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3ENCULT

Efficient Energy for EU Cultural Heritage

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www.3encult.eu

Daniel Martin (CARTIF)

danmar@cartif.es

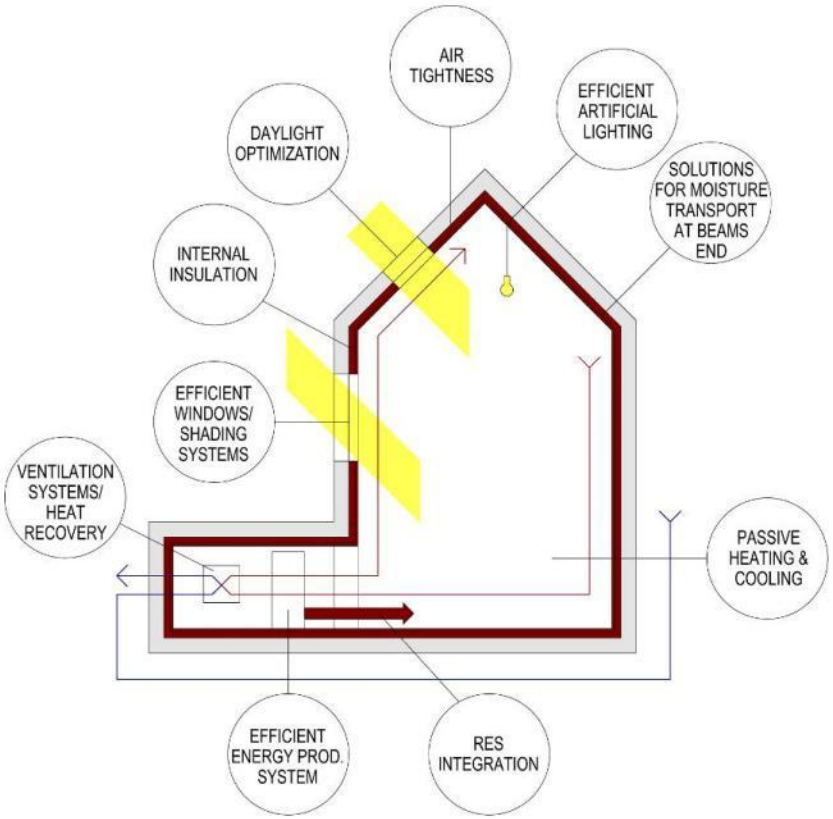
Historic buildings

Talking in numbers:

- 150 towns & urban fragments are World Cultural Heritage sites
- 55 million dwellings, home to 120 million Europeans, were built before 1945
- they need 1400 TWh of energy and emit 300 Mt of CO_2 (estimation)
- contribute to the income from tourism – which stands for 5.5% of EU GDP and employs 6% of EU workforce

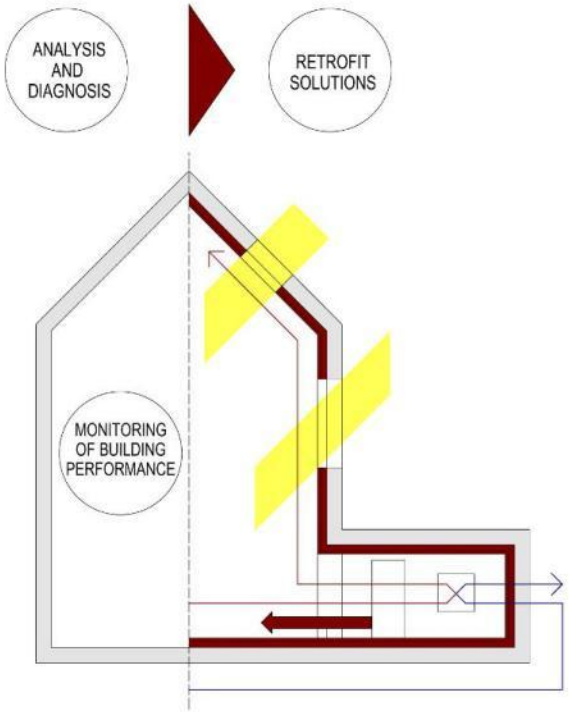
- Energy reduction is achievable,
  also in historic buildings, respecting their heritage value, if a multidisciplinary approach guarantees the implementation of high quality interventions, specifically targeted and adapted to the specific case

