



Proactive synergy of inteGrated Efficient Technologies on buildings' Envelopes

## Opportunities for energy neutral and seismic retrofitting

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Participant No *	Participant organisation name	Country
1 (Coordinator)	ALMA MATER STUDIORUM, Università di Bologna ( <b>UNIBO</b> )	IT
2	TECHNISCHE UNIVERSITAET MUENCHEN ( <b>TUM</b> )	DE
3	National and Kapodistrian University of Athens ( <b>NKUA</b> )	GR
4	HUYGEN Installatie Adviseurs ( <b>HIA</b> )	NL
5	Municipality of Peristeri, Athens ( <b>PERISTERI</b> )	GR
6	ACER Reggio Emilia ( <b>ACERRE</b> )	IT
7	Municipality of Brasov ( <b>BRASOV</b> )	RO
8	SAVIO SPA ( <b>SAVIO</b> )	IT
9	Associació LIMA ( <b>LIMA</b> )	ES
10	BLOOMFIELD S.R.L. ( <b>BLOOMFIELD</b> )	IT
11	BJW BV ( <b>BJW</b> )	NL
12	ALIVA Chimica e Sistemi ( <b>ALIVA</b> )	IT
13	ABT Belgie NV ( <b>ABT</b> )	BE
14	CLIVET SPA ( <b>CLIVET</b> )	IT
15	ANERDGY AG ( <b>ANERDGY</b> )	Switzerland

This project has received funding from the EU's Horizon 2020 IA GA No 723747

*The communication reflects only the author's view and the Research Executive Agency for SMEs is not responsible for any use that may be made of the information it contains*

# Objectives

Where we started from...

Greater efficiency, attractiveness and marketable renovation can only be achieved through a **holistic and integrated set of technologies**, in which all the different requirements **(energy, structural, functional)** are optimally managed.

## Objectives

This is why the project idea is based on the innovative integration of technologies to achieve

**a multi-benefit approach**

by a closer integration between

**energy and non-energy related benefits.**

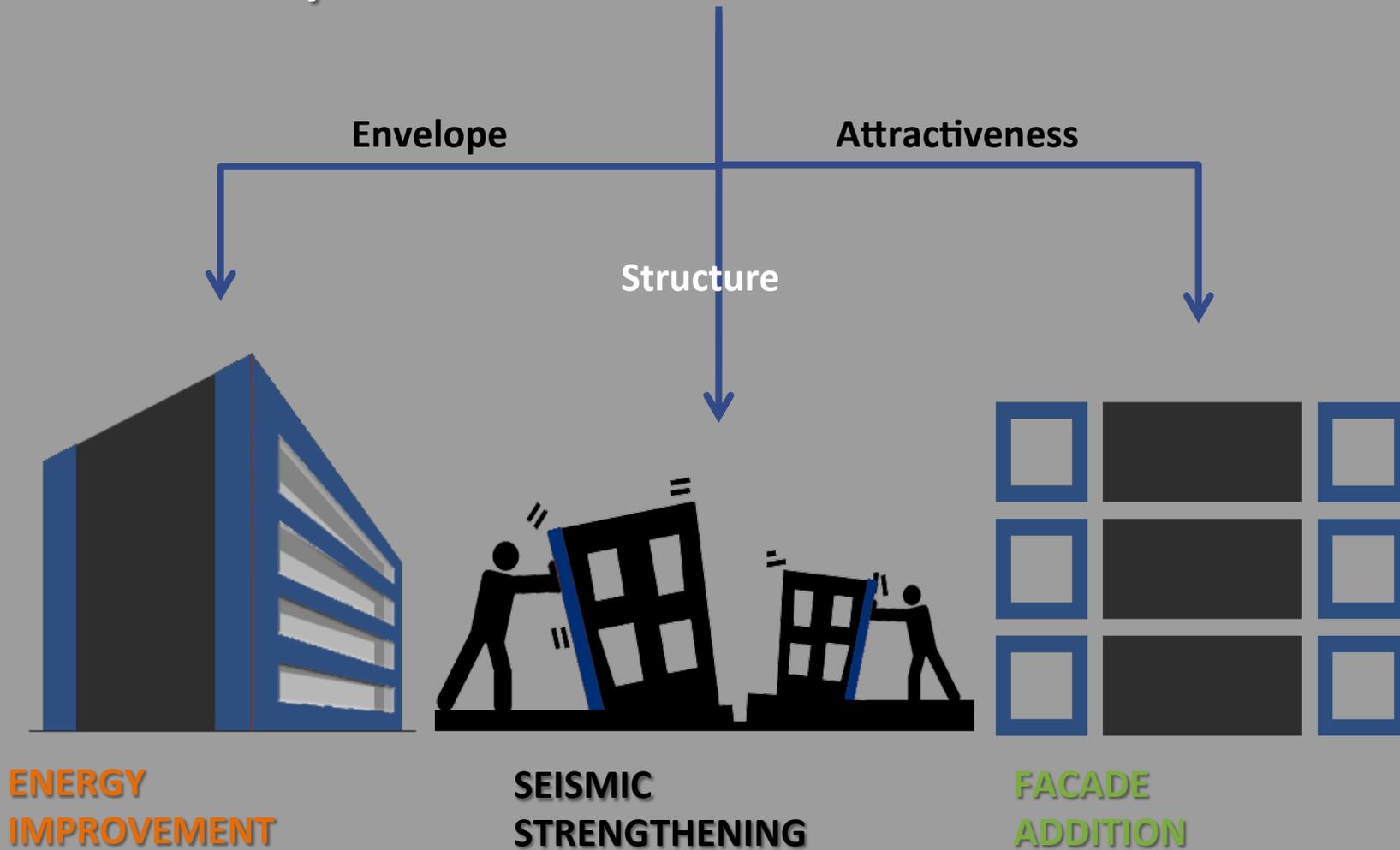
Thus, the project aims at combining in a same integrated system the highest performances (iii):

## Objectives

- **Energy requirements**
- **Safety**
- **Social sustainability**

# "GET" system

## InteGrated system



**Concept** and methodology

**GET** system

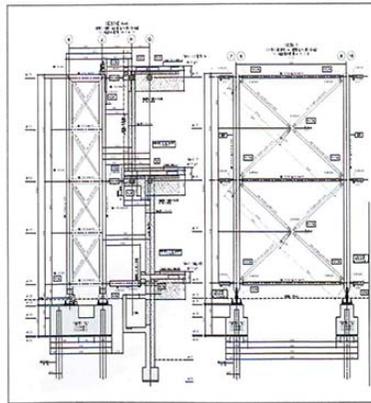
**inteGrated Efficient Technologies**

**Proactive synergy**  
**on buildings' Envelopes**

## Concept and methodology

### Structural requirements

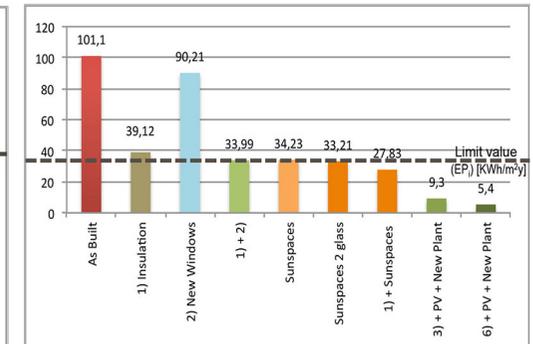
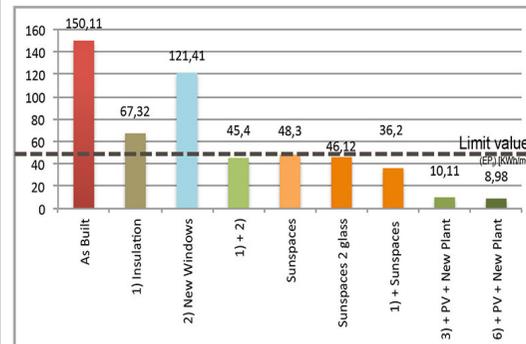
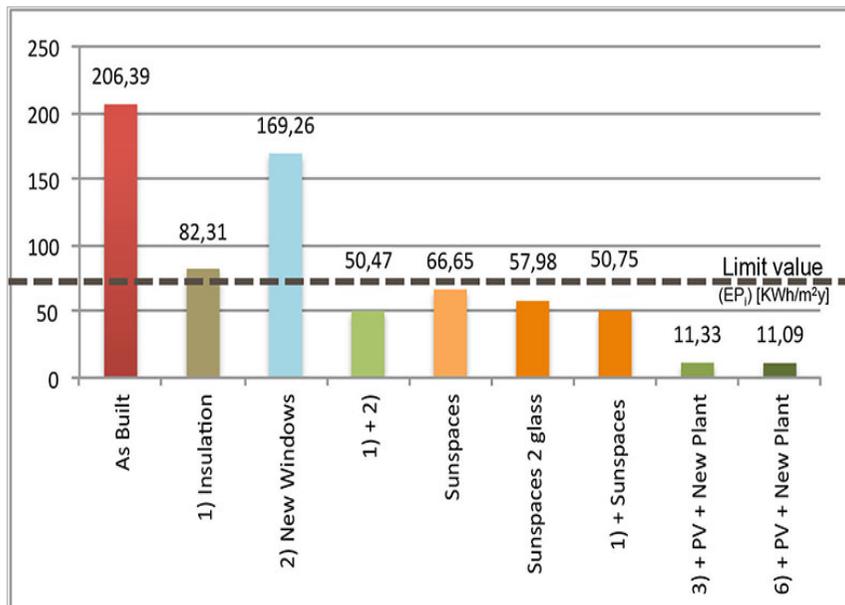
Exploit **solutions** currently applied in the building sector other than residential, adapting, “transferring” and integrating them in the sector of residential buildings



