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Renovating and preserving the built heritage: The interdisciplinary issues and challenges of a European project (CALECHE)

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CALECHE: A collaborative european project

CALECHE (Co*herent Acceptable Low Emission Cultural Heritage Efficient renovation*) is an Horizon Europe project launched in October 2023.

Mission: Develop methods that respect the heritage value of historic buildings while improving energy efficiency and reducing environmental impact.

A network of European partners and experts including architects, engineers, historians, scientists, and industry professionals.

Common Goal: « To make European historic buildings more livable, more accessible, and more environmentally sustainable ».

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European Partnership Network

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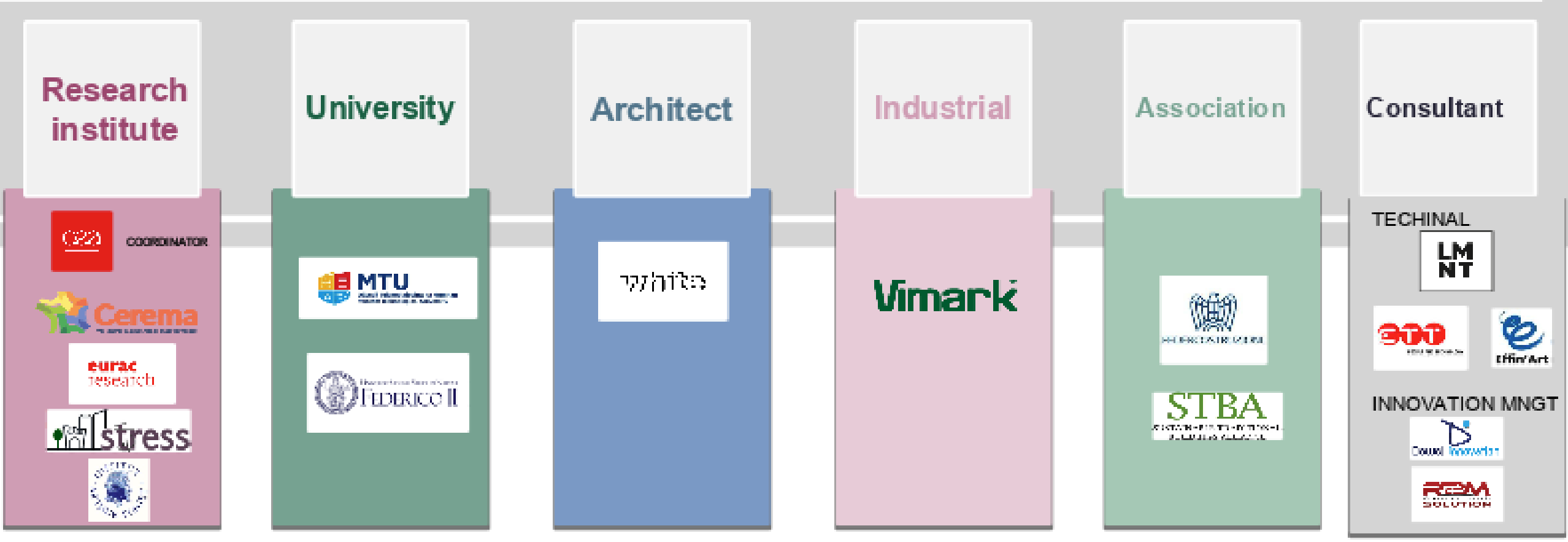

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Caleche's objectives

Balancing heritage and energy efficiency: Balancing preservation of historic value with modern energy needs.

Interdisciplinary collaboration: Bridging the gap between engineers, architects and historians with different methodologies and perspectives.

Communication challenges: Overcoming terminology and language barriers between disciplines.

Caleche's challenges

Heritage conservation: Historic buildings are key to preserving cultural history and community identity.

Contribution to the environment: Renovated historic buildings can be more environmentally friendly than new buildings by reducing resource consumption.

Technical challenges: Integrating modern technology while maintaining architectural integrity is a complex task.

