

## POLICY PAPER

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This Policy Paper addresses all levels of politics, public administrations and public non-governmental organisations that deal with the issues of energy efficiency in historic buildings<sup>1</sup>.

### Introduction

The project “Co<sub>2</sub>olBricks – Climate Change, Cultural Heritage & Energy Efficient Monuments” brings together 18 partners from 9 Baltic States: Denmark, Sweden, Finland, Estonia, Lithuania, Latvia, Belarus, Poland and Germany. Governmental institutions, universities and educational institutions in the construction sector are involved.

The project aims to support European decision-makers at all levels in the public and private sectors in achieving ambitious targets to reduce CO<sub>2</sub> emissions by 20 per cent by 2020. Co<sub>2</sub>olBricks aims to provide solutions that combine the needs of climate change mitigation<sup>2</sup> with appropriate technical, administrative and educational approaches for improving functionality and energy efficiency in historic buildings while not compromising their historic or cultural value.

Through this paper the partners in the Co<sub>2</sub>olBricks project seek to provide some background information about the issues the project addresses, explanations in greater depth of the recommendations elaborated and communicated in the Co<sub>2</sub>olBricks Joint Declaration<sup>3</sup> and, last but not least, a survey of further activities that are necessary if the topic of heritage preservation and mitigation is to move forward. Detailed examples and further information are given in the Co<sub>2</sub>olBricks Report “Integration of climate protection and cultural heritage aspects in policy and development plans”<sup>4</sup>.

### What is our starting point?

Years of experience show that the rehabilitation<sup>5</sup> of historic buildings and monuments has led to serious mistakes that have been detrimental. These threaten the very substance, the cultural value and the appearance of heritage buildings. The reason is generally a lack of knowledge and experience in the planning and execution of rehabilitation measures. Too often modern building techniques are applied without considering the specific issues inherent to the historical substance of the building. A particular

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<sup>1</sup> “Historic buildings” are defined as “architecturally, culturally or historically valuable buildings”. This definition is independent from the national laws and regulations for heritage preservation which differ a lot between the member states.

<sup>2</sup> This paper uses the term “(climate change) mitigation” rather than “climate protection” to render the German term “Klimaschutz”. “Mitigation” is defined as “technological change and changes in activities that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to climate change, mitigation means implementing policies to reduce greenhouse gas emissions and enhance sinks ...” (see Glossary of Terms used in the Special Report on Renewable Energy Sources and Climate Change Mitigation, IPCC, 2011: [http://www.ipcc.ch/pdf/special-reports/srren/SRREN\\_Annex\\_Glossary.pdf](http://www.ipcc.ch/pdf/special-reports/srren/SRREN_Annex_Glossary.pdf)).

<sup>3</sup> See Co<sub>2</sub>olBricks Joint Declaration.

<sup>4</sup> See Co<sub>2</sub>olBricks WP3 Report “Integration of Climate Protection and Cultural Heritage Aspects in Policy and Development Plans”

<sup>5</sup> “Rehabilitation” is defined in the European Norm EN 15898 as “interventions on an immovable object in order to recover an inferred earlier functionality, to adapt it to a different function or to standards of comfort, safety and access”. UNI EN 15898:2012, 3.5.8. This term is used in this policy paper because the definition describes quite exactly what was discussed. <https://law.resource.org/pub/it/ibr/uni.en.15898.e.2012.pdf>

cause for concern is energy-saving measures such as the installation of heat insulation. That said, it would be wrong to generally exclude historic buildings from rehabilitation measures related to energy saving. After all, an old building can only be conserved<sup>6</sup> if it is being used. The preconditions for use are modern comfort and appropriate energy efficiency. This applies generally to all countries in the Baltic Sea Region. Even though the regulations for historic buildings and monuments under conservation clearly differ from one nation to another, the technical requirements for rehabilitation in terms of energy saving are the same.

## General Statement

### Historic buildings are unique and must be treated as such

First of all it is important to understand that historic buildings are special and not comparable to new or other non-historic buildings. This is because of technical and architectural criteria on the one hand and the buildings' cultural value for society as a whole on the other.

