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## TEAM MEMBERS



**Martina Buzzo**  
PoliMI - Architecture,  
Built Environment,  
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**Gabriele Cacciato**  
PoliTO - Mechanical  
Engineering



**Cristian Dallere**  
PoliTO - Architecture  
for the Sustainability  
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**Mario Giuliano**  
PoliTO - Architecture  
for Heritage  
Preservation and  
Enhancement



**Martina Marino**  
PoliMI - Building  
Architecture



**Beatrice Tosini**  
PoliMI - Building  
Architecture

# DRIVE-EN

## Executive summary

DRIVE-EN project investigates how the refurbishment of former industrial buildings can act as a driver for territorial regeneration, by taking Olivetti factory as emblematic case-study.

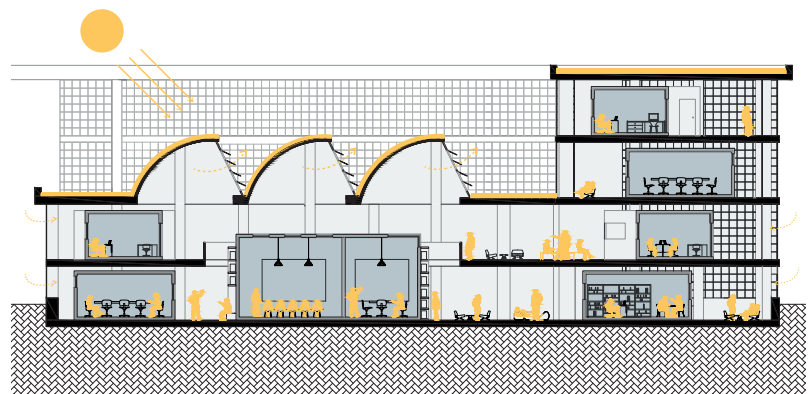
The final goal of the project is therefore to define several guidelines of intervention on industrial built heritage, which will possibly become a model for similar works.

To get this result, two scenarios of intervention are designed and then evaluated to choose the best performing alternative. Innovative solutions are investigated in order to respect the several constraints which are imposed by UNESCO and the peculiar layout of abandoned industry. The evaluation of both scenarios from the economic point of view consists in the balance between costs and benefits of each scenario so that tangible impacts of the refurbishment project on Ivrea's community and economy are clearly estimated.

DRIVE-EN work wants to demonstrate that the refurbishment intervention on such an industrial building as the Olivetti complex would effectively bring benefits to the local community from the economic and cultural point of view.

## Key Words

Retrofit; Territorial regeneration; Energy efficiency; Cultural heritage; Innovative HUB.



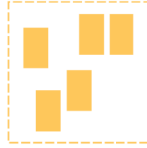
Energy and design strategy in the first proposed scenario.

## SCENARIO

# 01

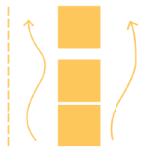
### UNIQUE ELEMENTS

Quality of private spaces that are autonomous units placed in an open space



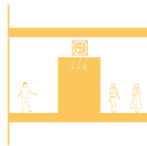
### RELATIONSHIP WITH THE PERIMETER

Untouched perimeter & Circulation around boxes



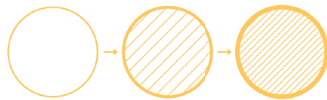
### CLIMATIC STRATEGY

The corridor becomes a filter animated by social encounters



### PRIVATE AND PUBLIC SPACES

Clients have a filter and a more private space



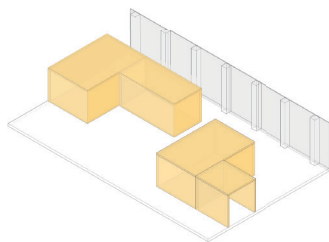
### PASSIVE SOLUTIONS

Improve natural ventilation thanks to the sheds



### STRUCTURE OF THE PROJECT

Insertion of independent sub-structures



## SCENARIO

# 02

### UNIQUE ELEMENTS

Optimization of the space with more less-private units surrounded by coworking space



