SUSTAINABLE PLACES 2022

Università degli Studi di Ferrara

Building Performance Simulators software for industrial regeneration projects: presentation of the Ex-SIR case study

Luca Morganti |

EX SIR RA

credit: L. Morganti & E. Lambertini

Building Performance Simulators software for industrial regeneration projects: presentation of the Ex-SIR case study

- International instances of sustainability and circular economy
- Industrial Archeology and Methodological recovery approach
- The Ex-SIR case study
- Application of the multiphysics simulation model
- Conclusions

SUSTAINABLE PLACES 2022

Building Performance Simulators software for industrial regeneration projects: presentation of the Ex-SIR case study

| International instances of sustainability and circular economy

| Industrial Archeology and Methodological recovery approach

| The Ex-SIR case study

| Application of the multiphysics simulation model

| Conclusions

SUSTAINABLE PLACES 2022

The built environment is a solution to climate change

Buildings responsible for around **40% of carbon emissions**

Buildings responsible for around **50% of extracted materials**

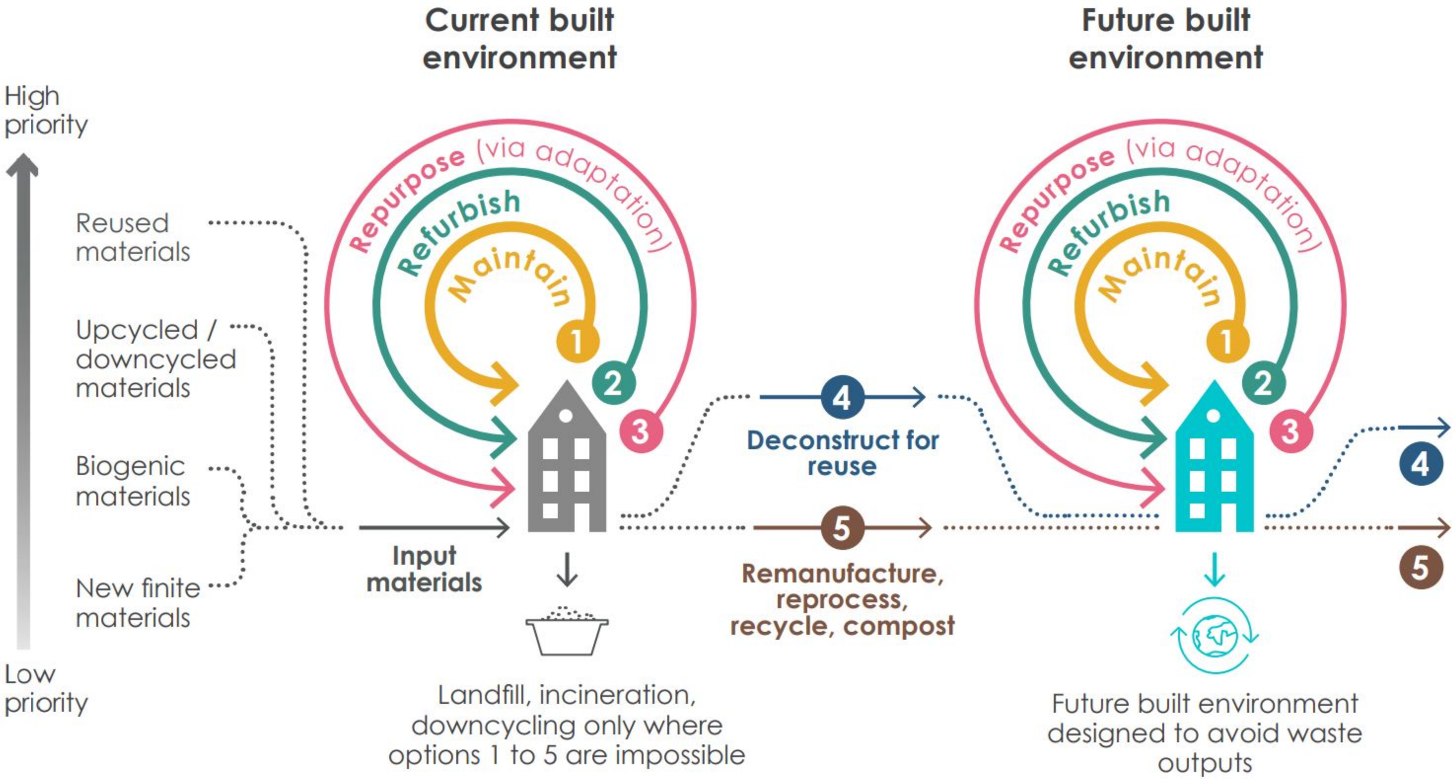
By 2060 the world's building stock will **double**

Time is running out

Reduce emissions now to meet a **1.5°C scenario**

credit: WORLD GREEN BUILDING COUNCIL

SUSTAINABLE PLACES 2022



credit:

LETI

SUSTAINABLE PLACES 2022

Building Performance Simulators software for industrial regeneration projects:
presentation of the Ex-SIR case study