# Concept and methodology

## Energy requirements

The **GET structure** will be combined with **energy** (and space) needs (new volumes –sunspaces and buffer zones- and insulation on existing envelopes)



# Concept and methodology

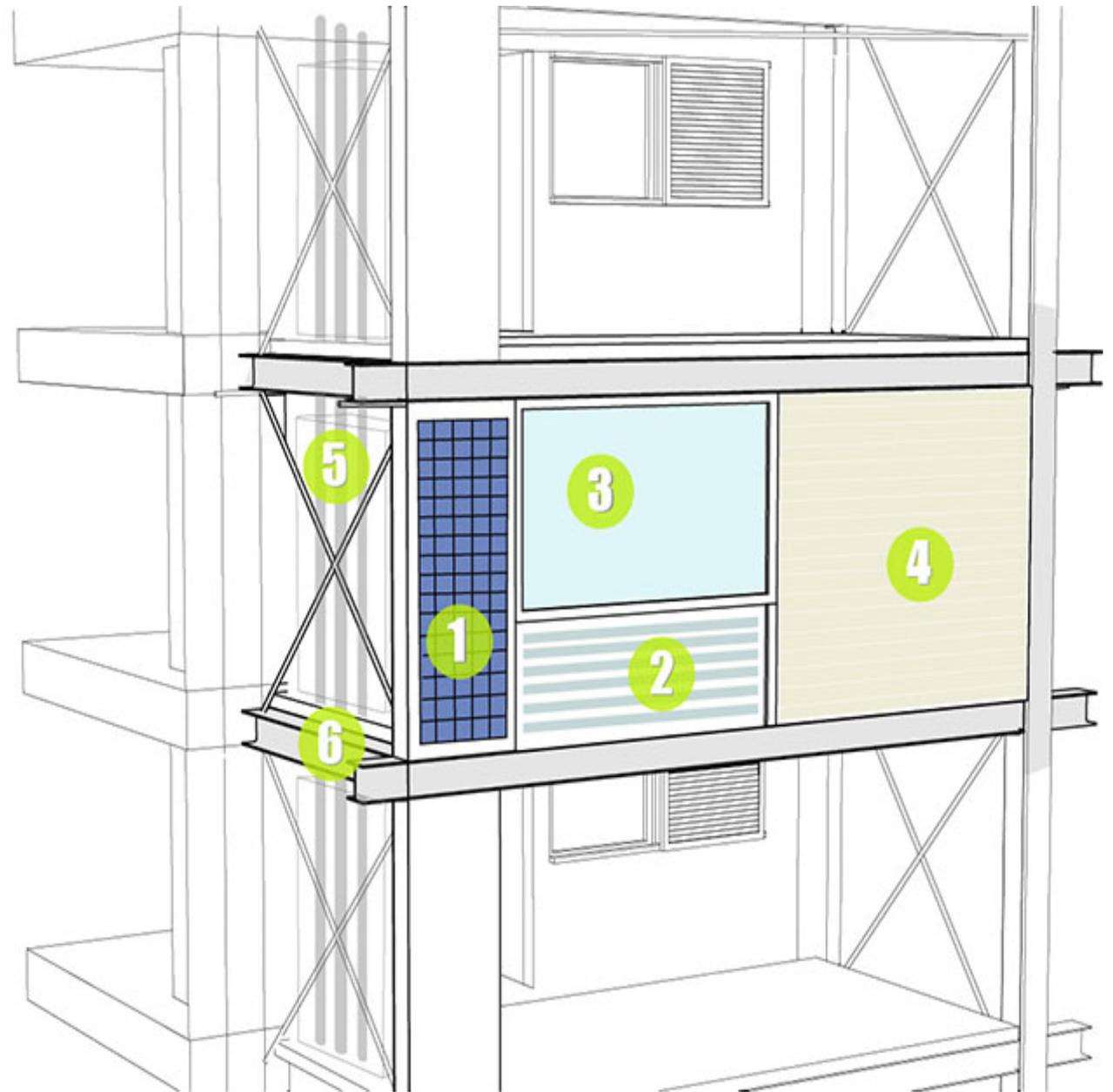
## Energy requirements

As a whole, GET  
can be equipped  
with several  
installation plants

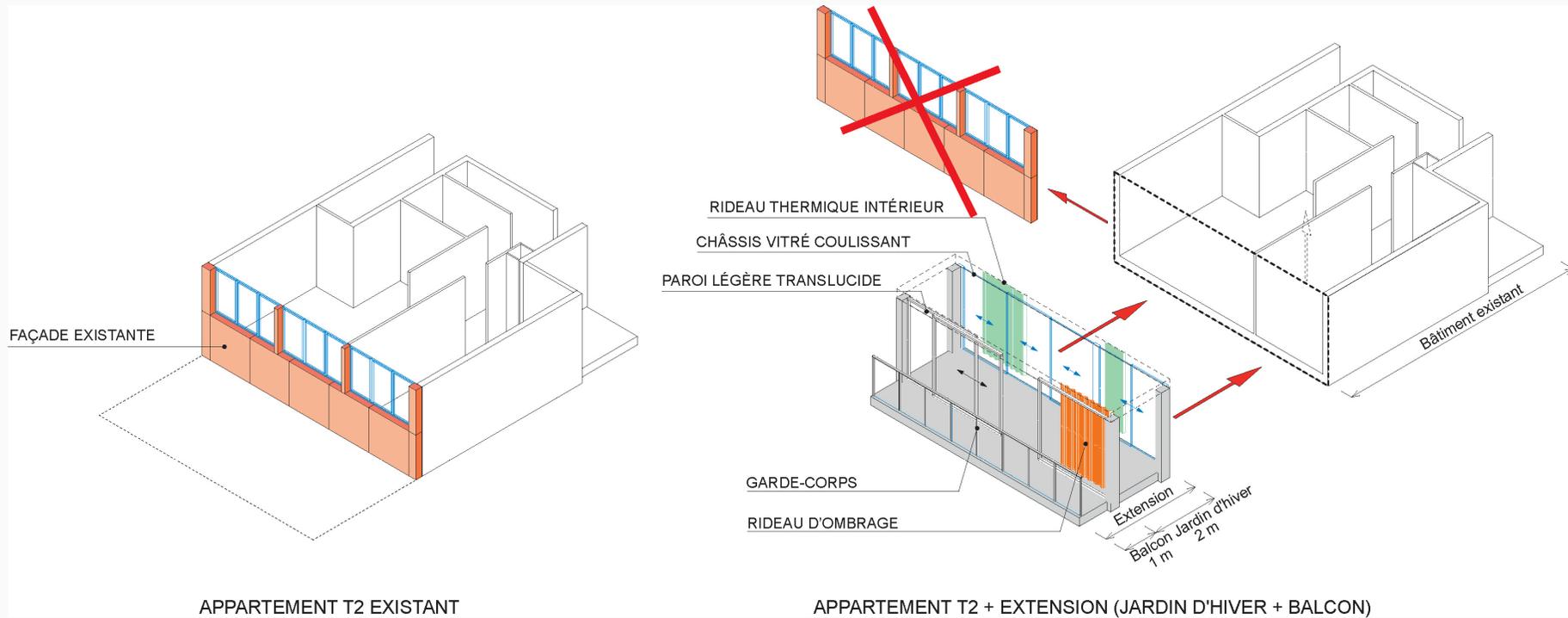
External structures providing existing building (5) with: strengthening by GET structure (2), energy saving and plug-and-play plant distribution (1, 4, 6) increased comfort and living areas for residents, additional new units (3).



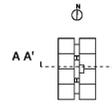
- 1 Anerdgy/Bloomfield
- 2 Bloomfield
- 3 Savio
- 4 Aliva
- 5 Clivet
- 6 BJW (Webo)/Aliva