### RELATIONSHIP WITH THE PERIMETER

Refurbished perimeter & Circulation in between



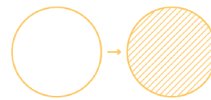
### CLIMATIC STRATEGY

The refurbishment allows an internal controlled ventilation



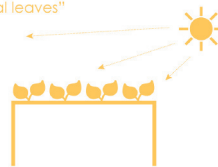
### PRIVATE AND PUBLIC SPACES

Clients have a closed space which is less private



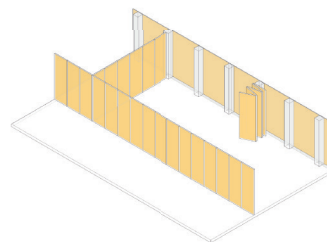
### PASSIVE SOLUTIONS

Improve internal insulation thanks to a green roof that also provides energy thanks to "technological leaves"



### STRUCTURE OF THE PROJECT

Renovation of the facade + Flexible partitions



Comparison between the two final scenarios in terms of design solutions

**Project description  
written by the  
Principal Academic  
Tutor**

Starting from the case industrial buildings belonging to the Olivetti complex in Ivrea, the project investigates the topic of territorial regeneration, with particular emphasis on the role of energy requalification operations. The research develops and compares two alternative scenarios for the requalification of the complex, based on innovative models in the domain of sustainability and energy production. Taking into consideration the cultural relevance of the buildings and their recent inclusion in the Unesco list, the project pays also attention to the symbolic and iconic value of the assets as well as the implications for the point of view of social benefits.

In order to support the decision process related to the transformation of the building, the alternative requalification scenarios are evaluated from the point of view of their global costs and related impacts, focusing in particular on the estimation of the co-benefits and externalities provided by the project. The results of the estimation are included in complex evaluation frameworks that allow computing synthetic indexes able to rank the alternative scenarios from the point of view of the overall sustainability.

In a strong co-operation with DMs and local stakeholders, specific guidelines for the intervention are formulated which will be helpful to lead the future steps of the transformation.

**Team description by  
skill**

This project stands on a multicultural approach to a stimulating topic that touches aspects of heritage retrofit and economic, cultural and comfort evaluations. The different characteristics of the team members supported the intent to investigate in depth every step of the project.

Five out of the six team members have an architectural background. In particular:

- Mario Giuliano had experiences in dealing with heritage and preservative meanings that in this case UNESCO requires;
- Martina Buzzo developed an analysis and design in coherence with the built environment and specific social and cultural context in which the site is located;
- Cristian Dallere contributed with his capacities in finding sustainable strategies in the design of energy retrofit and indoor climate;
- Martina Marino specified innovative solutions for the case study and promoted the dissemination of results with different forms of compositions;
- Beatrice Tosini conducted research upon the existing building's details and the preservative choices to adapt a retrofit intervention on them;
- Gabriele Cacciato, the only team member with an engineering background, supported energetic analyses and comfort evaluations to finalize, all together, a consistent architectural project with two possible scenarios and precise Cost-Benefit analysis.

## Goal

This project investigates requalification scenarios for the Olivetti complex in Ivrea, made up of three compounds, for a total of 40.000 m<sup>2</sup>, around which the study is centred: Red Bricks Factory, First extension and Second extension buildings.

Considering all the constraints given by the necessity to preserve the architectural value and the heritage of the buildings, part of what is considered a UNESCO site, different scenarios will be developed in terms of architectural and design choices and then analyzed upon energy retrofit solutions and economic, cultural and comfort value.

The main goal is to understand and interpret the vision of the client and to provide him with a set of guidelines that can represent a solid base for the architectural refurbishment project that a professional team will design in the following months. These guidelines are meant to go in deep in the site comprehension and in different sectors' evaluations. DRIVE-EN will design possible outcomes combining the most innovative technological and architectural solutions to re-transform this site into a pioneer in its sector, as it used to be in the past.

## Understanding the problem

In order to understand how to approach the project, the team started to gather and analyse a series of case studies coming from all over the world, selected since involving interesting aspects according to three main categories:

- Adaptive Reuse
- Energy Retrofit
- Modern Architecture Refurbishment

Then, the team defined scenario proposals, reached through a very long process, during which, starting from basic strategy proposals, the team tried to progressively deepen and refine the initial ideas until reaching satisfying results. Due to the several levels of complexity of the task, it was hard to build up a strong and coherent storyline within each scenario, able to link and motivate all the decisions taken under the point of view of attitude towards the existing heritage, of design strategy, of the energy solutions and program definition.

At the very beginning of this process, the focus guiding the elaboration of the different scenarios was centred on the main design strategy, concerning the way of dealing with the interior reorganization of the space in order to host the new program. The result of this early stage was the selection of three main project approaches:

- Boxes within the box
- Modular internal systems
- Passive-Active approach

During this work phase, the definition of the scenarios was continuously modified and deepened according to the feedback obtained during the reviews with the tutors and according to the comments obtained directly from the client.