| International instances of sustainability and circular economy

| Industrial Archeology and Methodological recovery approach

| The Ex-SIR case study

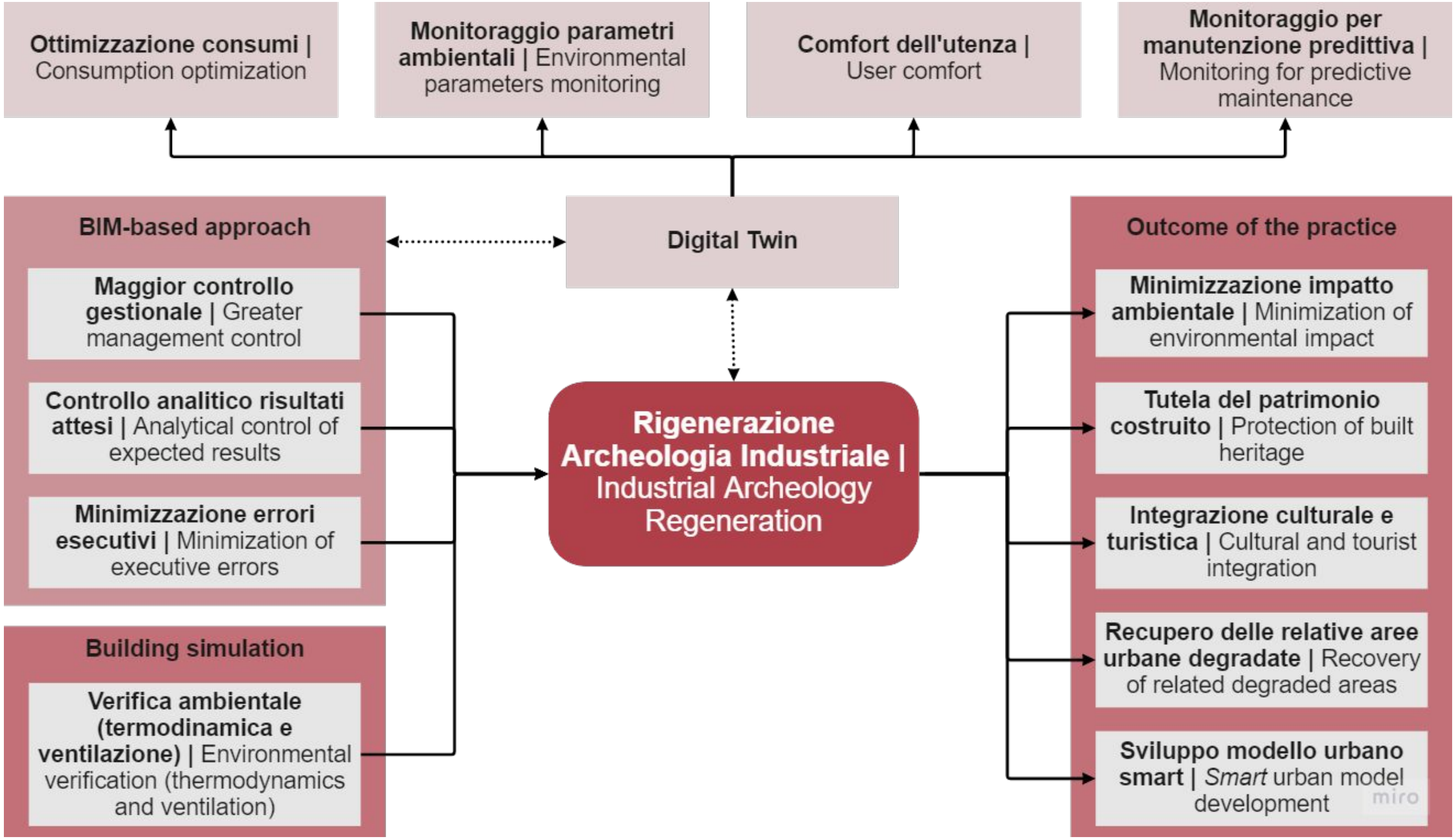
| Application of the multiphysics simulation model

| Conclusions

SUSTAINABLE PLACES 2022

credit: L. Morganti

SUSTAINABLE PLACES 2022



credit: L. Morganti

SUSTAINABLE PLACES 2022

Building Performance Simulators software for industrial regeneration projects: presentation of the Ex-SIR case study

| International instances of sustainability and circular economy

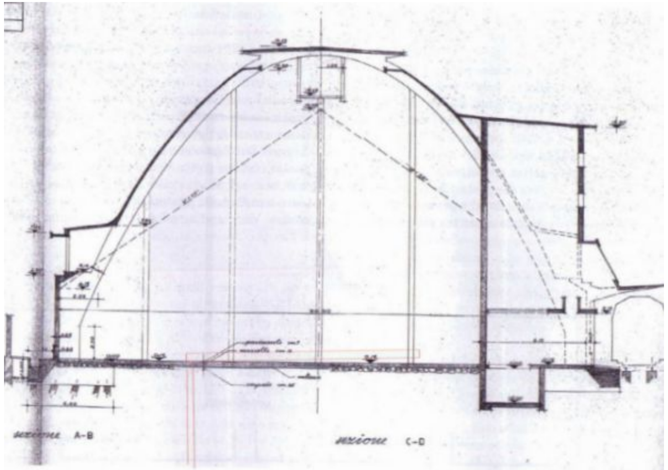
| Industrial Archeology and Methodological recovery approach

| **The Ex-SIR case study**

| Application of the multiphysics simulation model

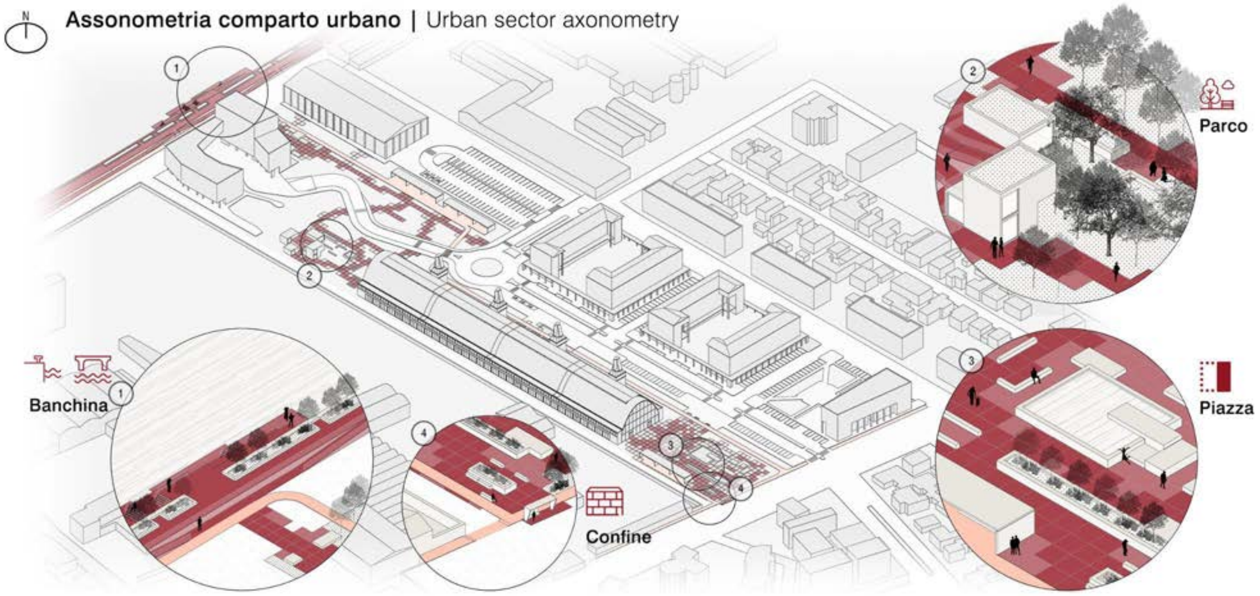
| Conclusions

credit: ph A. Villani | Società Interconsorziale Romagnola (SIR)