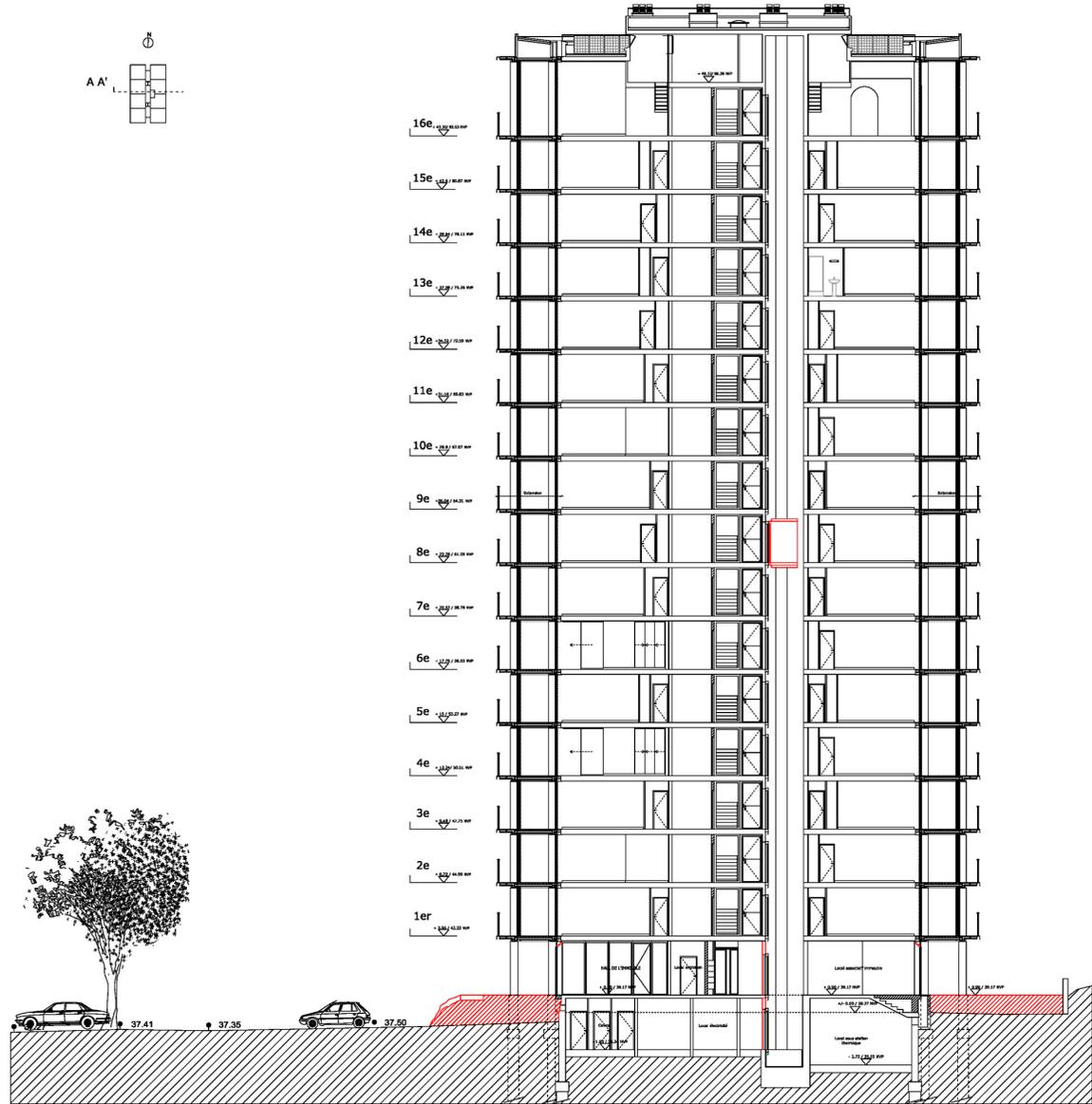
# Concept (and inspirations)



EXISTANT



PROJET



# Concept (and inspirations)



# Concept (and inspirations)



# Concept (and inspirations)



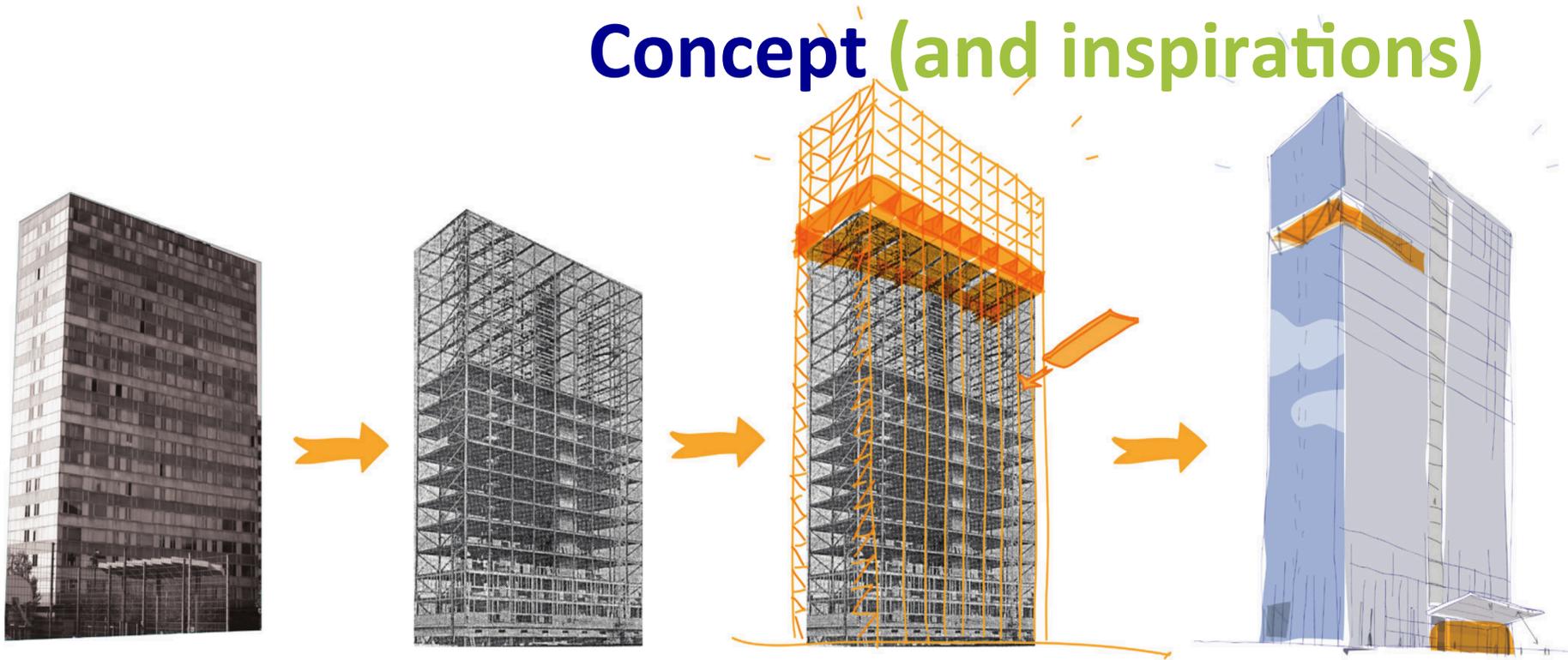
# Concept (and inspirations)



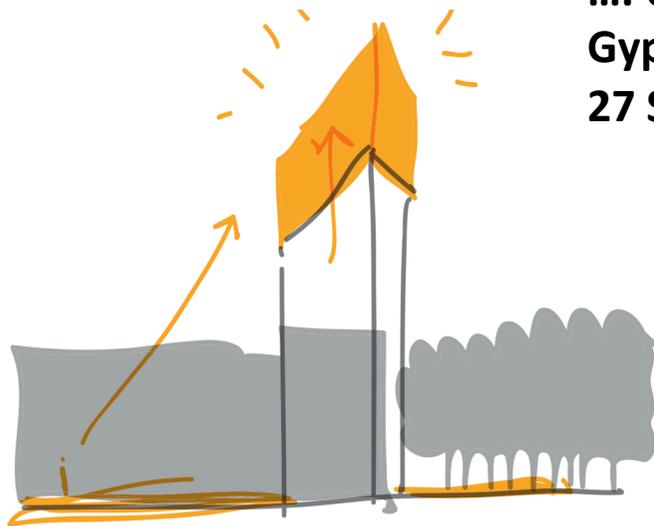
# Concept (and inspirations)

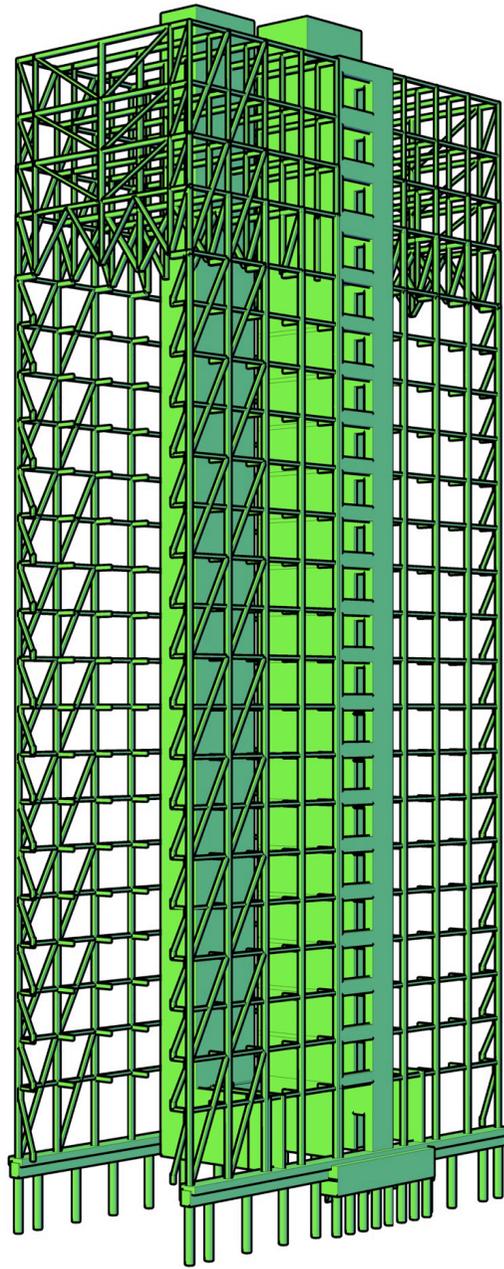
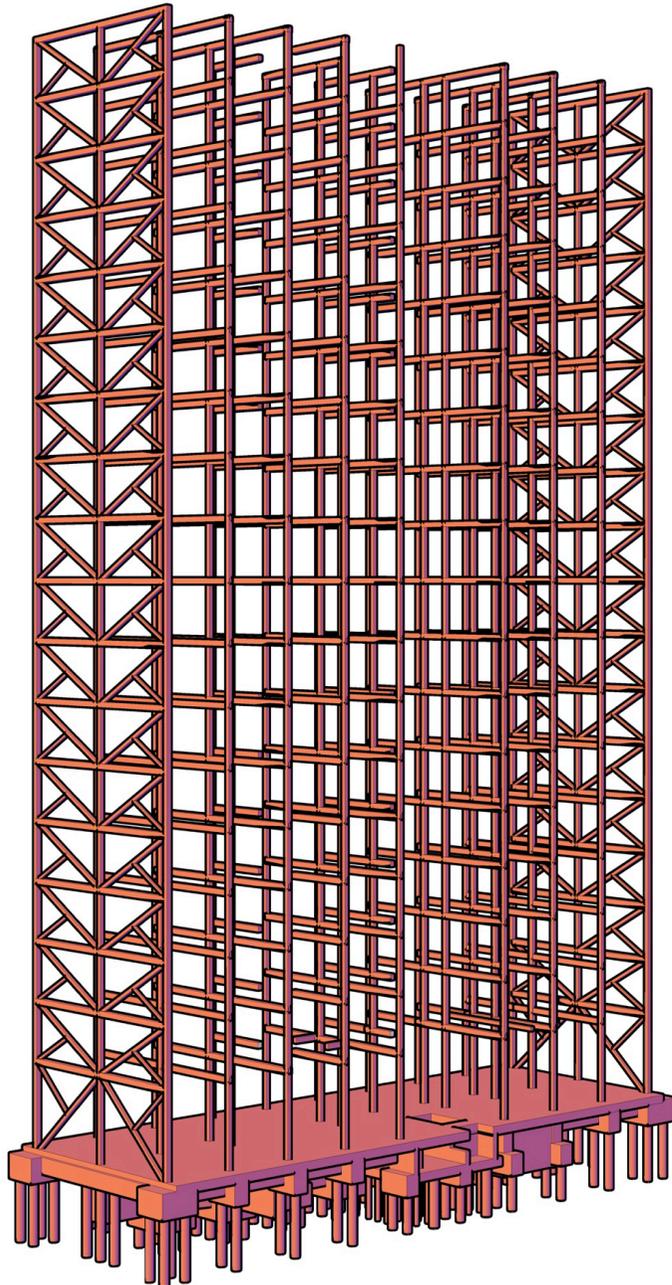


