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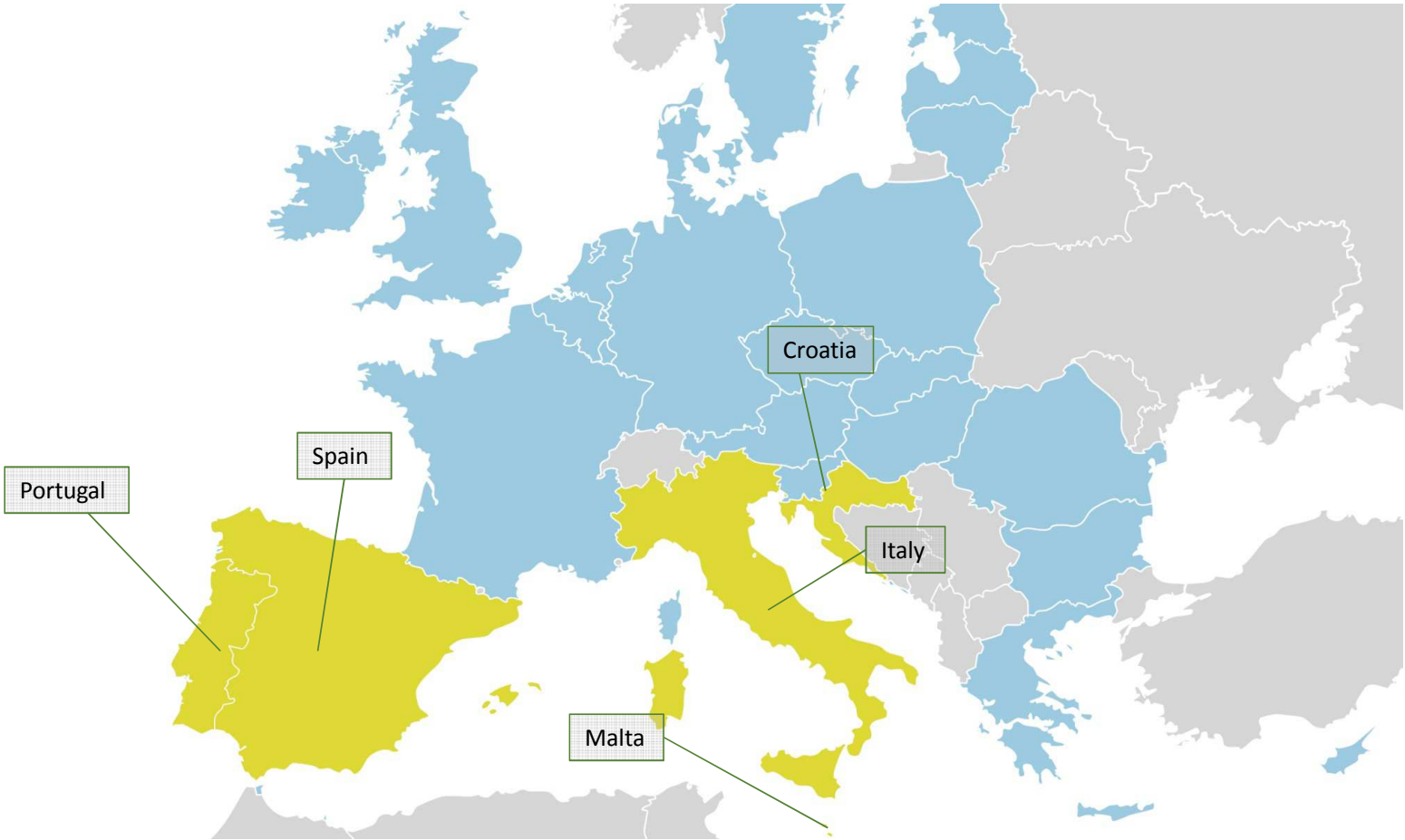
Advanced Training
on Energy Efficiency
in Historic Buildings