The strict standards of the European Energy Performance of Buildings Directive (EPBD) are not suitable for historic buildings, since the minimum energy efficiency standards defined in the EPBD and related national laws are aimed at new buildings and non-historic buildings. Indeed, if these standards are implemented, historic buildings often lose their historic value. Because of the differing legal, economic and historical situations within the Baltic Sea Region, it is important for each country to devise its own best measures to exclude historic buildings from the strict minimum energy efficiency standard. This is in general a minor problem for protected buildings<sup>7</sup> because they are usually excluded anyway. The bigger challenge is to conserve non-protected buildings of architectural, cultural or historical value. Therefore local municipality and heritage specialists have to work out local protection measures to allow non-listed historically valuable buildings an opportunity to keep their historical value.

But specific and individual energy efficiency measures for historic buildings are useful and important, both in conserving the buildings' cultural value and in making a contribution to reaching CO<sub>2</sub>-reduction goals. Such specific measures usually improve energy efficiency dramatically, though not as much as would have been possible in a non-historic building. It may be that 70 per cent of possible energy savings are achieved, rather than 100 per cent, but mitigation is not at the expense of heritage value.

Thus we can state that it is possible to improve the energy efficiency of historic buildings without destroying their heritage value.

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<sup>6</sup> "Conservation" is defined in the European Norm EN 15898 as "measures and actions aimed at safeguarding cultural heritage while respecting its significance, including its accessibility to present and future generations", UNI EN 15898:2012, 3.3.1.  
<https://law.resource.org/pub/it/ibr/uni.en.15898.e.2012.pdf>

<sup>7</sup> A "protected building" in the sense of this policy paper is a building which only can be changed with the approval of the conservator and/or the relevant authority.

## Recommendations

### 1. Iterative rehabilitation process with all involved parties

*“The energy efficiency rehabilitation of a historic building shall be teamwork by all involved parties (conservator, energy expert, architect, engineers, craftsmen, owner, tenant, authorities). An iterative process is necessary to reach the combined goals for energy and building standards and heritage values.”*

It hardly seems a novel idea to demand cooperation during building projects. But current practical experience shows that this is by no means common in the field of energy efficiency measures for historic buildings. There are some reasons for this: energy efficiency rehabilitation in general is a relatively new subject and, in combination with historic buildings, new technical challenges and further stakeholders join the process.

To improve this situation more information is needed, as are better education and public support. But the first step must be that each energy efficiency activity affecting a historic building is automatically regarded as a **joint rehabilitation process**. In addition to the owner, at least two experts – the conservator and the architect/energy consultant – have to be part of this process in addition to specialised craftsmen. Factors such as the size, complexity and future use of the building will determine whether further interested parties, for example building engineers or members of the building administration, need to join.

Moreover it is important to recognise that the identification of measures for energy efficiency upgrading of historic buildings is an **iterative process** which needs to acknowledge both the conservation concept of the historic building and the energy efficiency solutions. It must be accepted that unknown historic values might emerge during the rehabilitation process, necessitating changes to the conservation concept and the possibilities for energy efficiency upgrading. A building log-book should be done voluntarily and would be very helpful.

An example of such an iterative process is the “Refurbishment of Faestningens Materialgaard, Copenhagen, Denmark”<sup>8</sup>, which reports in detail on a comprehensive workflow of five iterative steps and with participation of all relevant stakeholders: owner, conservator, architect, HVAC<sup>9</sup> engineer.

To implement this it is recommended that

- **National, regional and local conservators, architects and all other involved planners** in cooperation with academia and experts develop, implement and improve professional standards and methodologies for the improvement of energy efficiency in historic buildings, e.g. the currently developed CEN-standard “Energy efficiency of historic buildings”<sup>10</sup>.
- **National, regional and local conservators, architects and all other involved planners** adopt this joint approach in their daily work.