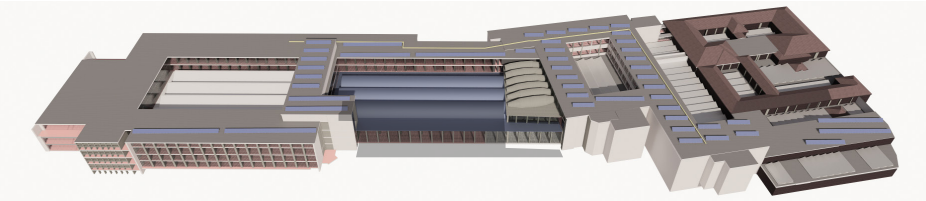
Accordingly, the scenarios were reduced to two, but with the clients' request to integrate passive strategies, which were the core of the third proposal, in the first two scenarios. Such operation required a further research analysis of passive techniques and how they take form in architecture, with the aim of selecting methods which would respect the identity of the heritage, as well as being coherent with the key-concept of each proposal.

Another challenge was that of trying to characterize the two scenarios who remain with clearly identifiable actions, following the same “fil rouge”. Such improvements determined several re-definitions of the proposals, aiming at a better quality and completeness.

SCENARIO 1							
Δ BENEFITS							
Δ COSTS		financial IRR	economic IRR	financial IRR	economic IRR	financial IRR	economic IRR
		Δ BENEFITS = 0		Δ BENEFITS = + 10%		Δ BENEFITS = + 70/80% (calculation of minimum annual revenue)	
	Δ COSTS = 0	/	8,07%	-15,36%	9,31%	7,45%	19,30%
	Δ COSTS = -20%	-11,71%	11,51%	-3,10%	13,26%		
	Leverage effect 50-50%	0,19%	13,15%	1,19%	14,12%		
	Leverage effect 60-40% + Δ COSTS =-20%	1,38%	16,16%	3,16%	17,90%		

SCENARIO 2							
Δ BENEFITS							
Δ COSTS		financial IRR	economic IRR	financial IRR	economic IRR	financial IRR	economic IRR
		Δ BENEFITS = 0		Δ BENEFITS = + 10%		Δ BENEFITS = + 100/120% (calculation of minimum annual revenue)	
	Δ COSTS = 0	/	1,02%	/	3,33%	7,45%	21,32%
	Δ COSTS = -20%	/	4,49%	/	6,68%		
	Leverage effect 50-50%	-5,82%	10,57%	-4,23%	11,48%		
	Leverage effect 60-40% + Δ COSTS =-20%	-4,70%	12,45%	-2,13%	14,12%		

Summary table of indications for the Costs-Benefits analysis

	SCENARIO 1	SCENARIO 2
	847 Units	493 Units
	1840 m²	1506 m²
		

Expected layout of photovoltaic modules on the rooftop of the building complex

### Exploring the opportunities

The opportunities of this site are related, most of all, to its glorious history, that can be taken as an example of innovation as well as the best subject to launch a cultural function to involve the local community in this project by providing the site with a permanent exhibition.

The fact that this site is part of the UNESCO heritage at first represented a difficulty

with which we had to cope, but this tutelage is also a resource for the cultural development of the area and the economic assets that the client can have access to.

Then, the architectural composition of the buildings is made of big open spaces and voids, which are suitable for different design solutions, for example, sub-dividing the spaces with autonomous units or with foldable walls. Moreover, the wide roofs became the perfect set for energy collectors, such as solar panels and piezoelectric innovative technology.

## Generating a solution

After completing the integrated evaluation of the two scenarios, it is possible to state which is the best-performing alternative, but it is also possible to point out the most useful observations identified by the team, in order to draw specific guidelines for the intervention.

First, among the two elaborated intervention proposals, the first one, based on a confined-comfort strategy leaving the existing envelope unaltered while inserting high-comfort sub-structures, results to be the most advantaging. Such a statement can be asserted considering that, even after the manipulation of the initial scenarios into different declinations, the first design proposal allows to reach positive results both under the financial and the economic points of view, while the second scenario, proposing the restoration of the entire envelope to allow flexible internal solutions, does not meet the minimum requirements to evaluate the profitable investment.

Regarding the design strategy, solutions should not be considered only in terms of the final performance, but they should also be selected according to the characteristics of the existing heritage, with the aim of respecting and possibly enhancing its original identity.

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