The importance of heritage conservation:

- Conservation is more than just preserving old buildings; it preserves the cultural memory and historical identity of communities.
- Historic buildings link the past with the present, serving as witnesses to centuries of history, art and culture.
- Heritage conservation contributes to environmental integrity: maintaining existing structures often requires fewer resources and less energy than new construction.
- CALECHE focuses on improving the energy efficiency of historic buildings, preserving their aesthetic and cultural value while making them more environmentally sustainable.

Key challenges of historic buildings

- Ageing: Historic structures face progressive deterioration due to time and environmental factors.
- Attractiveness is challenged: Declining aesthetic appeal as buildings age and become neglected.
- Increasing environmental pressures: stricter environmental regulations demand more sustainable solutions.
- Rising energy costs: Historic buildings struggle with high energy consumption and inefficiency, adding to running costs.

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The CALECHE project has selected 4 use-cases across Europe to demonstrate the viability of its innovative approaches to sustainable renovation

1. Villa Matarazzo, located in Ercolano near Naples, exemplifies late 19th-century neoclassical residential architecture.

2. La Chaux-de-Fonds, Switzerland

A UNESCO World Heritage site since 2009, is a Swiss town renowned for its centuries-old watchmaking heritage, whose urban planning was reimagined after a major fire in 1794 to meet the industry's needs.

3. Donner House, Visby, Sweden, on the island of Gotland (Sweden).

A historic building dating back to the 12th century, originally a medieval warehouse, later transformed by the influential Donner family, and now serves as a cultural and architectural symbol reflecting Visby's evolution from a Hanseatic trade hub to a modern tourist center.

4. The former Museum-Library of the city of Grenoble, France.

Built between 1864 and 1870. A prominent example of 19th-century public architecture, reflecting Grenoble's ambitions during its industrial and cultural expansion.

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Interdisciplinary challenges

Conservation versus energy efficiency: balancing heritage conservation with modern energy solutions.

Interdisciplinary collaboration: engineers, architects, historians and energy experts working together with different priorities.

Communication challenges: navigating complex, multilingual terminology to ensure consensus.

Two concrete examples of interdisciplinary work :

A critical literature review

A multilingual and multi-perspective lexicon: objectives and challenges

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A critical literature review: deepening knowledge of multi-benefit approaches

1. Identifying and prioritising values/benefits:

- Which criteria are relevant? How can they be prioritised?
  - Which building values and user impacts should be considered?

2. Decision-making in a multi-benefit framework:

- How are decisions made?
- Who are the key stakeholders?
- What are their main challenges?

Results of the critical literature review

1. Prioritisation of benefits:

- Key benefits: historic preservation, energy efficiency and user comfort.
- Social, cultural and economic impacts ranked according to stakeholder views.

2. Challenges in multi-benefit decision making:

- Balancing priorities between conservation and energy needs.
- Multiple stakeholders often lead to trade-offs.

3. Best practices identified:

- Prioritise collaborative decision making with clear criteria.
- Involve local communities to ensure sustainable outcomes.

We selected 35 key terms from the project proposal, based on relevance, need for explanation, and frequency of use.

These terms are grouped into categories such as technical, cultural heritage, and energy efficiency concepts.

Approach
- co-design
- energy retrofit
- historic windows retrofit
- inclusiveness
- retrofit
- whole house/building approach to retrofit

CALECHE-specific
- decision support system
- historical renovation hub
- stakeholder

Concept
- cultural heritage
- durability
- energy performance
- multi-benefit
- scenario
- system
- value

Methodology
- Building Information Modelling
- Heritage Building Information Modelling
- Life Cycle Assessment / Analysis
- multi-benefit evaluation
- use-case

Process
- refurbishment
- renovation
- restoration
- stakeholder engagement

Product
- interior bio-insulation
- photovoltaic modules

Technology-related
- artificial intelligence
- machine learning

Tool
- decision tree
- heritage regulations
- mock-up
- renovation passport
- sample box
- user-story mapping

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A multilingual and multi-perspective lexicon: goals and challenges

1

Identification of best practice:

Recommendations that balance sustainability, cost-effectiveness and respect for cultural values.