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<sup>8</sup> The complete report is available on the Co<sub>2</sub>olBrick website [www.coolbricks.eu](http://www.coolbricks.eu).

<sup>9</sup> Heating, Ventilation and Air Conditioning

<sup>10</sup> Operated by the CEN/TC 346/WG 8

## 2. Specific energy analysis for historic buildings

*“A specific energy analysis is an advantage for historic buildings. It shall always be conducted in the case of major rehabilitation.”*

Besides surveying the heritage value of the historic building to develop a conservation plan<sup>11</sup>, the first step to identify possible energy efficiency measures is a proper energy efficiency analysis<sup>12</sup>. The question is which kind of energy analysis should be conducted. Standard energy audits, mandatory for non-historic buildings, can only be used for a rough comparison of a number of buildings<sup>13</sup> but not as the basis for a detailed plan of rehabilitation measures because they are not precise enough and do not work with actual data, which is important for sensitive historic architecture. So a **specific energy efficiency analysis** has to be done (details are available in the Co<sub>2</sub>olBricks suggestion on “Analysis of existing buildings for energy-saving measures taking into account the conservation of historical value”<sup>14</sup>): e.g.

- Actual measured energy consumption has to be used to assess current energy efficiency<sup>15</sup>.
- Current use pattern and the future pattern have to be taken into account.
- Exact analysis of the walls (e.g. material samples) has to be conducted.

The specific energy efficiency analysis must be carried out by specially trained and certified experts as exemplary done in Germany with the specialised “Energy consultant for historic buildings” (see recommendation 5).

Obviously this kind of specific energy efficiency analysis is more expensive than doing nothing or a standard energy audit corresponding to the EPBD. Therefore our recommendation focuses on “major rehabilitation”<sup>16</sup>, which means that for minor building activities a comprehensive energy analysis should not be mandatory.

To implement specific energy efficiency analysis in historic buildings it is recommended that

- **National, regional and local conservators, architects, energy consultants and all other involved planners** conduct specific analysis in their daily work.
- The **providers of the planning and building services**, in cooperation with **academia and experts**, develop, implement and improve professional standards and methodologies for specific energy efficiency analysis in historic buildings.

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<sup>11</sup> “**Conservation planning**” is defined in the EN 15898 as a “management tool for the development and coordination of conservation measures and actions”. The norm notes that “an outcome may be a ‘Conservation Plan’ ”. <https://law.resource.org/pub/it/ibr/uni.en.15898.e.2012.pdf>

<sup>12</sup> We are talking about “**energy analysis**” in general because this expression covers all activities in this field. While “energy audit” would seem to be a defined analysis, its purpose, content and methodology vary across the BSR countries.

<sup>13</sup> A standard energy analysis could be a first step in analysing a historic building quarter, but it should never become a legal obligation, because the comparison with new buildings leads to wrong decisions – economically and culturally. Therefore energy labelling (certificates) is not suitable for historic buildings.

<sup>14</sup> Available to download on [www.coolbricks.eu](http://www.coolbricks.eu).

<sup>15</sup> See “Prebound Effect”, Sunikka-Blank, Galvin, Cambridge, 2012.

<sup>16</sup> “**Major rehabilitation**” as defined in the EPBD for “major renovations”: Renovation of a building where: (a) the total cost of the renovation relating to the building envelope or the technical building systems is higher than 25 % of the value of the building, excluding the value of the land upon which the building is situated; or (b) more than 25 % of the surface of the building envelope undergoes renovation (see DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 May 2010 on the energy performance of buildings, Article 2, Paragraph 10).

### **3. Mutual consideration in policy papers and regulations**

*“Climate change mitigation plans shall consider heritage issues, and energy efficiency matters shall be included in heritage conservation guidelines.”*

If policies on both “climate change mitigation” and “heritage preservation” are to be harmonised and adjusted, it is an absolute requirement for both topics to be considered and included simultaneously in all policy documents dealing with these issues.