ENERGY EFFICIENCY AND CULTURAL HERITAGE IN THE PARTNER COUNTRIES

Conference on Energy Efficiency in Historic Heritage
Labin, 30 June 2016

Flavio Camerata, MIEMA

Countries involved



Contents of first project report

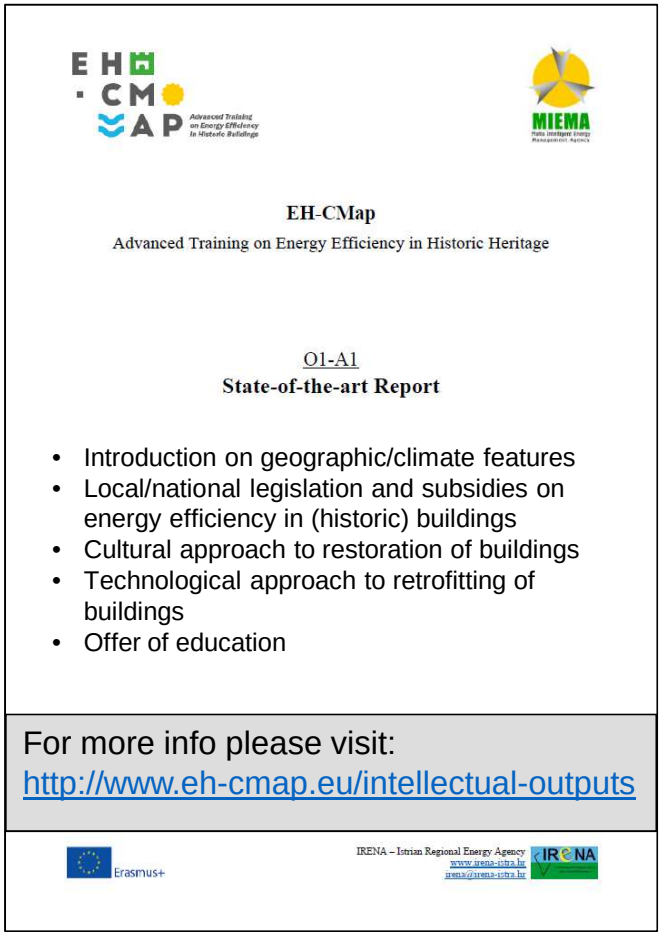
How is the local climate?

What are the local/national rules on energy efficiency in buildings?

Are there local/national subsidies for the energy retrofit of buildings?

What cultural approach to restoration fits my needs?

What is the most suitable technological approach to the energy retrofit of the building?