# Concept (and inspirations)

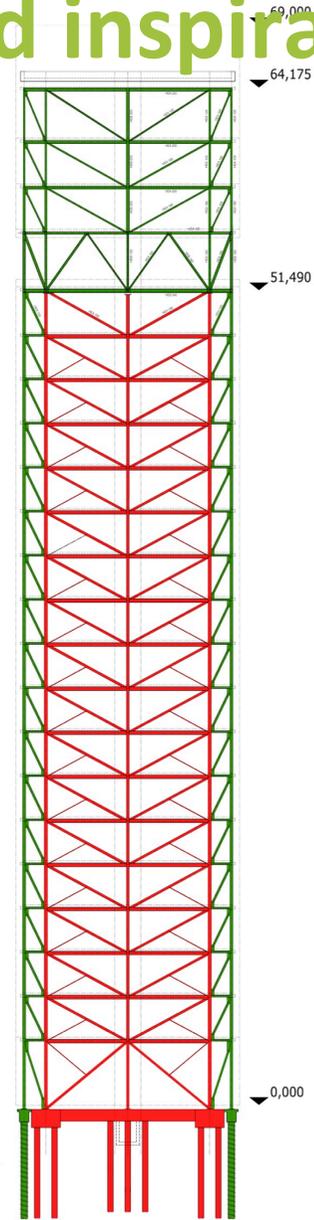
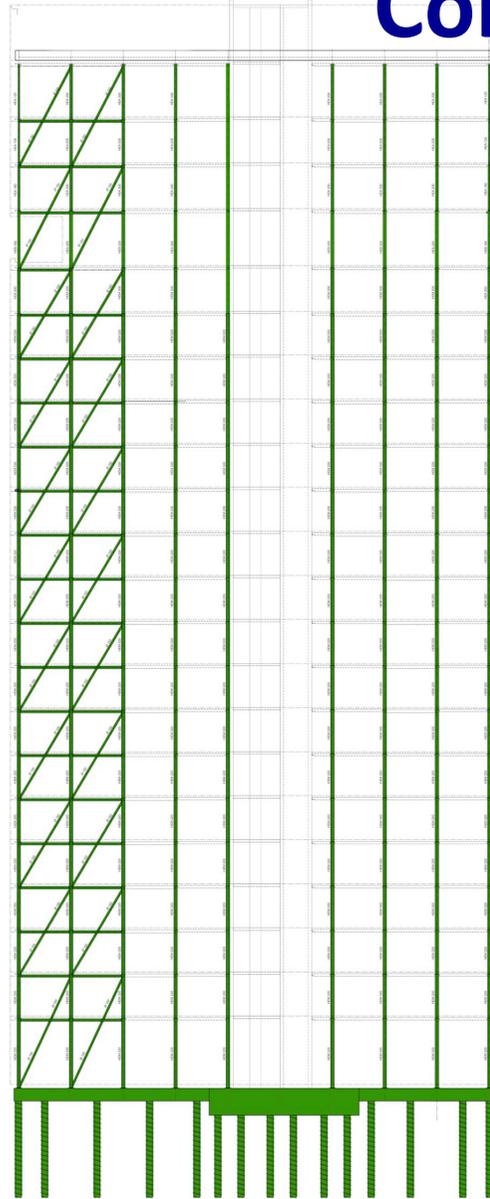


.... URBAN BUILDINGS  
Gypsum Forum Brussels  
27 September 2017





# Concept (and inspirations)



structures to support the possible addition of rooftop extensions in structurally inefficient buildings

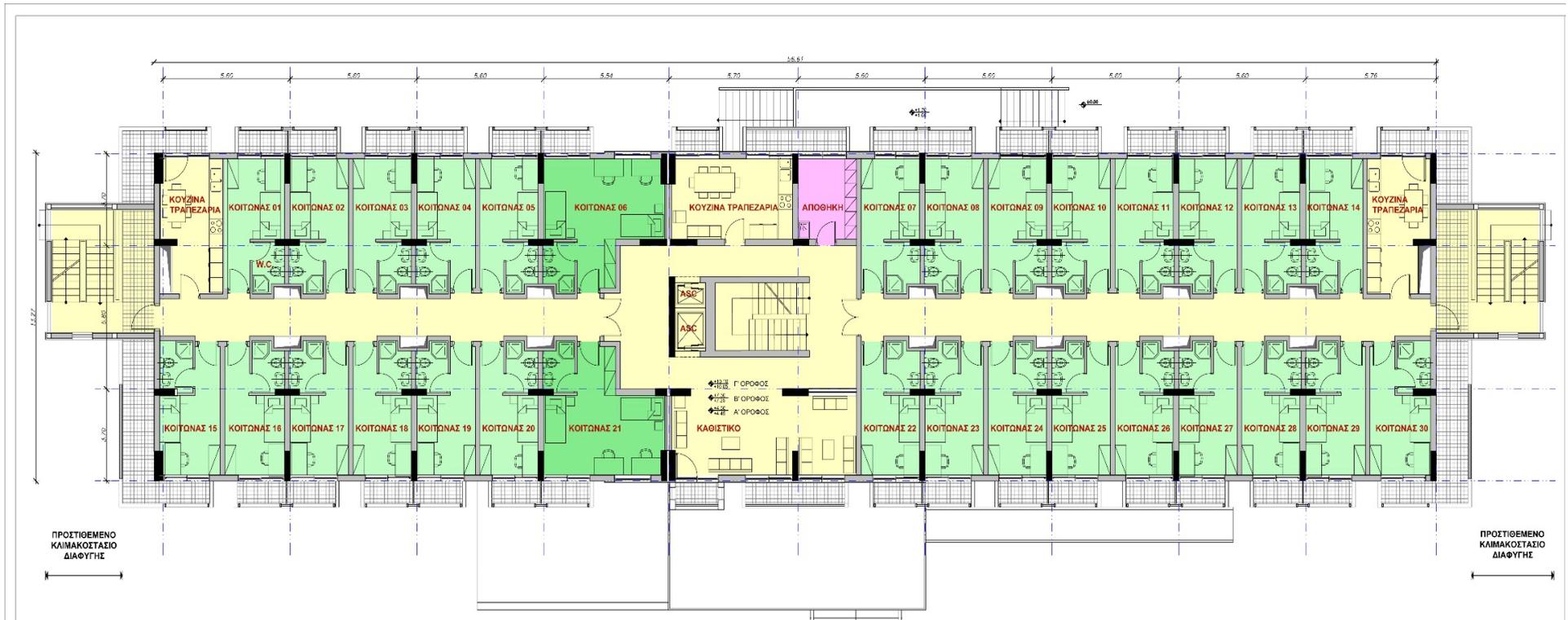
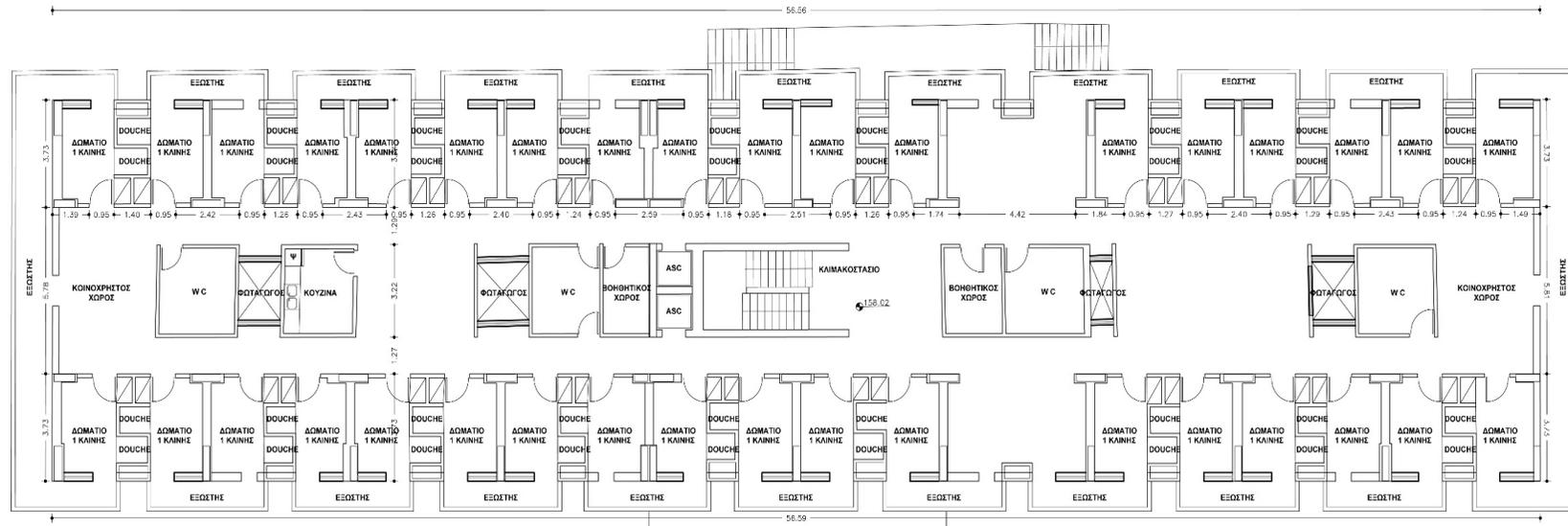
# Concept (and inspirations)