Objective 1: Passive and active energy retrofit solutions



- Develop passive and active solutions, as result of **open and constructive dialogue** among stakeholders in several fields
- starting with materials and products already **available** on the market and from solution already applied for new buildings.
- This with the aim to ensure the **widest possible dissemination** of the achieved results all around Europe

Objective 2: Diagnosis and Monitoring instruments



Define **diagnosis and monitoring instruments**

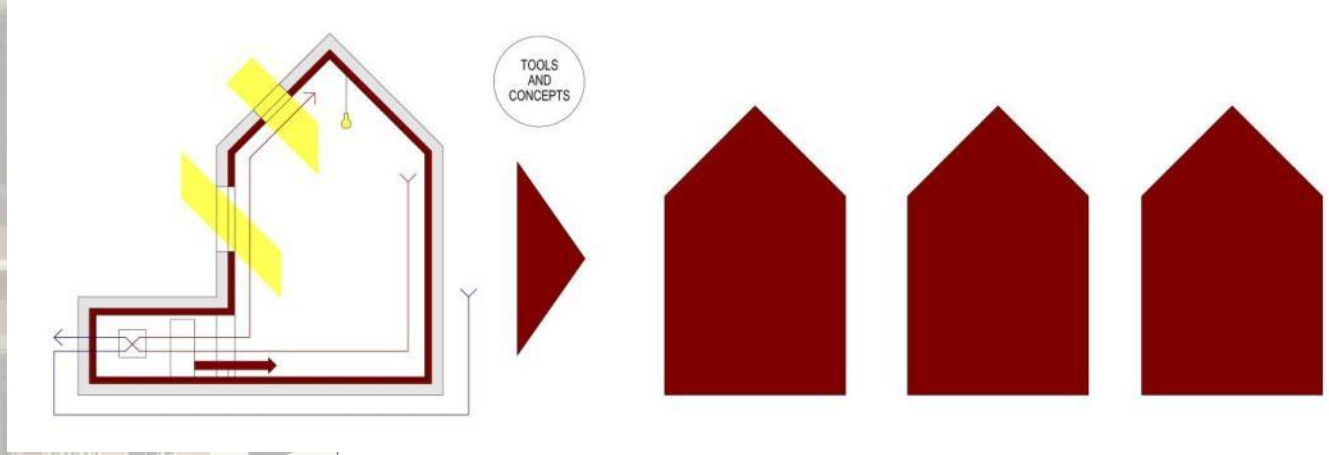
- to study historic buildings and find out the best technological and constructive energy retrofit solutions,
- to support their commissioning,
- to assess the actual performances of buildings once retrofitted and
- to monitor such performance.

Objective 3: Tools and concepts - the urban context

Develop **tools and concepts**

- supporting the implementation in other urban context,
- ensuring their effective transferability to historic buildings.

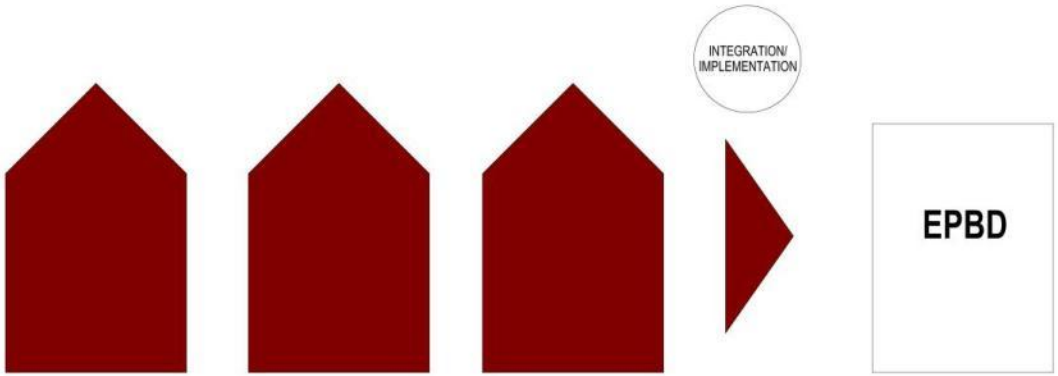
→ calculation software, solutions inventories, dedicated internet portal, monitoring systems, assessment approaches.



