 2 entrances and 12+1 floors: 7811 m<sup>2</sup>

HD current: 99,62 kWh/(m<sup>2</sup>.a)

HD regulation: 53 kWh/(m<sup>2</sup>.a)

HD proposed: 29 kWh/(m<sup>2</sup>.a)

Estimated Energy Savings:

**43 %**







### **P1.14/P1.15 (1975-1994)**

Gross floor area of prefab slab house with 2 entrances and 8+1 floors: 4048 m<sup>2</sup>

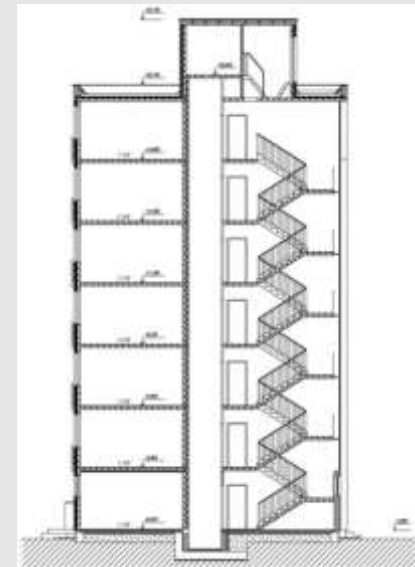
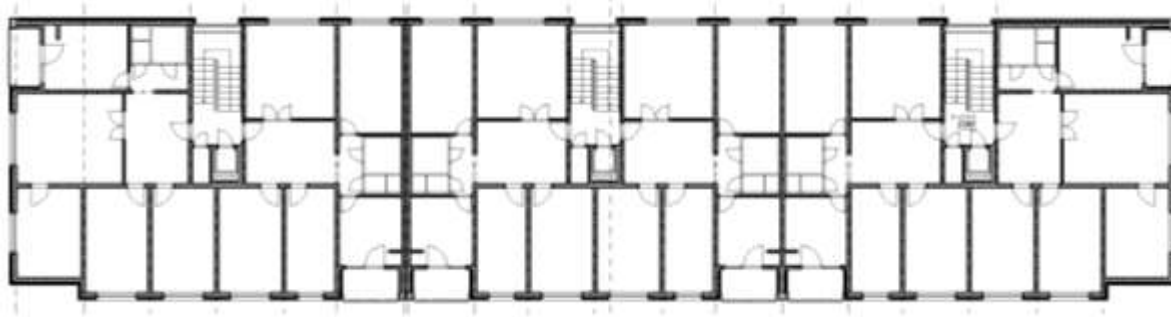
HD current: 121,72 kWh/(m<sup>2</sup>.a)

HD regulation: 53 kWh/(m<sup>2</sup>.a)

HD proposed: 31 kWh/(m<sup>2</sup>.a)

Estimated Energy Savings:

**36 %**





## **T – Brick house (1929)**

Gross floor area of the brick house with 3 entrances and 5+1 floors: 5250 m<sup>2</sup>

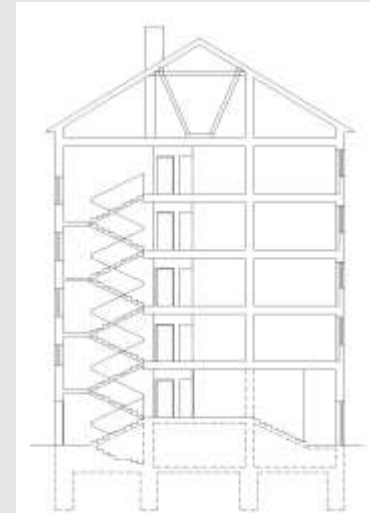
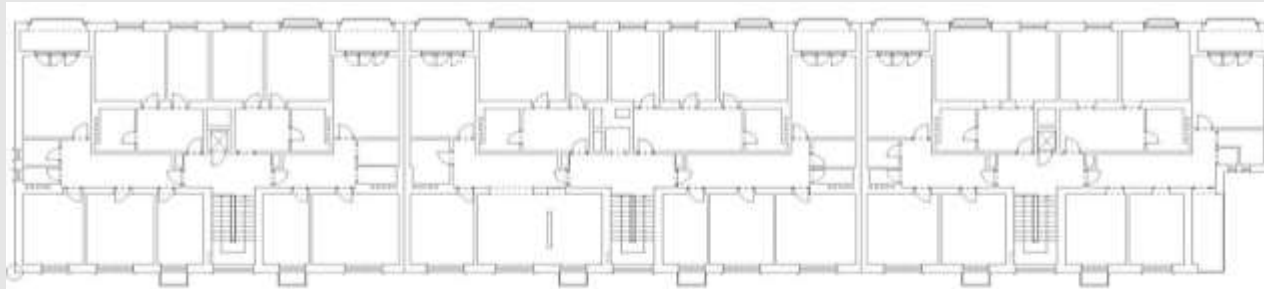
HD current: 95,43 kWh/(m<sup>2</sup>.a)