The EPBD is implemented not only through building regulations but also through environmental programmes and **climate strategies** that have become common in local politics in recent years. In all these documents the special situation of historic buildings must be considered. How precise the consideration of heritage preservation in these papers should be depends on how operational they are. For example, in a climate strategy focussing on the next 10 years, a hint that “the interests of heritage preservation have to be considered” could be enough – as in the “Masterplan Climate 2020” of the Free and Hanseatic City of Hamburg.

On the other hand, climate change mitigation issues have to be considered in **heritage preservation** documents. These could be national, regional or local laws but also heritage preservation department guidelines for everyday work. As a consequence, in Hamburg not only do climate change mitigation activities consider heritage issues, but the new Hamburg Heritage Protection Law (HambDSchG) of April 2013 also addresses energy efficiency measures in historic buildings. In their daily work the conservators now have to consider energy efficiency issues and must keep records about their decision.

To implement this mutual consideration it is recommended that

- **National and regional parliaments, governments and administrations** include the role of heritage preservation and climate change mitigation in their regulations or guidelines.

### **4. Development plans as an opportunity for further options**

*“Development plans and urban rehabilitation processes shall indicate energy-related provisions for historic buildings and areas. They offer the opportunity to plan energy efficiency measures in historic buildings in a wider context.”*

The consideration of urban quarters as a whole is very important in reconciling energy efficiency with historic value. Although there are existing urban planning instruments which organise the development of defined areas of a town or village, at present it is uncommon for energy efficiency targets and heritage preservation issues to be jointly implemented in development plans or urban rehabilitation processes – even though this presents great opportunities. For example, stricter obligations for new buildings in a quarter might compensate for lower ones for the historic buildings without losing sight of the overall climate change mitigation goal for quarter as a whole. Alternatively, district heating might improve the energy efficiency of the whole quarter and make it easier to reach CO<sub>2</sub> emissions targets by using renewable energy.

An example of how to integrate climate change mitigation issues with the preservation of historic buildings is the rehabilitation concept of the City of Kiel for the Elmschenhagen garden city. Here a new development plan meant changes to the historic quarter were strictly regulated while a model rehabilitation concept for the different types of buildings was developed, involving consultation with building owners and advice on

implementing energy efficiency measures. Additionally, district heating using wood pellets was installed for parts of the quarter<sup>17</sup>.

The BSR 2007-2013 partner project “Urb-Energy” ([www.urbenergy.eu](http://www.urbenergy.eu)) developed urban development processes with a holistic approach for energy efficiency rehabilitation of housing stock which could also be used as a blueprint for processes that integrate heritage preservation issues.

In order to implement energy efficiency analysis in development plans and urban rehabilitation processes it is recommended that

- **National parliaments, governments and ministries** include energy efficiency solutions on district level in the national implementation of plans and procedures by formulating best practice for integrating energy efficiency matters in master plans and major renovation permits, considering the limitations of heritage preservation.
- **Regional parliaments, governments and administrations** include energy efficiency solutions on district level in their procedural guidelines.

## 5. Training and certification of those involved

*“Specific training for the experts working on the energy efficiency rehabilitation of historic buildings shall be a mandatory requirement. All energy efficiency measures shall be carried out by qualified persons only.”*

Interdisciplinarity between the parties involved in the energy efficiency rehabilitation of a historic building, i.e. conservators; architects and energy consultants (planners); and craftsmen, is the key success factor for such a project. This entails more than just collaboration, since interdisciplinarity necessitates a minimum understanding of the work of the other professions on the part of all those involved.

Without it, **planners** could not develop a useful energy efficiency concept. Before they start to compile such a concept, they need to know what aspects of a building they can or cannot change. As not every detail can be determined beforehand, planners need enough understanding of heritage preservation to be able to assess by themselves during the creative process what can or cannot be done. If the planner had to ask the conservator about every idea, the process would become too cumbersome for both sides and too expensive for the owner. Knowledge of relevant heritage conventions and charters is the first step. An example of what can be assumed as minimum knowledge for planners is the curriculum for the German qualification “Energieberater für Baudenkmale” (Energy consultant for historic buildings) which can be downloaded here (in German): [www.energieberater-denkmal.de/fortbildungsmodul\\_2011\\_12\\_14.pdf](http://www.energieberater-denkmal.de/fortbildungsmodul_2011_12_14.pdf).