2

Facilitating dialogue:

Bridging the terminological gap between historians, engineers and architects.

3

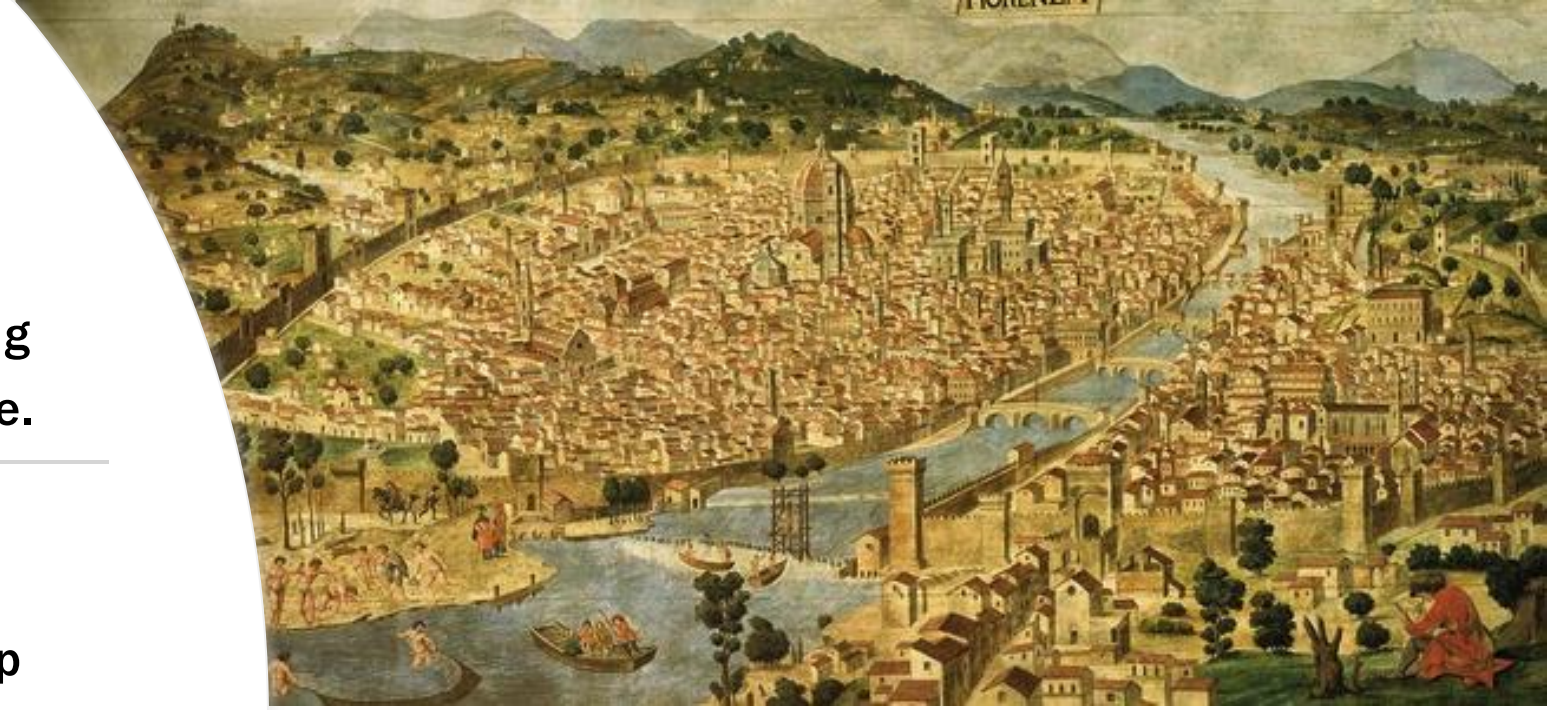
Interdisciplinary understanding:

Promoting a deeper understanding of each discipline for effective collaboration.

CALECHE project is more than just a renovation effort — it is a model for how Europe can preserve its past while meeting the environmental challenges of the future.

I encourage you to stay engaged with our work, as the results of this project will help shape the future of historic building renovation across Europe.

https://calecheproject.eu



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THANK YOU!

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