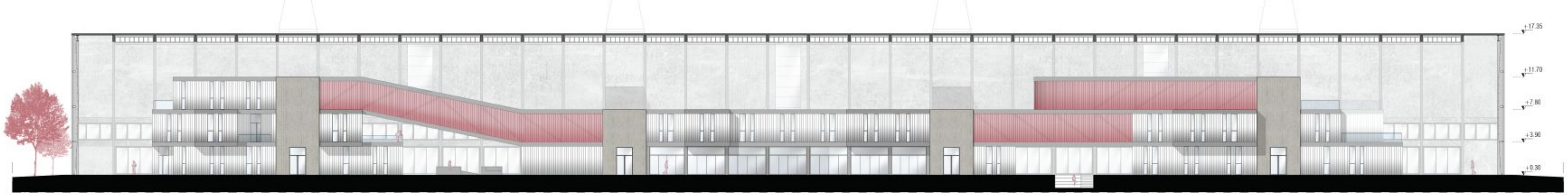
credit: Società Interconsorziale Romagnola (SIR) - 1956/1957

SUSTAINABLE PLACES 2022

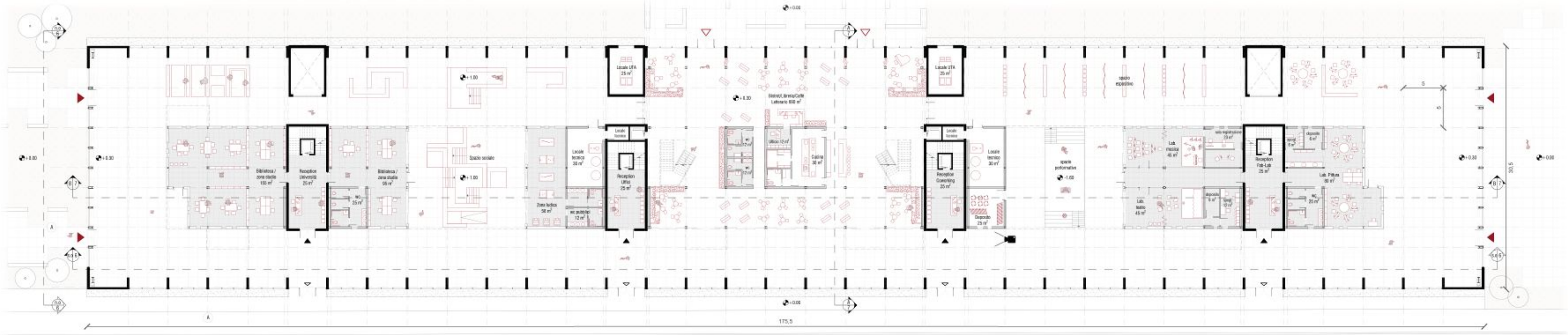


credit: L. Morganti & E. Lambertini

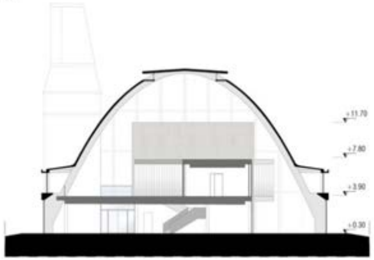
Prospetto inteno sud-ovest | Internal perspective south-west
Scala 1:250



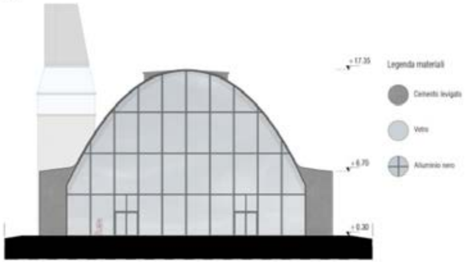
Pianta piano terra | Ground floor plan
Scala 1:200 - Quota: +1,50 m



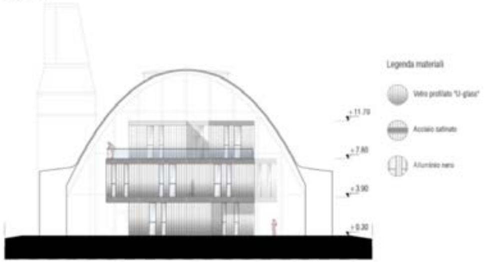
Sezione trasversale A-A | Transversal section A-A
Scala 1:250