EH-CMap

Advanced Training on Energy Efficiency in Historic Heritage

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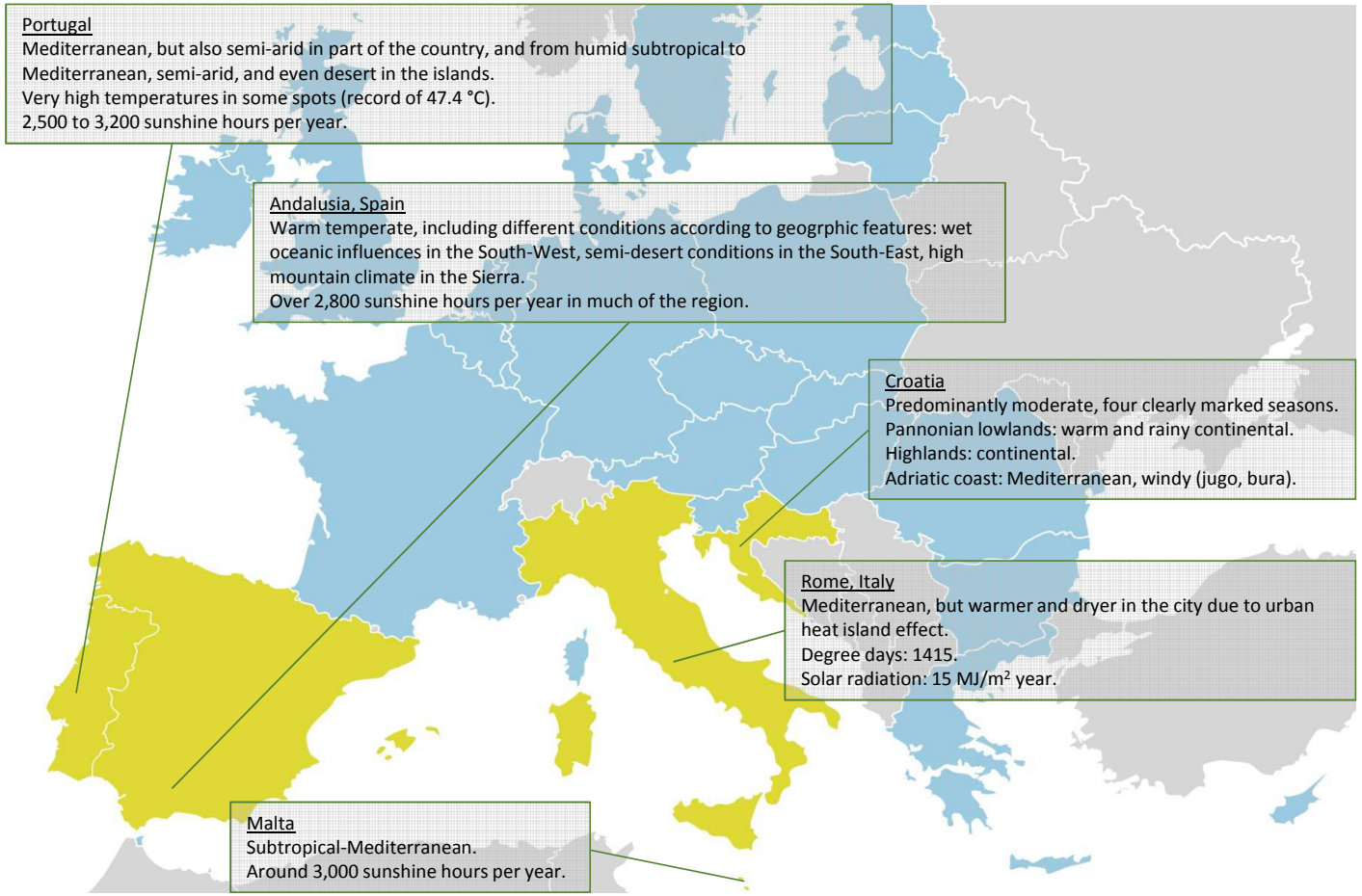
State-of-the-art Report

- Introduction on geographic/climate features
- Local/national legislation and subsidies on energy efficiency in (historic) buildings
- Cultural approach to restoration of buildings
- Technological approach to retrofitting of buildings
- Offer of education

For more info please visit:
http://www.eh-cmap.eu/intellectual-outputs

IRENA – Istrian Regional Energy Agency

Geographic and climate features



Legislation and subsidies on energy efficiency in (historic) buildings: European directives

Directive 2002/91/EC (EPBD) and Directive 2010/31/EU (EPBD recast):

- general framework for calculating energy performance of buildings;
- minimum requirements on energy performance of new buildings;
- minimum requirements on energy performance of large existing buildings subject to major renovations;
- energy performance certificate mandatory in case of construction, sale and rental of buildings;
- regular inspection of boilers and air conditioners;
- national measures and instruments (including financial measures) promoting the objectives of the Directive.

Directive 2012/27/EU:

- MS must set their own indicative national energy efficiency target;
- MS must establish a strategy for renovating national stock of residential and commercial buildings;
- 3% of total floor area of nationally-owned buildings must be renovated each year to meet minimum energy performance requirements.

Derogations are possible for places of worship and protected buildings.