**Conservators**, on the other hand, need to know enough about energy efficiency rehabilitation. In most countries there is no formal education for conservators, meaning it is a post rather than a profession. Those holding the post of conservator come from various educational backgrounds. Besides architects or building engineers, they may be art historians or archaeologists, for example. The latter two groups will usually have learned nothing about the physics or energy efficiency of buildings in their studies, while these issues are often of only subsidiary importance in the training of architects and construction engineers. Even in the professions where building physics and energy efficiency are taught, the material studied usually concerns new buildings. This is regrettable because, in Germany at least, more than 50 per cent of all construction work now involves existing buildings. Even these professions have a need for further training in the energy efficiency rehabilitation of historic buildings. In most cases, those concerned can only learn by doing, which requires a lot of experience and generally remains an unstructured learning process. It is not proposed that conservators should themselves develop energy efficiency concepts for the buildings, but they must be able to assess the energy rehabilitation plans that planning engineers have drawn up. Otherwise they will be

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<sup>17</sup> See Chapter 2 of the Co2olBricks publication “Improving the energy efficiency of historic buildings - The four pilot projects of Co2olBricks”

easily deceived. They must be able to recognise the snags and hitches in the concepts and make counter proposals if they are to become really involved with “their” historic buildings.

Practical implementation by **craftsmen** of the jointly planned measures also requires a high level of professional know-how on the one hand and special awareness of the historic and cultural value of historic buildings on the other. Within the Co<sub>2</sub>olBricks project, learning packages for various crafts aimed at professionals at several levels of planning, supervision and construction work were proposed and described. Additionally, examples of harmonised curricula for training modules for bricklayers, plasterers, drywall builders, carpenters and foremen were developed<sup>18</sup>.

The reason for mandatory **certification** of those involved is that unskilled craftsmen and unskilled planners can do more harm than good. Especially in the long run, wrongly calculated and implemented measures can do tremendous damage to a building. Certification can be awarded on the basis of practical references or proof of appropriate further training. Requirements for the different crafts are set out in the Co<sub>2</sub>olBricks publication “Economic Promotion”<sup>19</sup>.

To ensure that rehabilitation of heritage buildings is only carried out by educated and certified staff it is recommended that

- **Universities, universities of applied sciences, vocational training centres and education service providers** develop/implement these issues in their curricula.
- **Heritage protection departments** encourage their staff to take such further education courses.
- The **authorities and public bodies** (e.g. chambers of crafts) implement and operate a certification system.
- **Housing companies, housing associations and house owners** select only those companies which have this expertise.

## 6. Centres of excellence and expertise

*“Information centres shall be established and provide practical information for all stakeholders.”*

As historic buildings have to be treated individually, both case studies about individual rehabilitation projects and practical information about specific techniques are very helpful. Therefore centres of excellence to provide owners of historic buildings, architects and energy auditors with advisory services and guidelines on maintaining and carefully upgrading their heritage properties would be a great advantage; best practice examples are especially helpful in this context. An example is the info-room of Co<sub>2</sub>olBricks project partner SRIK (Säästva Renoveerimise Infokeskus) in Tallinn, Estonia.

To implement centres of excellence it is recommended that

- **National, regional and local governments, in cooperation with NGOs and chambers of architects and crafts**, install centres of excellence and cooperate with owners and service providers to develop general and best practice guidelines to improve the energy efficiency in buildings of historical value, taking into account the constraints of heritage preservation.