Prospetto nord-ovest esterno | External perspective north-west
Scala 1:250

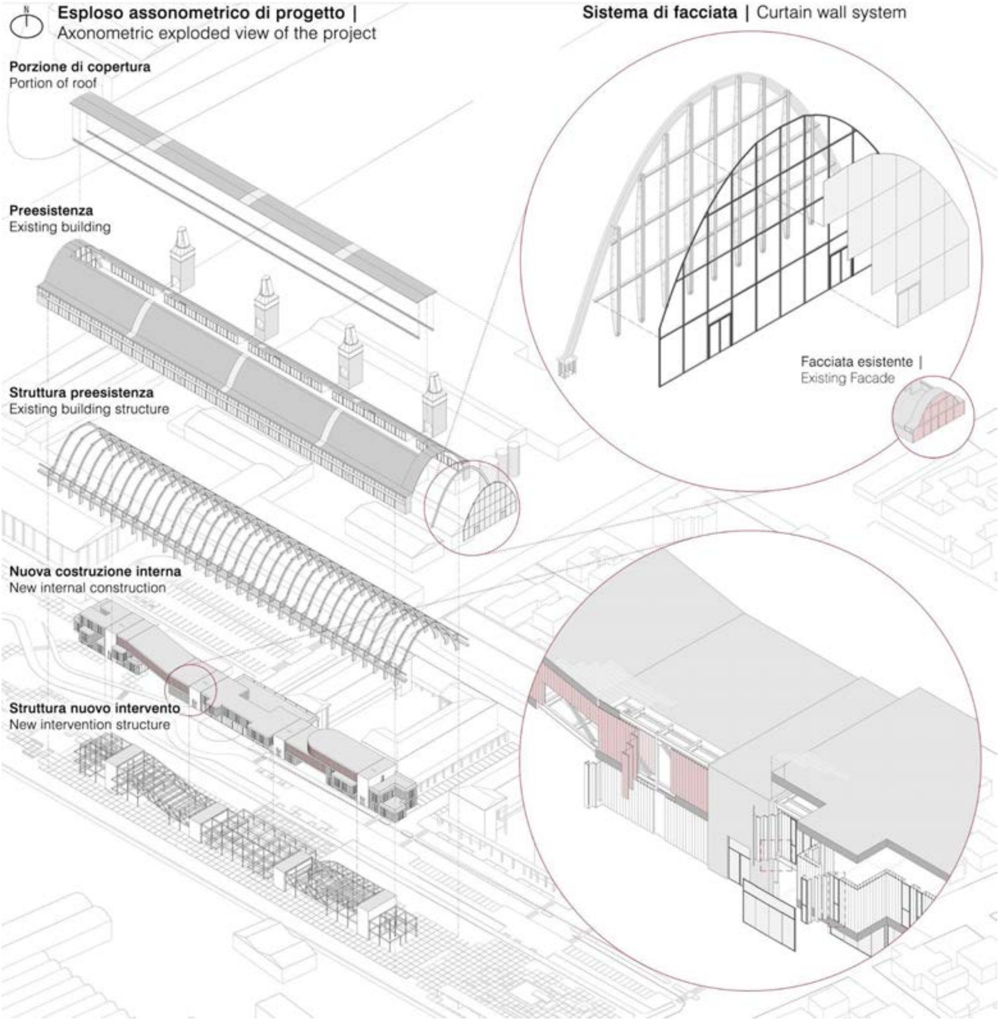


Prospetto inteno nord-ovest | Internal perspective north-west
Scala 1:250



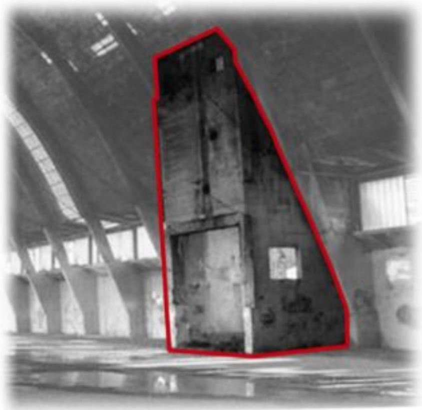
credit: L. Morganti & E. Lambertini

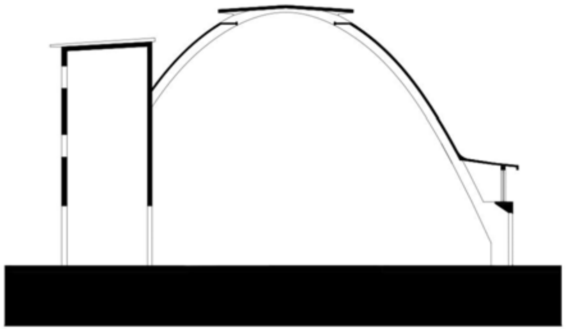
SUSTAINABLE PLACES 2022

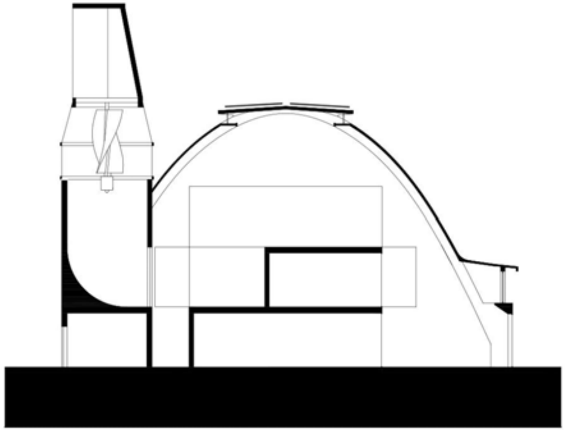


credit: L. Morganti & E. Lambertini

SUSTAINABLE PLACES 2022







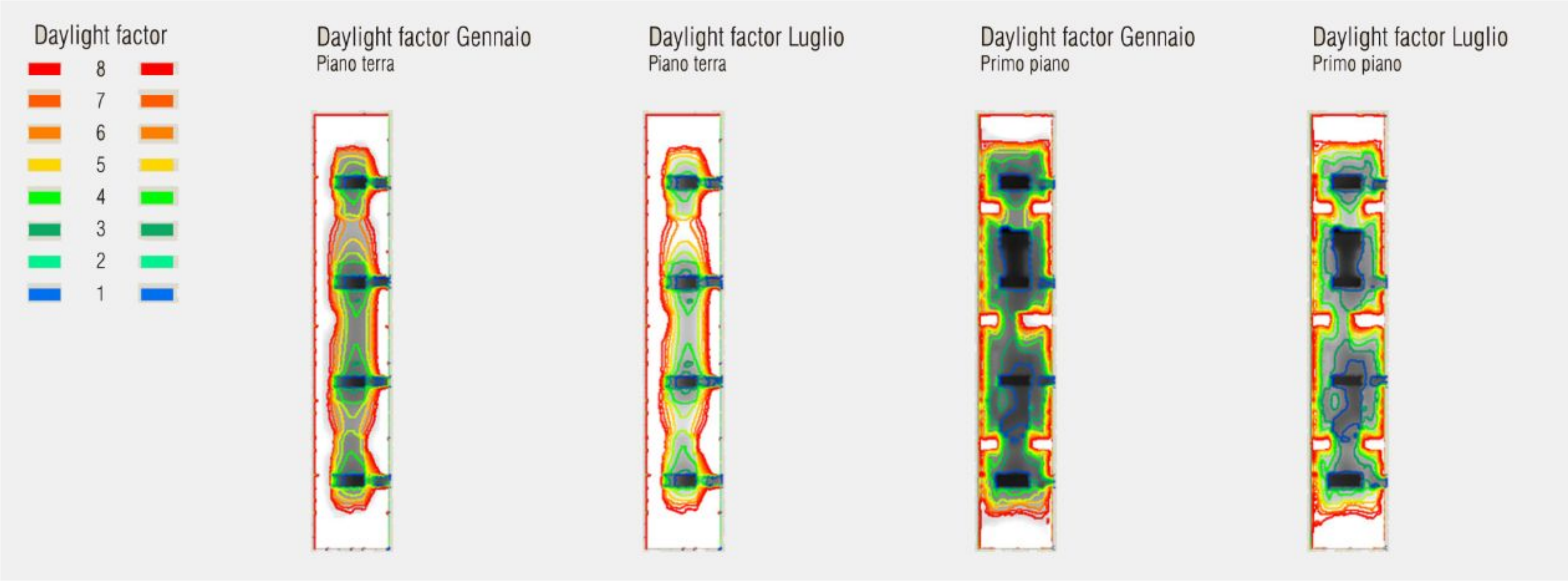
credit: L. Morganti & E. Lambertini

SUSTAINABLE PLACES 2022

Building Performance Simulators software for industrial regeneration projects: presentation of the Ex-SIR case study