Legislation and subsidies on energy efficiency in (historic) buildings

RETROFIT OF HISTORIC BUILDINGS	**Croatia**	38% of government-owned facilities are protected cultural goods or are located within protected areas; however, it is very difficult to obtain authorisations for the energy retrofit of buildings registered in the Register of Cultural Property
	Italy	a regional law of Lazio promotes the maintenance of traditional technical solutions, being in line with the principles of sustainable architecture, in historic buildings
	Portugal	a specific decree establishes the system of analyses and solutions for the energy retrofitting of historic buildings that are excluded from the energy performance obligations

Legislation and subsidies on energy efficiency in (historic) buildings

PERFORMANCE REQUIREMENTS	**Croatia**	according to the Act on Construction, all works of building renovation must result in energy savings; derogations are possible for registered cultural buildings
	Italy	a number of national and regional laws, and municipal regulations establish minimum energy performance requirements for new and existing buildings: a regional law of Lazio obliges to install solar water heaters and PV systems in new buildings and in the case of building renovation; the new building regulation of the Municipality of Rome also provides for obligations in terms of energy efficiency; both the regional law and the municipal regulation include derogations concerning historic buildings
	Spain	two national laws and a regional law of Andalusia establish the basic requirements in terms of energy efficiency for new buildings and building renovations
	Malta	national regulation establishes minimum requirements for the energy performance of new buildings, existing buildings subject to major renovation and their building elements and technical systems
	Portugal	national building codes have been revised in order to implement European EPBD Directive

Legislation and subsidies on energy efficiency in (historic) buildings

SUBSIDIES	**Croatia**	the Environmental Protection and Energy Efficiency Fund, funded by environmental taxes (e.g. taxes on industrial emissions, motor vehicles, waste), provides funding for energy retrofit projects, granting zero-interest loans, subsidies and other types of financial aid to private and public entities; and, under the Act for the Protection and Preservation of Cultural Property, restoration works can be funded via an annual call by the Ministry of Culture
	Italy	considerable tax deductions (65%) at national level are provided for energy retrofit works; important subsidies on feed-in tariffs for PV systems have boosted the market in the past years, but now they have been considerably reduced
	Spain	a regional law of Andalusia provides subsidies for the energy retrofit of buildings, consisting in the direct payment of 60% of the costs after the end of the retrofitting works (70% in case of high efficiency installations such as light dimmers, condensation boilers, IT technologies for energy control and management, built-in or high-efficiency water heaters, etc.).
	Malta	subsidies on feed-in tariffs for electricity produced by PV systems on residential buildings
	Portugal	personal income tax deduction in case of energy retrofit works; national and municipal tax deduction for A and A+ buildings; reduced VAT on the sale of solar water heaters; "efficiency cheques" rewarding consumers having reduced their electricity consumptions over a two-year period (cheques have to be spent on energy efficiency measures); and low-interest lines of credit for investments in energy efficiency in buildings

Cultural approach to restoration of buildings

Italy

- the theory of restoration of buildings in Italy comprises three positions:
  - "Roman school": **"critical" restoration** implying an "interpretation" of the building and his historic stratifications; main criteria are "minimum intervention" and "noticeability"; it does not exclude the use of innovative techniques;
  - "pure conservation": **maintenance of all stratifications** and the documentary role of the building, no critical restoration;
  - "hypermaintenance": completion of some of the missing parts of the building, or transformation of some features in order to **return to some ideal form** having existed (or thought to have existed) in the past.

Cultural approach to restoration of buildings: example of «critical restoration»

Florence, Palazzo Vecchio: use of high-tech windows resembling the original ones (source: Wikipedia).

Cultural approach to restoration of buildings: example of «pure conservation»

Restoration and re-use of original wooden trusses (source: nogap-progetti.com).

Cultural approach to restoration of buildings: example of «hypermaintenance»

“La Zisa” palace in Palermo, partially collapsed in 1971, and reconstructed in its missing parts according to the concept of “restauration à l’identique”: the reconstructed parts are not recognisable from the original ones.

Cultural approach to restoration of buildings

Spain

- the philosophy of conservation is stated by a national law: conservation, consolidation, improvement and rehabilitation actions **should avoid attempts at "reconstruction"**. If materials or parts that are essential for stability are added, they must be **recognisable** and avoid mimetic confusion. **All historic stratifications should be maintained**;
- criteria established by the regional law (Andalusia) on historic heritage: methods and materials should be chosen according to criteria of **reversibility** and must be **compatible with the specific architectural traditions**;
- criteria by the Spanish Committee of ICOMOS: the choice between traditional and innovative techniques should be weighed case by case, giving preference to **the least invasive and most compatible techniques**; whenever possible, **removal of historic material should be avoided**, and **deteriorated parts should be repaired**.