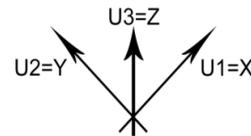
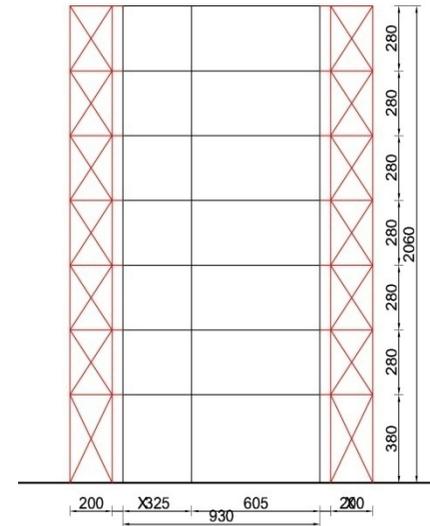
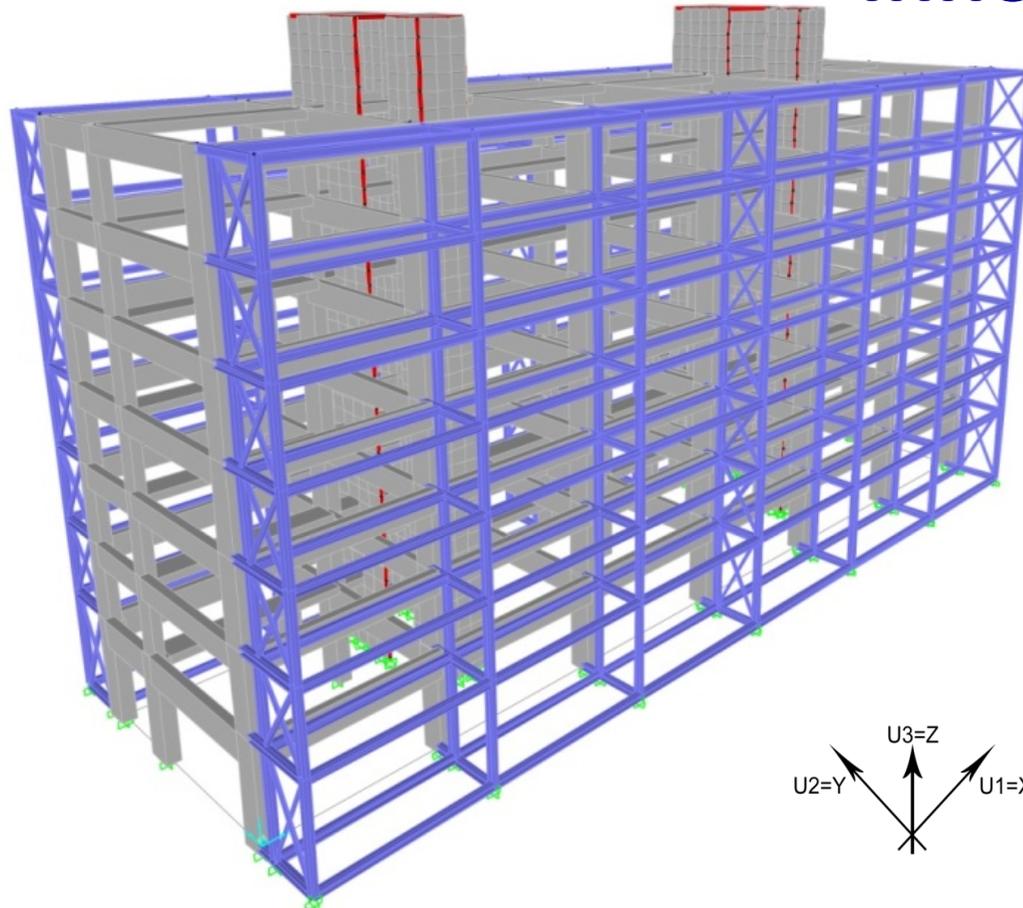
# Case studies



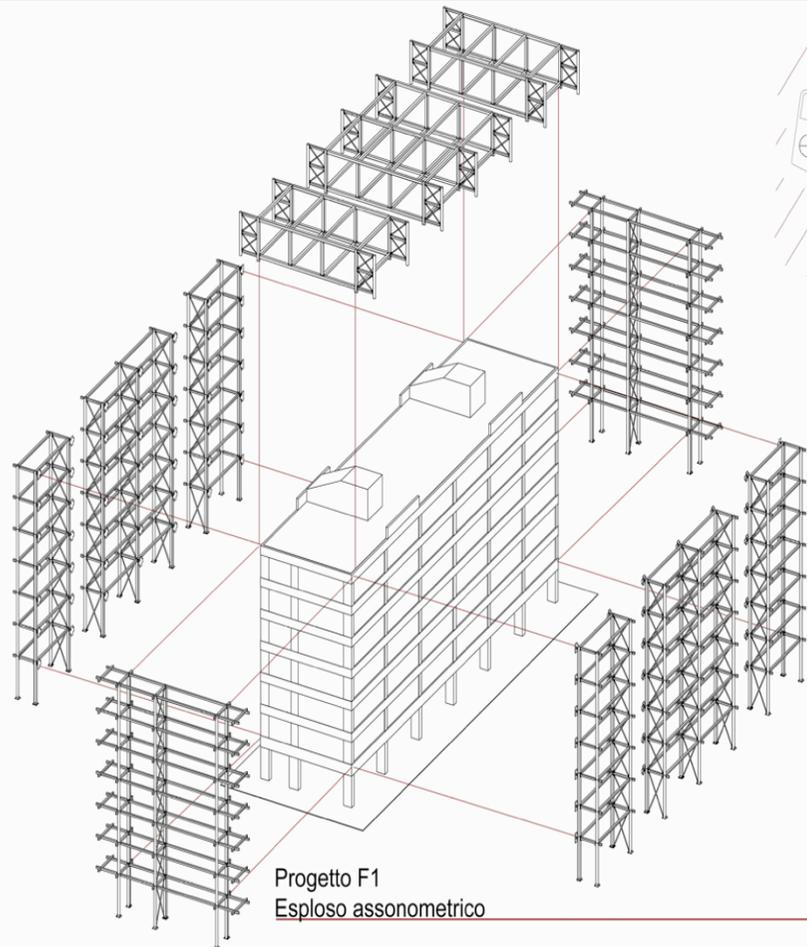




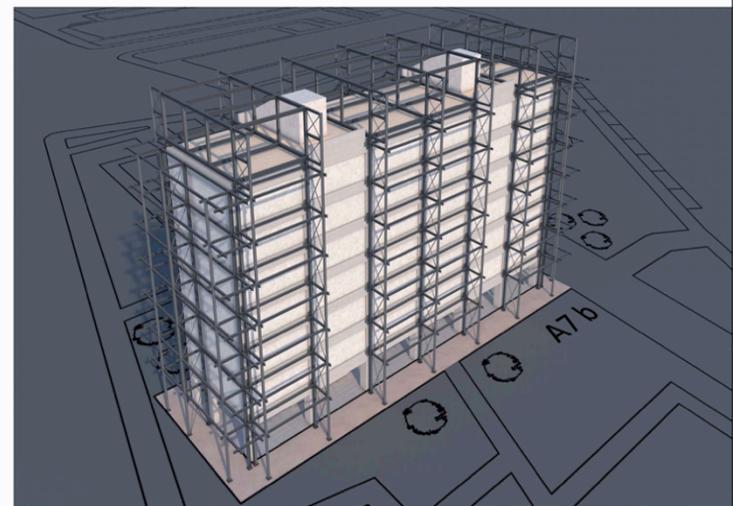
# Innovation/Ambition



Simulations modelling using FEM software (EN 1998), performed for different residential buildings, have shown an overall reduction of horizontal displacements of the retrofitted structures with a percentage from the 15% up to the 50% and more.