SUSTAINABLE PLACES 2022

| Daylight factor simulation



Daylight Visualizer

credit: L. Morganti

SUSTAINABLE PLACES 2022

| Multiphysics simulation

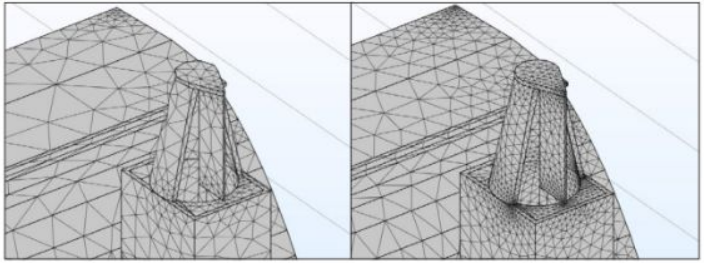
| Multiphysics simulation

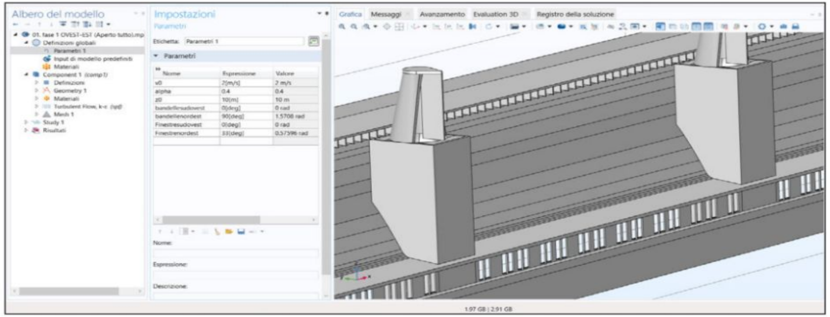
The analysis was divided into three distinct phases:

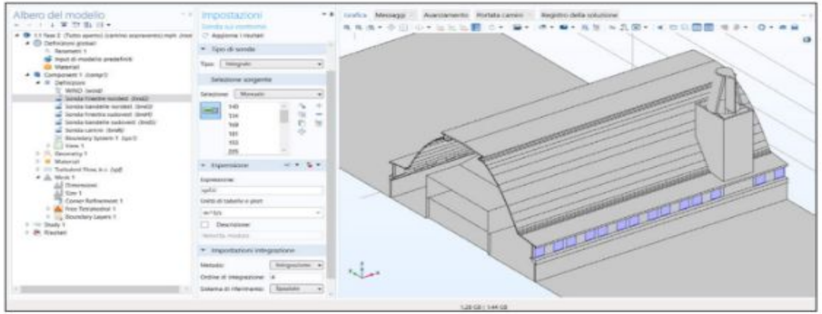
1 | feasibility study,
in which the possibility to work with passive environmental systems has been verified, considering the shape of the pre-existence in its climatic context.

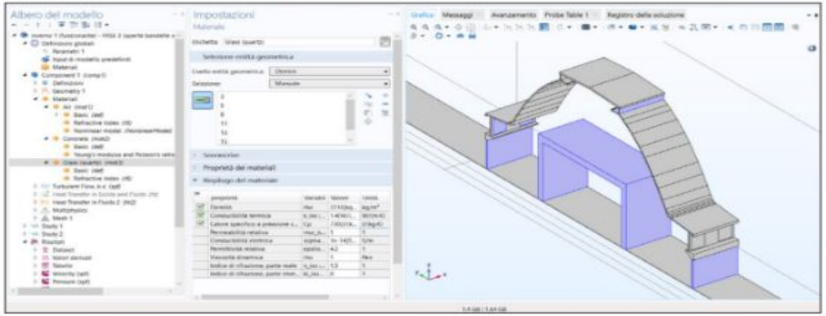
2 | numerical study,
in which the flow rates of moving air were quantified by comparing them with those necessary for the project

3 | thermodynamic study,
aimed at verifying the hypothesized advantages due to the multiplicity of casings.