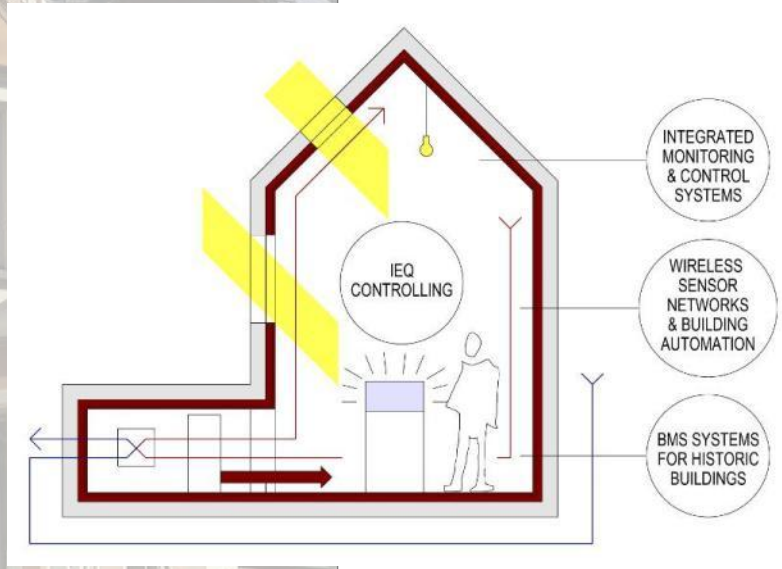
Objective 4: Integration of the present regulation framework

Issue position papers suggesting possible **integrations and/or implementations of the present regulation framework** for improving energy efficiency of historic building in urban areas and in particular

- EPBD - Energy Performance of Building,
- EIA as well as the SEA Directives and SUIT guidelines



Objective 5: IEQ controlling



- Define a methodological approach in order to use the developed monitoring system also for **IEQ controlling** in historic buildings where cultural heritage collections are located.

- comfort for users and
- “comfort” for heritage collections,

Project Consortium

The direct project partners cover:

- Conservation experts
- Technical experts
- Urban development experts
- Industry partners
- Implementation experts and stakeholder associations

Furthermore **Local Case Study Teams**, with one project partner as focal point and scientific partner, gather building owner, representatives from the offices for the protection of historic monuments, representatives from other local bodies concerned (e.g. city council) as well as the architects and engineers in charge of the retrofit works

Project Consortium

			Country	Status of organisation: Research	Public body	Association	SME	Industry	other	Case study	Role: "Technical solutions"	"Urban context"	"Conservation"	"Dissemination"
1	EURAC research	EURAC	IT	x						x	x			
2	The Royal Danish Academy of Fine Arts	KA	DK	x						x		x		
3	IDK	IDK	DE				x						x	
4	Universität Innsbruck	UIBK	AT	x						x	x			
5	ARUP	ARUP	UK					x			x			
6	Universität Darmstadt	TUDA	DE	x							x			
7	Cartif	CARTIF	ES	x							x			
8	Bartenbach Lichtlabor	BLL	AT				x				x			
9	TU Dresden	TUD	DE	x						x	x	x	x	
10	Comune di Bologna	COBO	IT		x					x		x		
11	Passivhaus Institut	PHI	DE				x				x			
12	TNO	TNO	NL	x										x
13	Alma Mater Studiorum - Università di Bologna	UNIBO	IT	x						x	x		x	
14	Artemis	ARTEMIS	IT				x						x	
15	Elettronica Gelbison	GELBISON	IT				x				x			
16	Grupo Unisolar	G1S	ES				x				x			
17	Menuseries Andre	ANDRE	FR				x				x			
18	Remmers	REMMERS	DE					x			x			
19	ATREA s.r.o.	ATREA	CZ				x				x			
20	youris	youris	BE						x					x
21	ICLEI	ICLEI	EU			x						x		x
22	REHVA	REHVA	BE			x								x

Case studies

- The research activities are **accompanied** and **stimulated** by the involvement of eight case studies.
- At the same time, the different case studies will allow the **assessment** of the developed solutions.
- From here an analysis will be conducted to generalize the found solutions, identify **replicable factors** and the context where replication is possible.

- 3ENCULT will contribute to the **diagnosis**, **support the design** and planning phase and **give feedback** with its monitoring
- The project can, however, **not** contribute financially to the **intervention itself**.

It was thus important to select case studies, where the **owners are committed** to implement dedicated solutions and where the planned intervention's time schedule matches the project's time schedule.

Case studies – selection criteria

- **DIFFERENT KINDS OF UTILISATION**

  Reflects typical utilisations in urban areas and ranges from **residential** use over **commercial** and **office** use to **educational** use for a school and university. Furthermore, in order to cover also the special case of the preservation of cultural heritage collections in historic buildings, a building with **museum** use was also inserted, in several other buildings the preservation of frescoes in the interior is an issue.