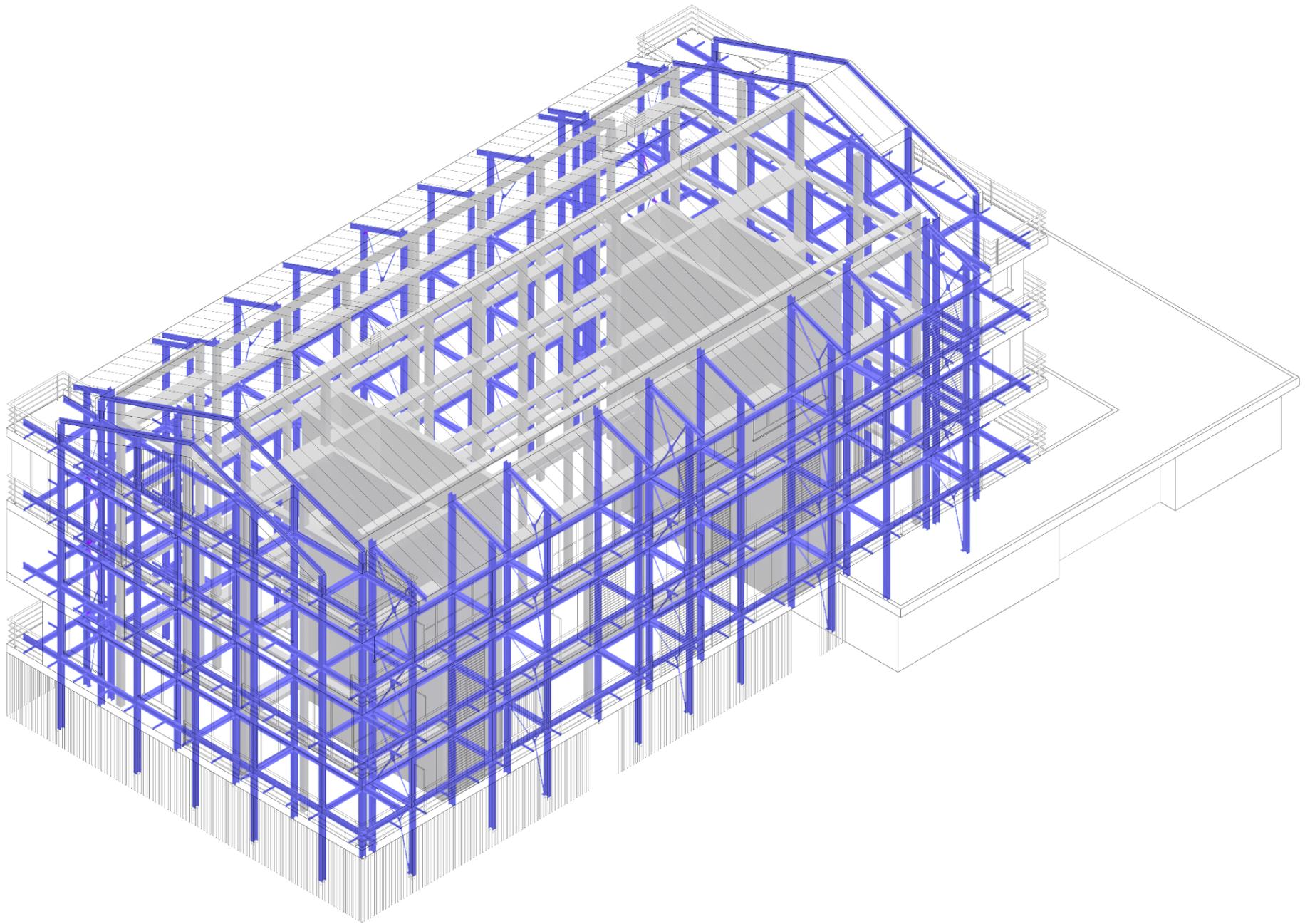
Vista Ovest





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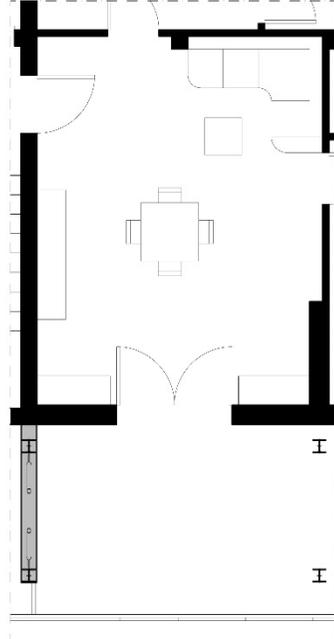
Invariante strutturale



IN PROGRESS

## Balcone

Pianta



Materiali



Frangisole: Alluminio



Infissi: Vetro



Nastro: Lamiera metallica

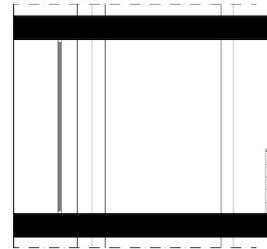


Parete: Intonaco bianco

Prospetto

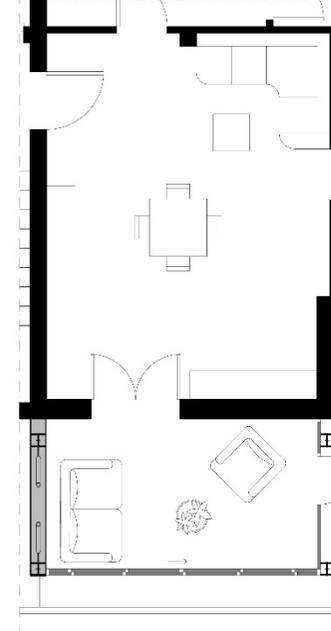


Sezione



## Serra

Pianta



Materiali



Telaio infissi: Alluminio

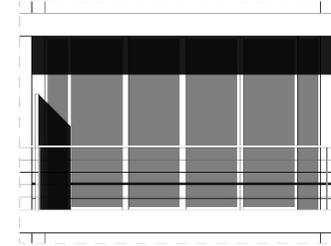


Infissi: Vetro

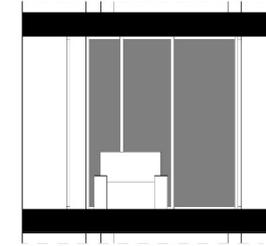


Nastro: Lamiera metallica

Prospetto

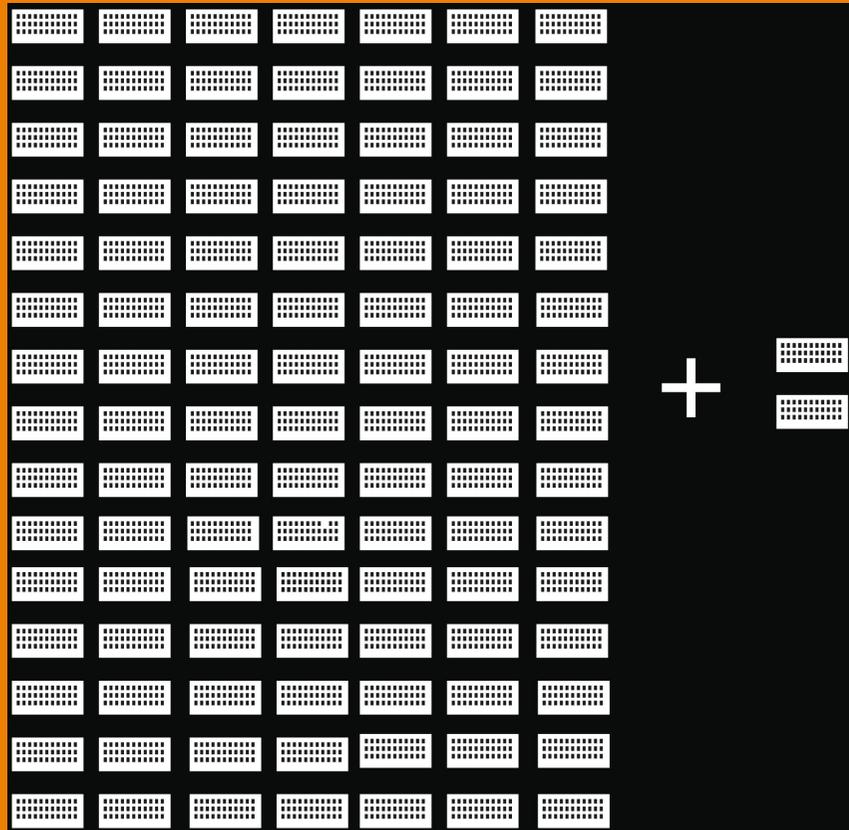


Sezione





# THE LARGEST CHALLENGE IS IN EXISTING BUILDINGS



new buildings  
increase the building  
stock by around  
1-1.7% every year



# CHALLENGE IN THE CHALLENGES



- As built
- 1 Insulated walls
- 2 Windows' replacement
- 1+ 2 Insulated walls and windows' replacement
- Insulated Roof
- Green Roof
- Complete retrofitting

## Problems' statement (the building ....regeneration)



Guidelines on best practice to limit,  
mitigate or compensate

# soil sealing

## Urban scale

Urban re-thinking  
Soil consumption  
reduction

## EXISTING Buildings

Low energy  
renovation rate  
nZEB



IDEA

designed by freepik.com



**Assistant Buildings' addition to Retrofit, Adopt,  
Cure And Develop  
the Actual Buildings  
up to zeRo energy,**

**Activating a market for deep renovation**

ABRACADABRA aims at implementing  
a new, attractive renovation strategy based on a multi-  
benefit approach  
(substantial increase in the real estate value)

(NON-ENERGY RELATED FACTORS for nZEB!)