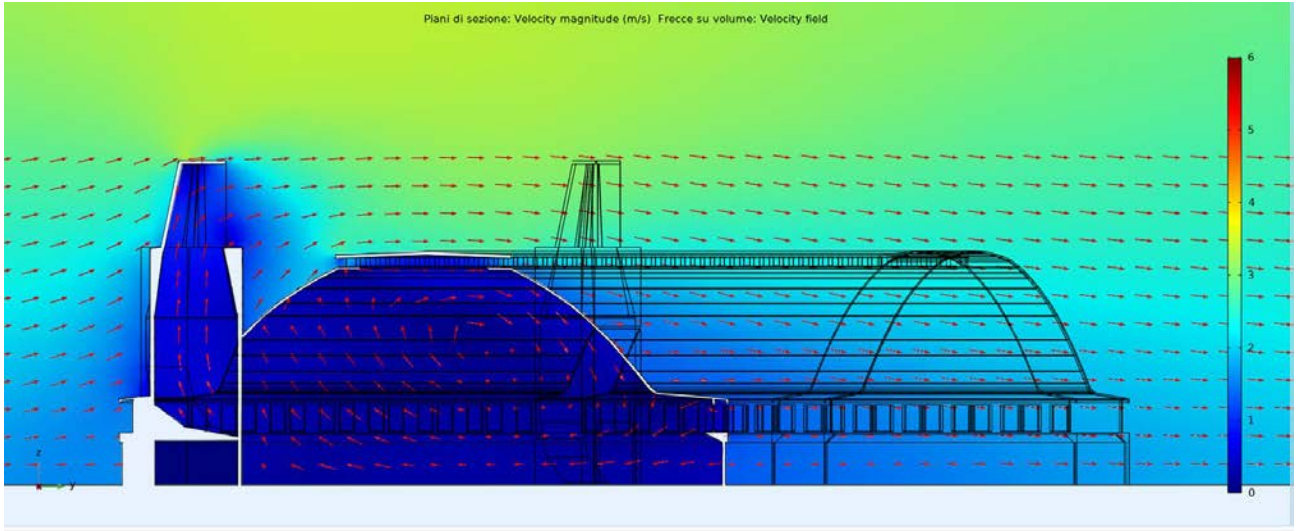






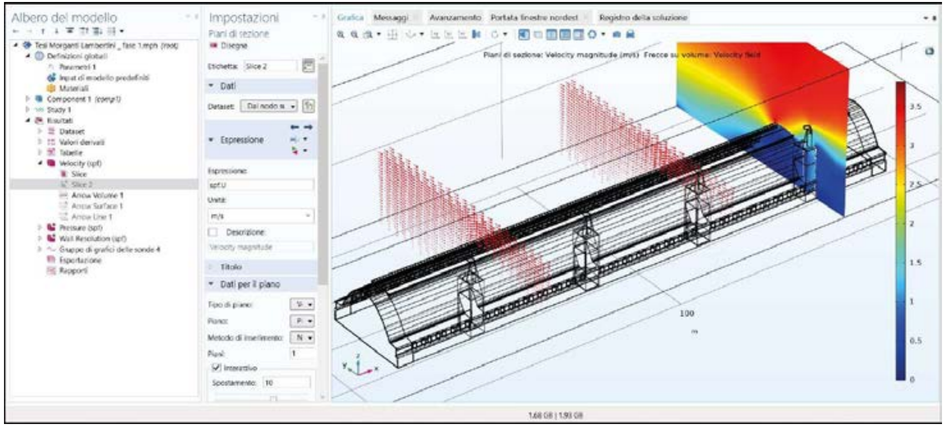
credit: L. Morganti

SUSTAINABLE PLACES 2022

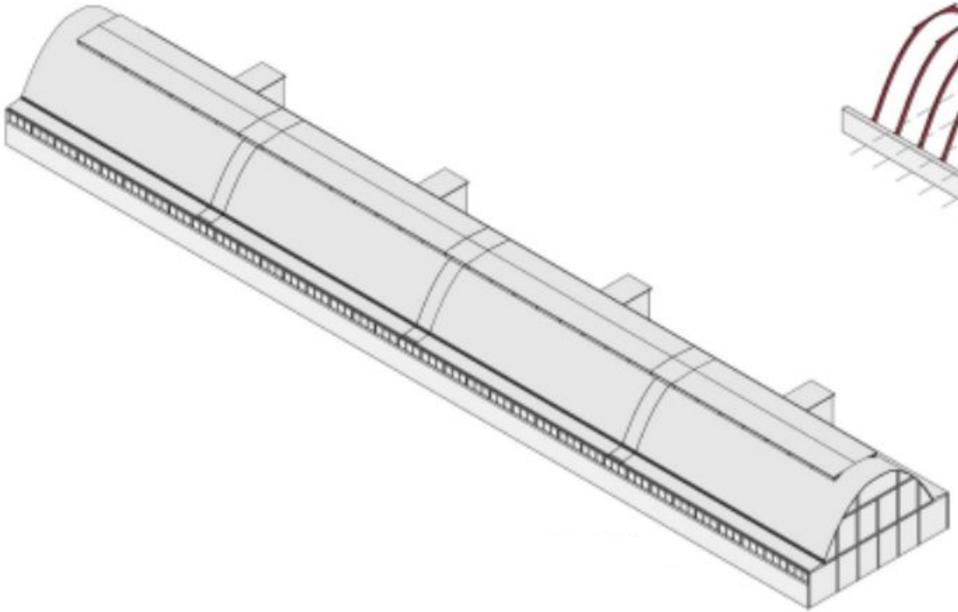


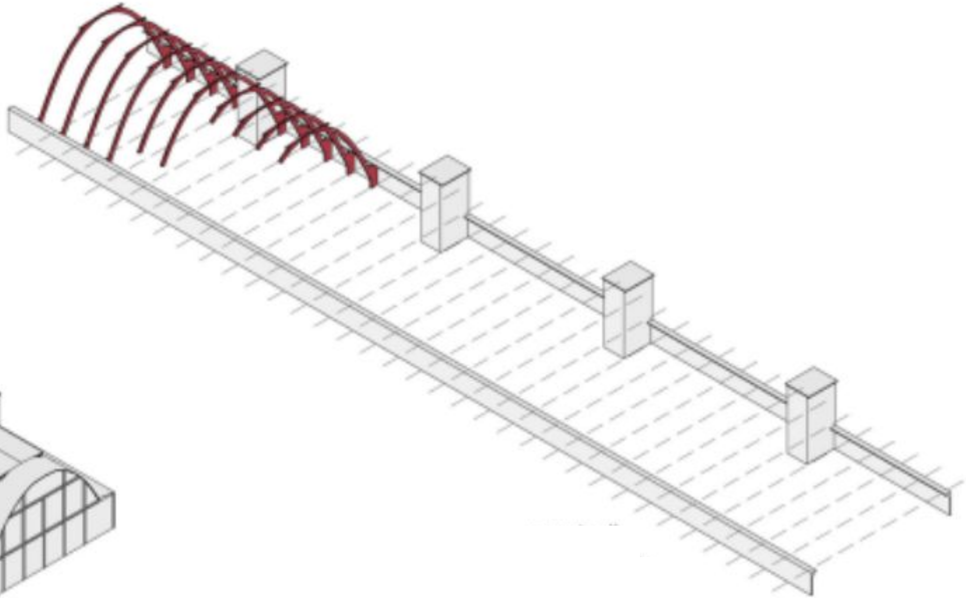
Phase one simulation:

45° inclined section of the paraboloid passing over a wind chimney



SUSTAINABLE PLACES 2022





| Min volumetric flow rate

Q (interno) =2,61E+00 m^3/s
Q (spazio intermedio) =2,61E+00 m^3/s

Qtot (Ex-Sir) = 3,61E+00 m^3/s

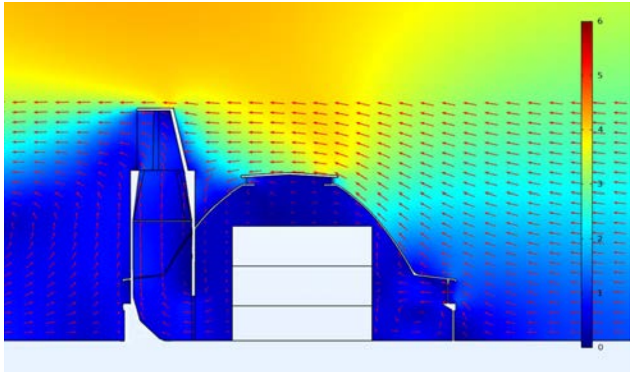
Q (per single bay) = 1,10E-01 m^3/s

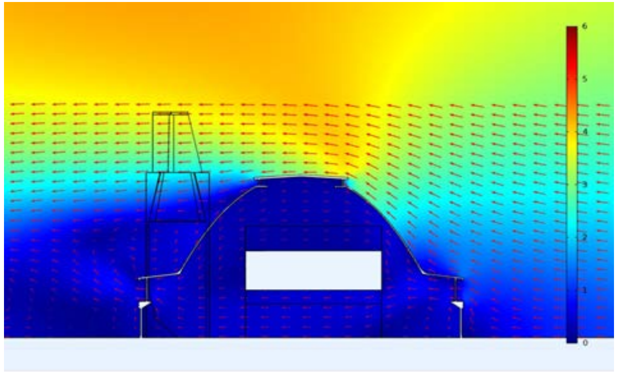
SUSTAINABLE PLACES 2022

	In / Out	Velocity magnitude [m/s]	Flow rate per bay [m³/s]
N-E Windows sensor	Out	4,33E+01	5,41E+00
S-W Windows sensor	In	6,67E+01	8,34E+00
N-E Upper ribbon window sensor	Out	6,90E+01	8,62E+00
S-W Upper ribbon window sensor	In	6,61E+01	8,27E+00
Wind tower sensor	Out	2,22E+01	2,69E+00
		Total input per bay [m³/s] =	**1,66E+01**
		Δ In and Out [m³/s] =	-1,20E-01
		Relative error in the measurement =	0,72%