Cultural approach to restoration of buildings: example of «recognisability»

Restoration of Hospital de San Jerónimo in Marchena, Spain: «recognisability» through contrast between new and old.

Cultural approach to restoration of buildings: example of «recognisability»

Restoration of walls and plasters in the Alhambra: «recognisability» through maintenance of all historic stratifications (photo: FC).

Cultural approach to restoration of buildings

Malta

- no defined methodology on restoration techniques for historic buildings; most interventions on important historic buildings have been accompanied by long debates, and each intervention has followed a different approach;
- one relatively recent approach is headed towards **adaptation and re-use**, i.e. building heritage must remain actively used rather than merely preserved;
- no shared parameters for assessing the historic value of a building, and common methods for conservation and rehabilitation; a result has been the demolition of many historic – even if minor – buildings and urban environments;
- MEPA's Heritage Planning Unit assesses the impact of any proposed work on scheduled properties and recommends that the application is granted or refused, proposing also modifications to the design.

Portugal

- the XX-century approach, rooted in Viollet-le-Duc's theories (stylistic restoration), has been recently replaced with a much more restrictive vision: in case of works on classified historic buildings, priority is always given to **preservation of the historical integrity**; incorporation of new elements is accepted only when it does not affect the qualities that led to the classification of the building;
- if the historic building is not classified, competent (municipal) authorities tend to be more permissive;
- energy retrofitting of historic buildings usually focuses on the thermal component (thermal insulation in walls and slabs, replacement of windows, addition of internal windows).

Technological approach to restoration of buildings

Technological choices must depend on the single cases; only after a detailed analysis of the historic building and its specific performances, and of the existing technological solutions, it is possible to choose the most suitable one.

EXAMPLES OF INNOVATIVE BUILDING SOLUTIONS	**Windows**	tailor-made windows can be designed according to the needs of the specific building: quality and form of frames, glass, gas fillings, films
	Wall surfaces	thanks to the advancement of nanotechnologies, it is possible to use innovative materials for waterproofing wall surfaces and protecting them from pollution, with minimum impact on the building's aesthetics
	Insulation and thermal inertia	the use of phase-change materials allows to increase the thermal inertia of walls; they can be encapsulated in microspheres inside plasters, or contained in stiff panels with aluminium structures
		aerogel products provide insulation capacity even in reduce thicknesses
	Production of electricity	a number of innovative solutions allow to install integrated PV systems even in delicate contexts: e.g. PV tiles for roofs and PV films for windows

Remember:
many traditional, low-tech solutions can be still used today
(e.g. use of courts for regulation of temperature, use of blinds/shutters, etc.).

Offer of education

An integrated vision including restoration of historic buildings and energy retrofitting is not always available at higher education level. Where available, the following have been highlighted by the partners.

Croatia (University of Zagreb)

- Faculty of Architecture: courses focused on restoration of architectural heritage, and energy retrofitting of historic buildings. One course (Energy efficient building upgrade) provides a topic on restoration of historic buildings.

Italy (Sapienza University)

- Master's Degree in Architecture-Restoration, including courses related to structural and functional renovation of historic buildings;
- "Master" course in renovation of historic buildings and urban spaces, including issues of sustainability and energy audit of existing buildings;
- "Master" course in "bio-ecological" architecture and sustainable technologies for the environment, including issues of energy performance technologies in the renovation of buildings.

Spain (University of Granada)

- Degree in Architecture includes courses concerning diagnostics applied to conservation of historic buildings;
- Master's Degree in structural reinforcement and energy optimisation of buildings.

Portugal (Fernando Pessoa University)

- only a few courses providing an integrated training in this field: "rehabilitation of the built heritage" and "thermal rehabilitation and building acoustics".