**provided by AdoRES**

(new Assistant buildings' addition and Renewable Energy Sources)

**to create an up-grading synergy between**

**OLD AND NEW ...**

Pay back times of the investments up 30-35 years can be observed as a function of the different hypothesised scenarios

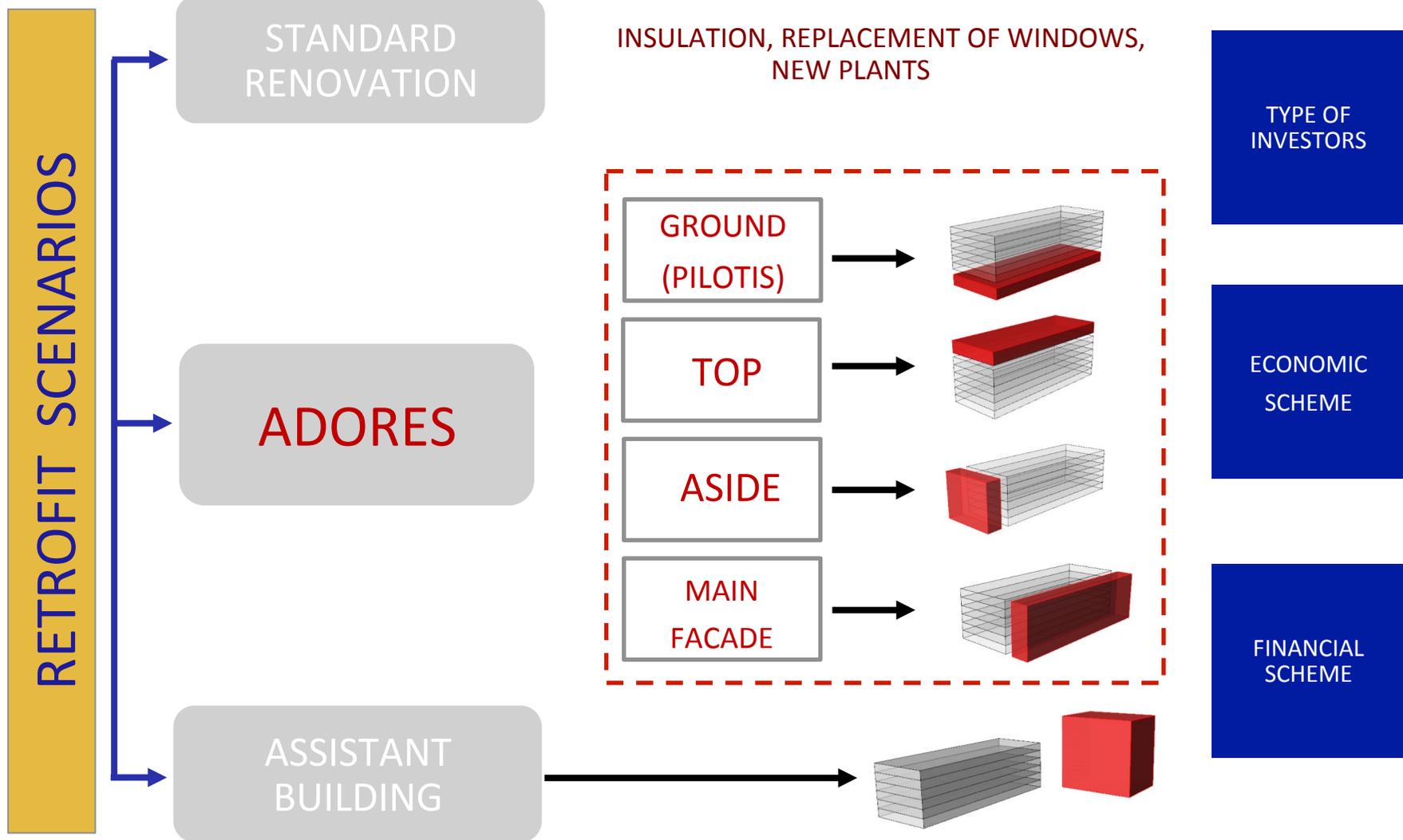
**---for nZEBs up to 40 years---**

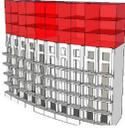
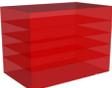
**... CHALLENGING**

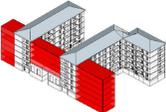
**up-front investments, high degree of risk, long payback times and the general “invisibility of the energy benefit” ..**

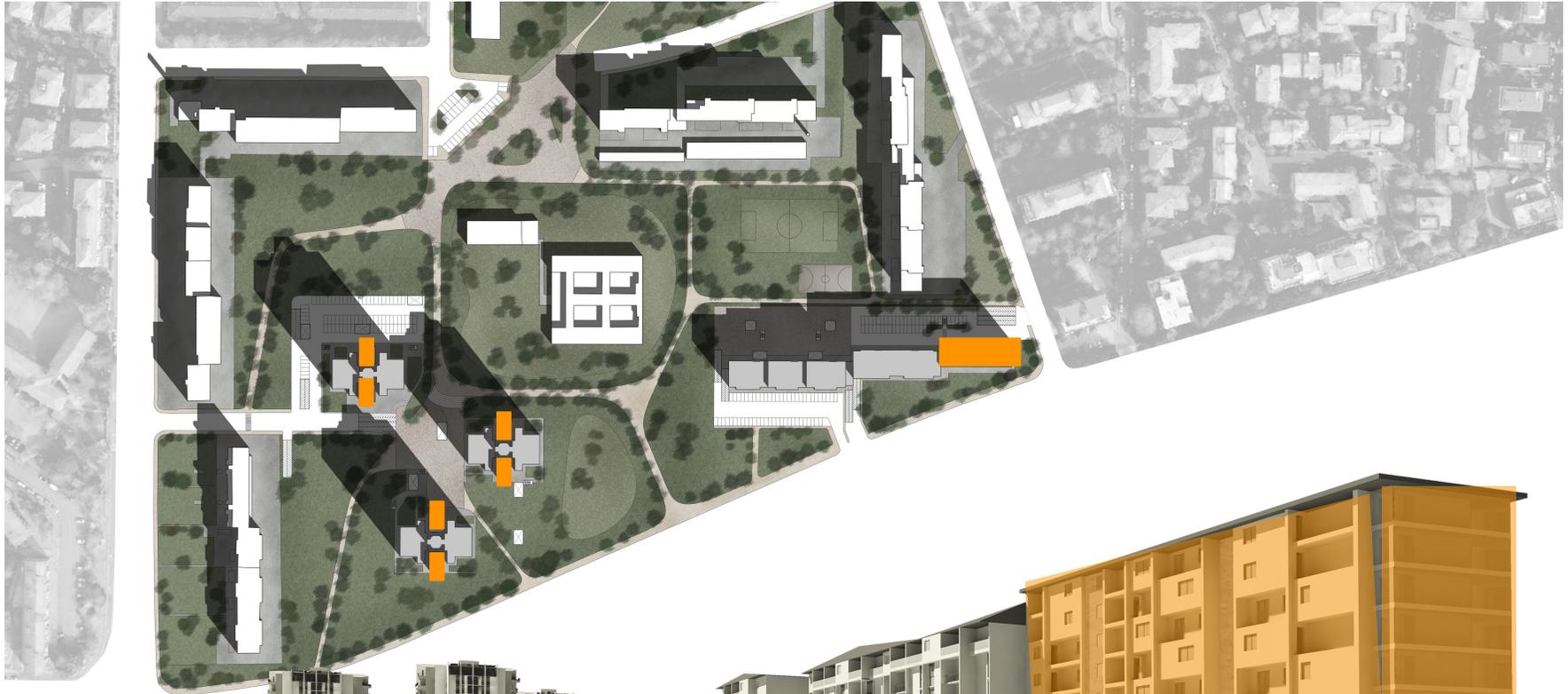
**And the problem asks for solutions...**

The estimated costs of energy retrofit options indicate the **need for additional tools and measures to be developed at social, legislative and market level,** to counterbalance the **large pay-back times of EE measures** aimed at achieving nZEBs in existing buildings.