Phase two simulation:

Orthogonal section of the paraboloid passing over a wind chimney and passing through the raised volume. Summary of the results obtained from the measurements of the incoming (In) and outgoing (Out) air flows.



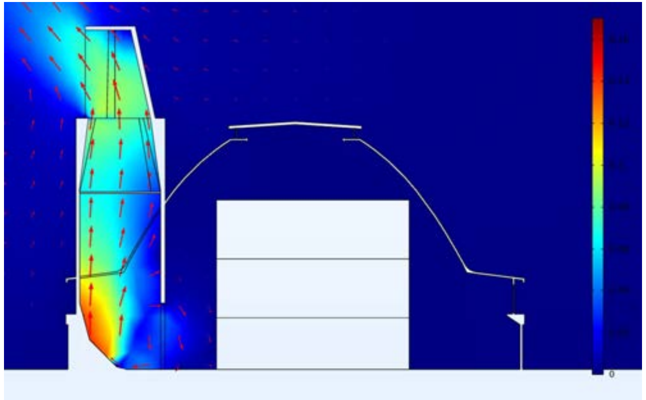


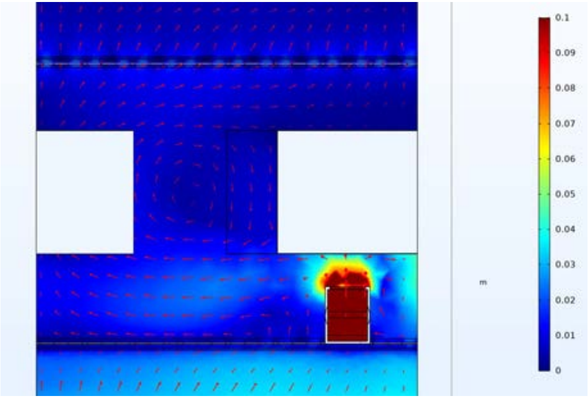
credit: L. Morganti

	In / Out	Velocity magnitude [m/s]	Flow rate per bay [m³/s]
N-E Windows sensor	In	4,16E-02	5,20E-03
S-W Windows sensor	In	5,83E-02	7,28E-03
N-E Upper ribbon window sensor	In	2,46E-02	3,07E-03
S-W Upper ribbon window sensor	In	2,40E-02	3,00E-03
Wind tower sensor	Out	1,19E+00	1,45E-01
		Total input per bay [m³/s] =	**1,45E-01**

Phase two simulation:

Orthogonal section of the paraboloid passing over a wind chimney and ground floor plan. Summary of the results obtained in still wind conditions.



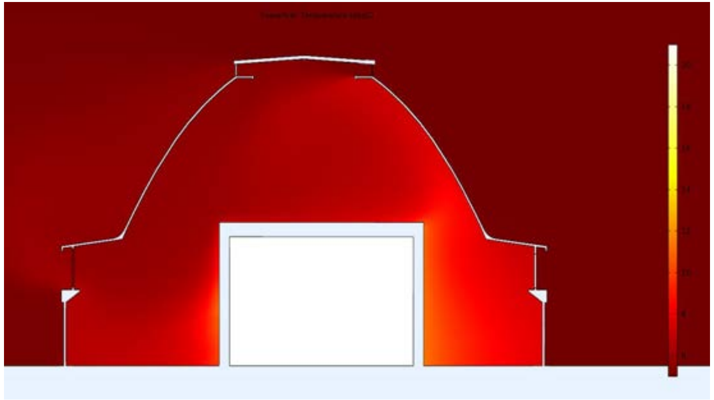


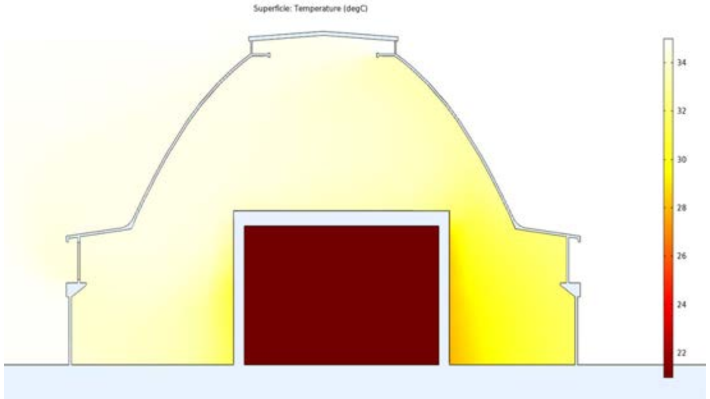
credit: L. Morganti

	In / Out	**Flow rate per bay** [m³ / s]	
N-E Windows sensor	Out	1,00E-01	
S-W Windows sensor	/	/	
N-E Upper ribbon window sensor	/	/	
S-W Upper ribbon window sensor	In	1,21E-01	
	Total input per bay [m³/s] =		**1.21E-01**
	T med [°C]	**T Max** [°C]	**T min** [°C]
Winter temperature sensor (Text = 5°C)	**6,9**	**11,4**	5,0
Summer temperature sensor (Text = 35°C)	**33,3**	35,0	**27,9**

Phase three simulation:

Summer and winter thermodynamic analysis. Summary of the results obtained.





credit: L. Morganti

SUSTAINABLE PLACES 2022

Building Performance Simulators software for industrial regeneration projects: presentation of the Ex-SIR case study