- **DIFFERENT KINDS OF BUILDING STRUCTURE AND EPOCH**

  The buildings date from **different epochs** – ranging from middle age (13th century) to the 20th century. As regards the buildings structure, the most common types ranging from **stone**, over **masonry** and **clinker** to **wooden** structures are covered. Both very "heavy" buildings with **high thermal inertia** are present and lighter constructions with **large transparent areas** – having both their specific advantages and issues.

CS1: Public weigh house Bolzano (IT)

- **Object**
  Building of Romanesque origins (**13th century**). Rehabilitation intervention necessary. Use: commerce, residential, (exhibition). Owner: Stiftung Südtiroler Sparkasse (foundation)
- **Proposed activities**
  - diagnosis & support for architecture competition
  - support during planning phase (insulation, windows, energy system)
  - transfer to concept on urban scale

CS2: Palazzo d'Accursio Bologna (IT)

- **Object**
  13th century nucleus, developed over centuries. Use: museum, public administration. Owner: Comune di Bologna
- **Proposed activities**
  - diagnosis & NDT
  - support during planning phase (insulation, windows, HVAC, lighting)
  - transfer to concept on urban scale

CS3: Palazzina della Viola Bologna (IT)

- **Object**
  15th century, lightened by double open gallery, enriched with frescoes and painted wooden ceilings. Intervention and functional requalification planned. Use: university. Owner: University of Bologna
- **Proposed activities**
  - diagnosis & NDT,
  - modelling
  - verification of intervention results

CS4: Material Court of the Fortress (DK)

- **Object**
  Constructed in **18th century**. Energy retrofit pilot project in course. Owner: Realea A/S
- **Proposed activities**
  - monitoring
  - control and energy provision measures

CS5: Siegmair School Innsbruck (AT)

- **Object**
  Building constructed in 1960s, listed for architectural reasons. Mural paintings from Rehm, Diesner, Berger, Honeder et al. High energy demand (400kWh/m²a), severe overheating, air quality and moisture problems. Use: School. Owner: Innsbrucker Immobilien GmbH&Co KG
- **Proposed activities**
  - highly efficient passive house windows with integrated shading
  - external insulation of walls and roof
  - ventilation system with heat recovery

CS6: Warehouse City Potsdam (DE)

- **Object**
  Schinkelspeicher (19th century), refurbishment already completed, monitoring data available to 3ENCULT. Persiusspeicher (17th century), refurbishment planned. Use: Residential, offices, exhibition. Owner: Speicherstadt Potsdam
- **Proposed activities**
  - diagnosis of historical constructions
  - development of energy efficiency solutions (insulation, windows, energy system)

CS7: Engineering School – Béjar (ES)

- **Object**
  Building constructed in 1968s, listed for architectural and climate reasons. High temperature in rooms and corridors during the summer months. Use: Engineering School. Owner: Universidad de Salamanca.
- **Proposed activities**
  - Monitoring System.
  - RES Integration: PV and Thermal Solar. Daylighting.
  - Building Management System.

CS8: Strickbau Appenzell (CH)

- **Object**
  Farmhouse (19th century), will be demolished for economics aspect, missing of comfort and lack of modernization potential. Use: Residential. Owner: Farmer
- **Proposed activities**
  - internal insulation, airtighness, moisture problems.
  - monitoring system and controlling strategies.

Strategic impact

3ENCULT HELPS IMPLEMENT THE EU ENVIRONMENTAL IMPACT ASSESSMENT DIRECTIVES WHEN APPLIED TO HISTORIC BUILDINGS

- Enhancement hypothesis for SUIT "Summary Guidance and the Active Conservation principle", introducing energy issues and more detailed standard references and thresholds in a well framed methodological approach.

3ENCULT CONTRIBUTES TO EUROPEAN ENERGY POLICY

3ENCULT SUPPORTS THE STRATEGIC RESEARCH AGENDA OF THE EUROPEAN CONSTRUCTION TECHNOLOGY PLATFORM (ECTP) AND ITS FOCUS AREA IN CULTURAL HERITAGE (FACH)

Thank you for your attention!

For further information:

Daniel Martin & Daniel Garcia, Cartif
danmar@cartif.es / dangar@cartif.es

Coordinator:
Alexandra Troi, EURAC research
alexandra.troi@eurac.edu