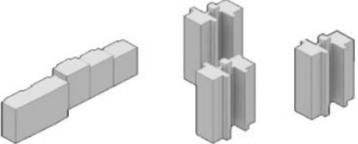
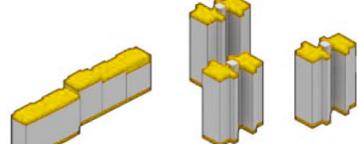
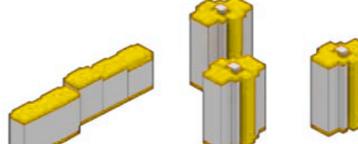
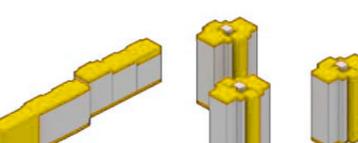
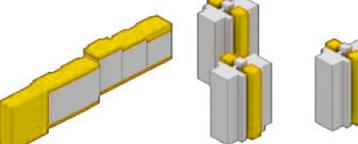


ADRES CASE STUDIES	BULGARIA 3720 m <sup>2</sup> 	LATVIA 1650 m <sup>2</sup> 	NORWAY 1076 m <sup>2</sup> 	SPAIN 1480 m <sup>2</sup> 
GROUND				
TOP	 ADDED 446 m <sup>2</sup>	 ADDED 435 m <sup>2</sup>	 ADDED 270 m <sup>2</sup>	 ADDED 756 m <sup>2</sup>
ASIDE	 ADDED 945 m <sup>2</sup>	 ADDED 715 m <sup>2</sup>	 ADDED 435 m <sup>2</sup>	
FACADE	 ADDED 416 m <sup>2</sup>	 ADDED 537 m <sup>2</sup>	 ADDED 202 m <sup>2</sup>	 ADDED 270 m <sup>2</sup>
ASSISTANT BUILDING	 ADDED 720 m <sup>2</sup>	 ADDED 720 m <sup>2</sup>	 ADDED 900 m <sup>2</sup>	

ADRES CASE STUDIES	ITALY 4250 m <sup>2</sup> 	GREECE 2310 m <sup>2</sup> 	ROMANIA 1160 m <sup>2</sup> 	THE NETHERLANDS 1000 m <sup>2</sup> 
GROUND		 ADDED 210 m <sup>2</sup>		
TOP	 ADDED 2100 m <sup>2</sup>	 ADDED 330 m <sup>2</sup>	 ADDED 366 m <sup>2</sup>	 ADDED 1000 m <sup>2</sup>
ASIDE	 ADDED 1337 m <sup>2</sup>	 ADDED 1000 m <sup>2</sup>		
FACADE		 ADDED 630 m <sup>2</sup>	 ADDED 254 m <sup>2</sup>	 ADDED 370 m <sup>2</sup>
ASSISTANT BUILDING		 ADDED 1800 m <sup>2</sup>	 ADDED 600 m <sup>2</sup>	 ADDED 1000 m <sup>2</sup>



**CASE STUDIES**

ASSUMPTIONS	CASE STUDY 1: VIA TORINO/VIA ORTOLANI, BOLOGNA		Epi	PAY-BACK TIME		
Cost of construction: 1.000 euro/mq Cost of Renovation: 650 euro/mq Real estate value: 2.700 euro/mq	CURRENT STATUS	 Area= 16.150 mq      Area=8.450 mq		Epi tower= 259 kWh/mq Epi line building= 315 kWh/mq	-	
		INTERVENTION	1 RENOVATION		NO ADDITION	Epi tower= 25 kWh/mq Epi line building= 32 kWh/mq
	2 SATURATION			ADDED 4.740 mq	Epi tower= 25 kWh/mq Epi line building= 32 kWh/mq	16 years
	3 ADHESION			ADDED 10.340 mq	Epi tower= 25 kWh/mq Epi line building= 32 kWh/mq	2 years
	4 ASSISTANT BUILDING			ADDED 14.740 mq	Epi tower= 25 kWh/mq Epi line building= 32 kWh/mq	0 years
	5 PROPOSED PROJECT			ADDED 12.140 mq	Epi tower= 25 kWh/mq Epi line building= 32 kWh/mq	0 years



Assistant **B**uildings' addition to **R**etrofit, **A**dopt,  
**C**ure **A**nd **D**evelop  
the **A**ctual **B**uildings up to ze**R**o energy,  
**A**ctivating a market for deep renovation

**DEEP RENOVATION  
THROUGH  
BUILDING ADD-ONS**

**UP TO ZERO ENERGY  
WITH ZERO COSTS**

**SOUNDS MAGIC!**

**WITH ZERO  
COSTS!!!**



Assistant **B**uildings' addition to **R**etrofit, **A**dopt,  
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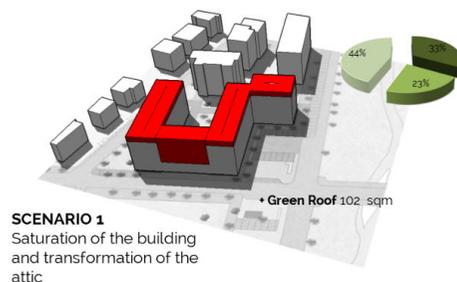
**SOUNDS MAGIC!**



**WITH ZERO  
COSTS!!!**

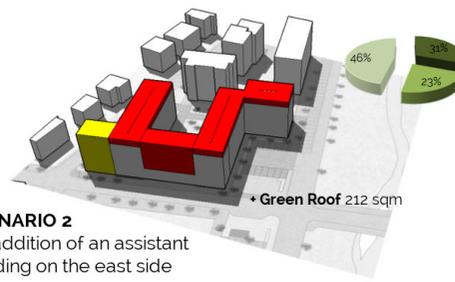
Other **advantages** still remain...

## Feasibility studies (project-based transformations)



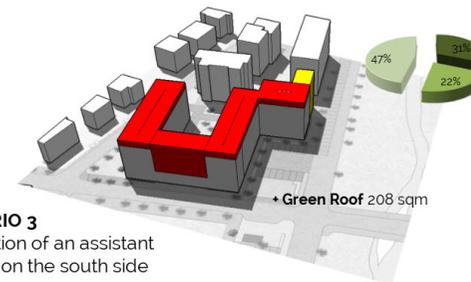
**SCENARIO 1**  
Saturation of the building  
and transformation of the  
attic

397+ 775= **1172 sqm**  
Return Time 8.2 years



**SCENARIO 2**  
1 + addition of an assistant  
building on the east side

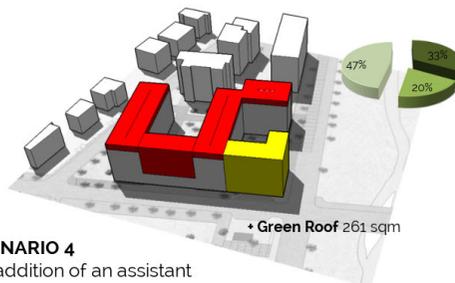
1172+ 428= **1600 sqm**  
Return Time 3 years



**SCENARIO 3**  
1 + addition of an assistant  
building on the south side

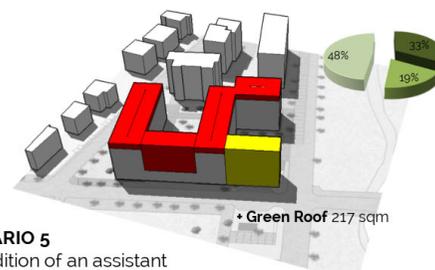
1172+ 430= **1602 sqm**  
Return Time 3 years

Saturation ■  
Addition ■



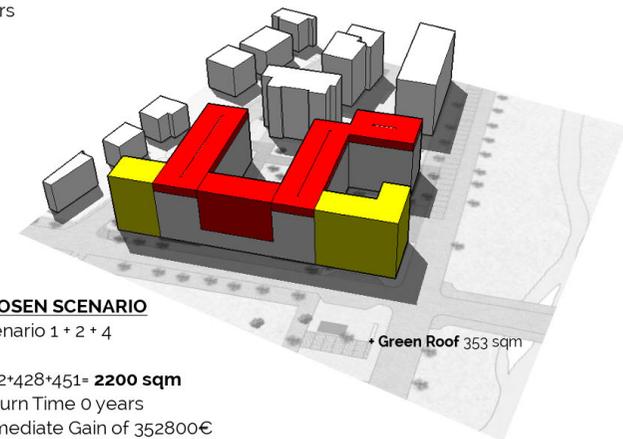
**SCENARIO 4**  
1 + addition of an assistant  
building on the west side

1172+ 451= **1623 sqm**  
Return Time 2.7 years



**SCENARIO 5**  
1 + addition of an assistant  
building on the west side

1172+ 263= **1435 sqm**  
Return Time 5 years



**CHOSEN SCENARIO**  
Scenario 1 + 2 + 4

1172+428+451= **2200 sqm**  
Return Time 0 years  
Immediate Gain of 352800€

**CASE STUDIES...** Preserving permeable surfaces





**+ 40%**

**+ 80%**

**GREEN**



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**DEEP RENOVATION  
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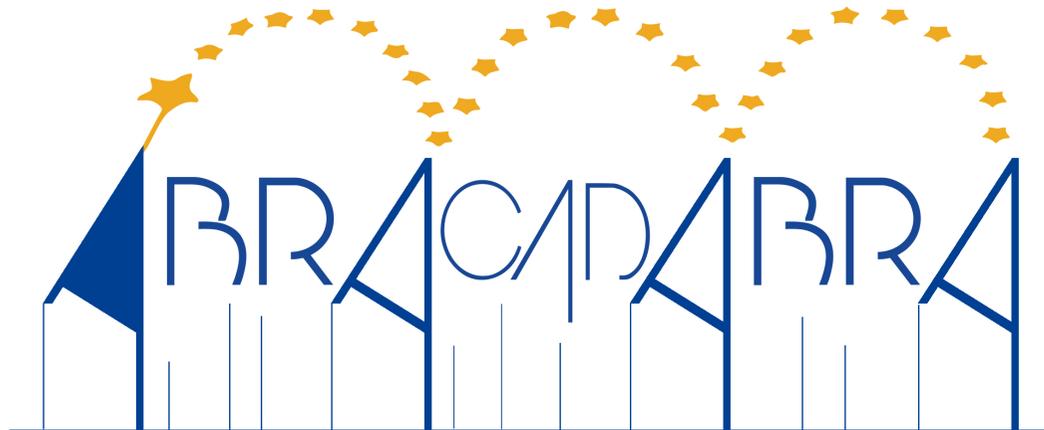
**UP TO ZERO ENERGY  
WITH ZERO COSTS**

and ....

WITH ZERO  
**URBAN SPRAWL**  
!!!



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