HD regulation: 53 kWh/(m<sup>2</sup>.a)

HD proposed: 31,97 kWh/(m<sup>2</sup>.a)

Estimated Energy Savings:

**36 %**







**BA  
(1955-1959)**

Gross floor area of prefab slab house with 2 entrances and 6+1 floors: 3938 m<sup>2</sup>

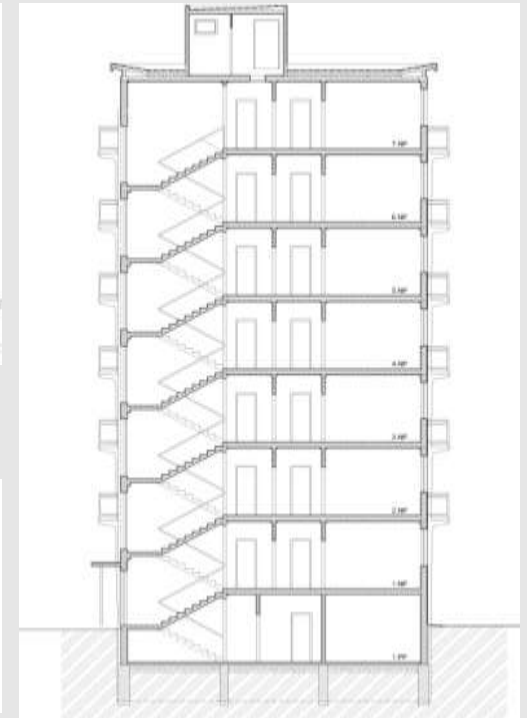
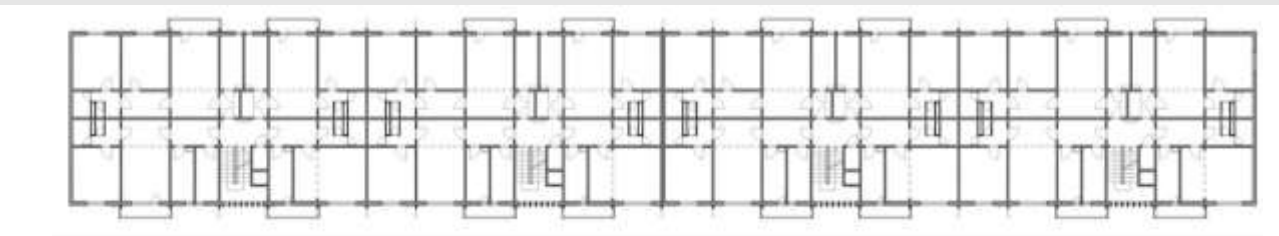
HD current: 110,05 kWh/(m<sup>2</sup>.a)

HD regulation: 53 kWh/(m<sup>2</sup>.a)

HD proposed: 32 kWh/(m<sup>2</sup>.a)

Estimated Energy Savings:

**35 %**



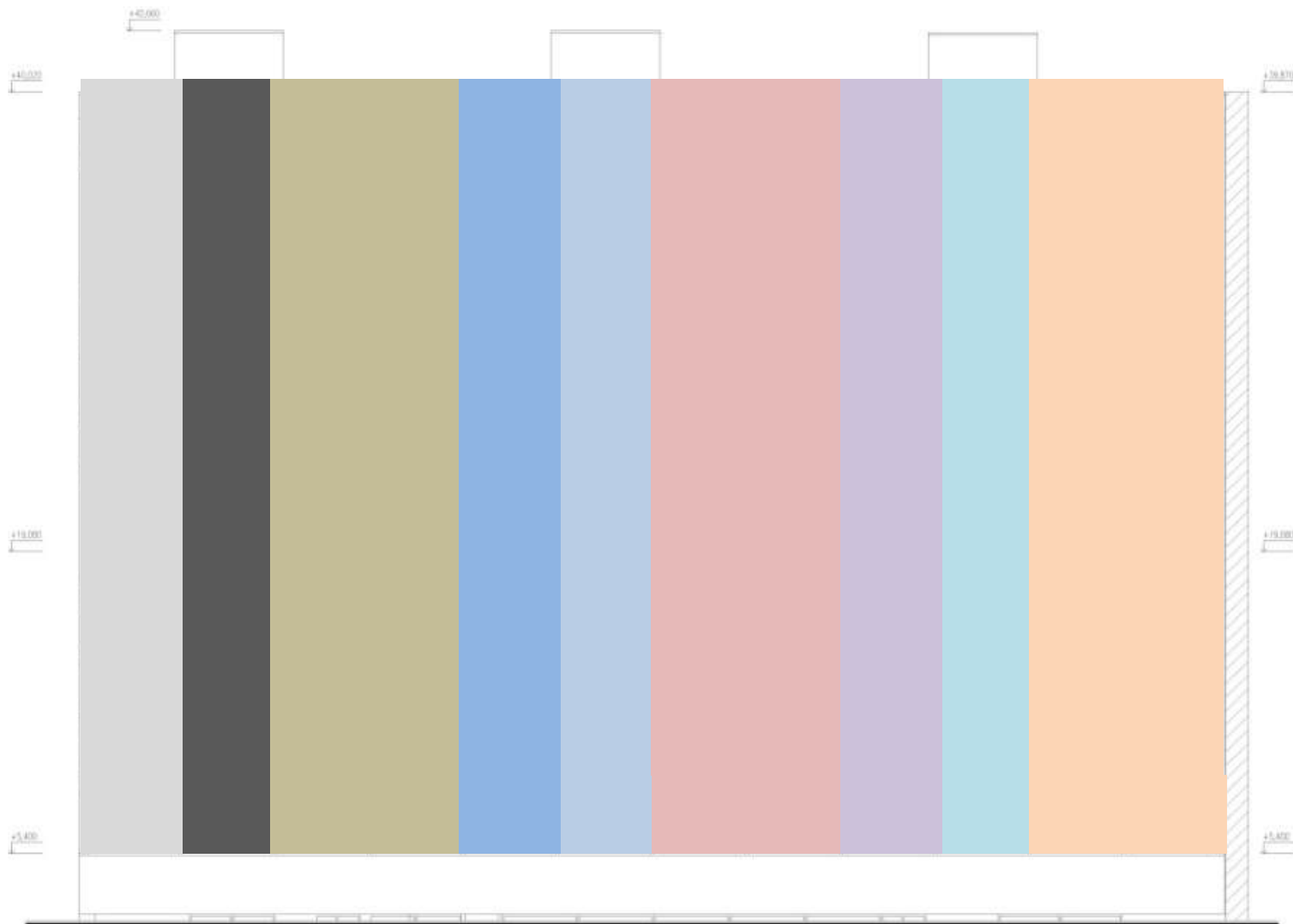
# THE CHALLENGE

Refurbishment of

**42 000 m<sup>2</sup>**

gross floor space





Pohľad zadný - 3









Minimal effort – lowest costs









France- significant reconstruction (Lacaton, Vassal, Druot)



Switzerland- Greifensee, ventilated facade with wooden finishing (Schwarz architekten)





Austria- Linz, dwelling renewed to reach passive house criteria (Arch+more)



Germany- Leinefeld (Stefan Forster)





Finland- Helsinki, architectural re-design (ARK House architects)



MESTO BRATISLAVA



TECHNICKÝ SKÚŠOBNÝ ÚSTAV STAVEBNÝ



University of Natural Resources  
and Applied Life Sciences, Vienna  
UNIVERSITÄT FÜR BODENKULTUR WIEN