## 7. Financial support programmes

*“Financial support programmes specially dedicated to energy efficiency of historic buildings shall be developed.”*

Preservation of cultural heritage is one of society’s common tasks. Because the owners of historic buildings face higher costs and greater legal restrictions for the preservation of their properties than for other

<sup>18</sup> Available to download on [www.coolbricks.eu](http://www.coolbricks.eu)

<sup>19</sup> Available to download on [www.coolbricks.eu](http://www.coolbricks.eu)

buildings, support programmes are common. They should be augmented by special programmes to support the energy efficiency qualification of historic buildings.

Public funding programmes are needed to offset heritage-related additional costs. Some key points should be considered, however. All funding programmes should include clearly defined specific objectives that must be met to qualify for a grant. In the case of energy efficiency measures, these should be specific targets for the energy consumption by the historic building after rehabilitation. But these target values have to be defined by each county or region individually with regard to specific conditions such as climate. Furthermore, due to the individual situation of each historic building it is very important to set overall energy consumption targets for the building as a whole and not targets for each part.

To achieve best results, grants should depend mandatorily on minimum qualification standards being met by the architects, engineers and energy consultants dealing with the historic building for which funding is sought. These standards could be special, certified further training (see recommendation 5). Making public funding dependent on certified training is a potential way of achieving quality management of energy efficiency measures in historic buildings. An example of this approach is the German public funding programme “KfW Effizienzhaus Denkmal”.

To implement support programmes it is recommended that

- **National, regional, local governments and foundations** develop special public funding programmes.

## 8. Further research

*“Further research on energy efficiency measures in historic buildings shall be conducted.”*

Although a lot is already known about energy efficiency, much remains vague or solutions have yet to be found. Many energy retrofitting measures are based on experience only and lack a scientific foundation. This often makes it difficult to calculate and hence predict correctly how certain techniques will function.

A major problem is that most technical solutions are designed for and directed at new buildings. Technical and organisational solutions for historic buildings and other existing building stock need to be improved by research.

The following possible research topics are recommended:

- User behaviour
- Energy efficiency in historic buildings at a district or town level
- Wall heating and internal insulation in different climates
- Calculation tools: input data need to be improved and tools must become easier to handle so that they become more widely available and less expensive
- Forgotten techniques: often old techniques have been forgotten and need to be made available to stakeholders once more.

To initiate further research it is recommended that

- **EU Directorates and national administrations** provide funding through the research framework programmes and other research funding programmes.
- **Universities, universities of applied sciences and companies** apply for funding and conduct research and development of appropriate technologies (including technological nodes) and techniques for the improvement of energy efficiency in historic buildings.



## **Further activities after the end of the project**

As the activities and results of the Co<sub>2</sub>olBricks project demonstrate, the process of reconciling the conservation of historic buildings and monuments with energy efficiency has been successfully stimulated in recent years and a broad awareness of the topic has been achieved.

In order to put the findings described in the recommendations into practice, follow-up projects or activities addressing the topics outlined below have to be conducted: e.g.

- Basic research into building physics, e.g. to ascertain the effect of alternative heating systems on the building envelope; this is the precondition for the inclusion of new technologies in laws, standards and funding programmes.
- Basic research on user behaviour in historic residential buildings.
- Research and practically oriented support for renewable energies in historic buildings: Production, distribution (smart grids) and storage.
- Practically oriented integration of energy efficiency rehabilitation of historic residential buildings into urban development processes.
- User-oriented development of specific energy analysis for historic buildings with the goal of enabling the collection of information in sufficient depth while taking cost considerations into account.
- User-oriented development of practice-based specific guidelines for improving user behaviour with regard to energy consumption (technical, financial and social incentive systems).
- Implementation of rules and regulations (laws, regulations, land-use plans, administrative orders, etc.) and funding programmes for energy efficiency rehabilitation measures in historic residential buildings.
- Implementation of competence and support centers.
- Introduction of multinational training standards (initial and further training for academics and craftsmen) for all those involved in the energy efficiency rehabilitation of historic residential buildings.
- Implementation of international university courses about energy efficiency in historic buildings.
- Organisation of commonly realised transnational refurbishment projects of historic buildings with the focus on technical issues and with partners from abroad actively involved on site.