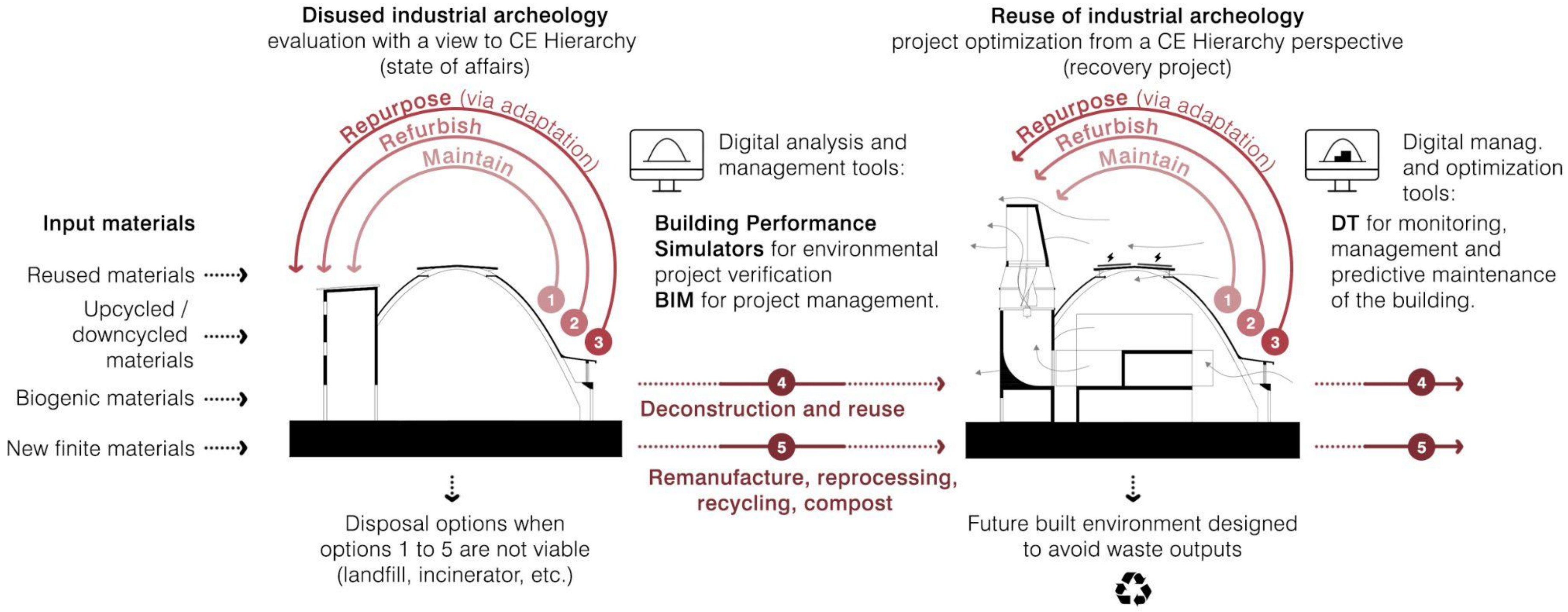
| International instances of sustainability and circular economy

| Industrial Archeology and Methodological recovery approach

| The Ex-SIR case study

| Application of the multiphysics simulation model

| **Conclusions**



credit: LETI, reworked by L. Morganti

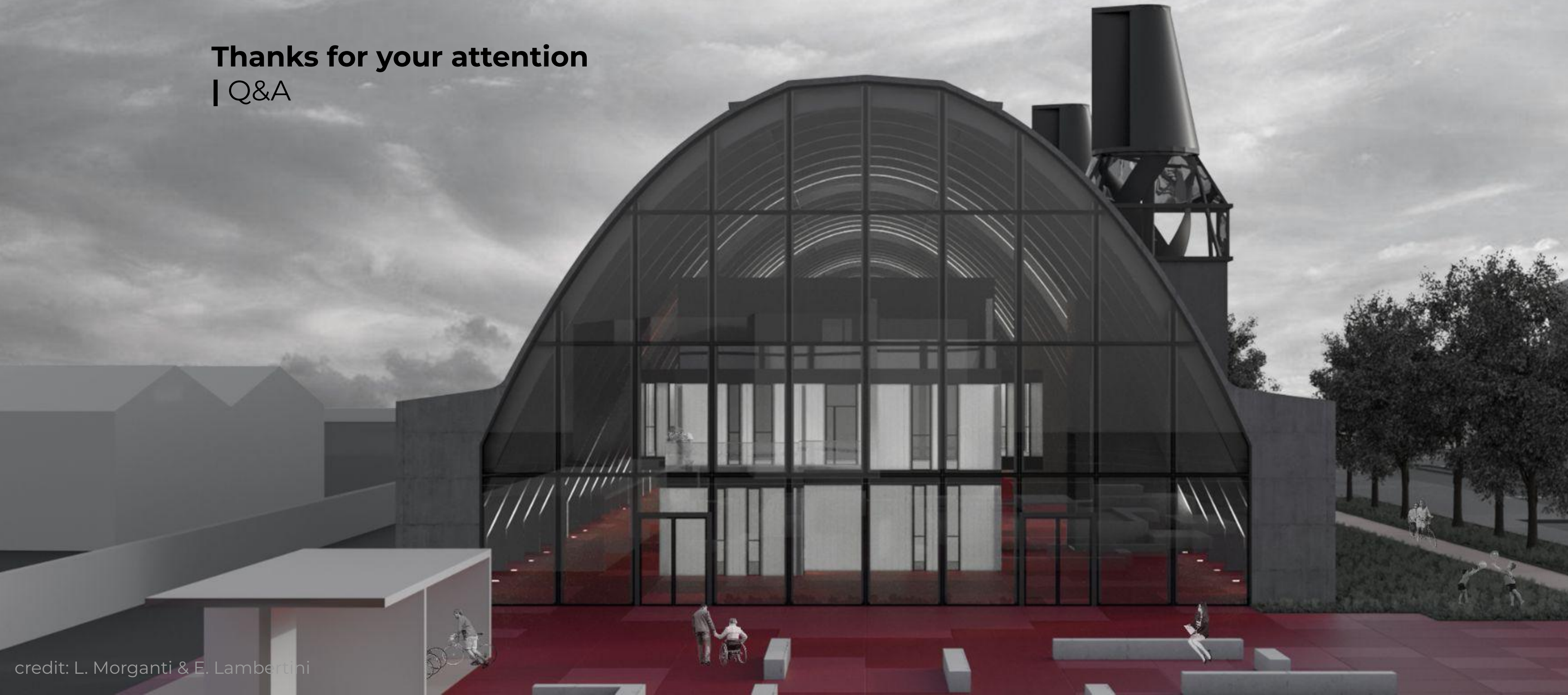
SUSTAINABLE PLACES 2022

SUSTAINABLE PLACES 2022

Università degli Studi di Ferrara

Thanks for your attention

| Q&A



credit: L. Morganti & E. Lambertini