

Living the historic city: universal accessibility and energy efficiency strategies

Egusquiza A., Gandini A.

Department of Cultural Heritage. Tecnalía Construction
e-mail: aeusquiza@labein.es, agandini@labein.es

Key words: historic cities, energy efficiency, universal accessibility

Abstract

In order to protect our urban historic heritage we must focus on protecting not only the physical fabric but also the social context, recognizing the right of local residents to continue living in the area. Labein-Tecnalía develops a research line based on the belief that furthermore ensuring the maintenance of historic buildings, urban policies should aim at improving quality of life in historic centres, facilitating the sustainable development and integrating citizens' participation into planning processes. Consistent with this ideal, this work points at recommending universal accessibility and energy efficiency strategies for the historic city. One of the projects related to energy efficiency is the SECHURBA project which aims to demonstrate sustainable energy interventions in historic urban areas and buildings, respecting culture, heritage and local character. The project addresses local communities with their barriers and potentialities by developing best-practice technical methods, innovative tools and bottom-up "Community Climate Change Strategies", as a transferable technical toolkit and an innovative Intelligent Energy Application Tool for relevant key actors. Furthermore, the E2CH project arises from the concept that historical cities could be handled as a reference model for contemporary urban development. One of its main goals is to improve knowledge of energy performances within the historic centre as a system, studying the efficiency and adaptability of traditional buildings to the environment. The project will develop a comprehensive methodology and different tools for the diagnosis, the decision making, the implementation of solutions and the subsequent management of energy at urban-scale. Another factor that influences the habitability of the historic city is the lack of universal accessibility. The main goal of the PATRAC project is to provide a decision support system for planning improvements in accessibility ensuring that the optimal solution is adopted according to criteria of universal access, respecting cultural values and economic viability.

1 Introduction

Urban conservation and development of our historical cities is primarily about sustainable management of change. It is necessary, then, to promote policies of conservation that comprises not only cultural issues, but intensely linked with housing policy, habitability aspects, infrastructure renewal, etc. The urban renewal strategies must be based on a continuous decision making focused on identifying what is important to protect and what allows a controlled evolution of the historic environment. In order to achieve this goal, the relationship between heritage preservation and habitability in the historic cities must be deepened.

Two critical factors for the improvement of this livability are energy efficiency and universal accessibility. In both issues the goal is the same but the approach must be different because, although the historic city is inherently sustainable, is originally inaccessible. Historic cities have been designed taking into account specific climate, built largely from renewable materials obtained locally, but they

were built in geographically isolated and not easily accessible sites as the main objective of the first settlements was defensive. Then they have a bioclimatic potential to exploit but the level of accessibility in historic consolidated areas is naturally low. There are specific lacks of accessibility which lies in the urban attributes: excessive slopes, level changes and narrow streets occur more frequently in the historic districts than in other parts of the modern city.

2 Energy efficiency and the historic environment

Energy efficiency is a key factor to talk about sustainability in the historic city. A proper management of energy saving is an effective way to improve the quality of the habitability of the historic cities whilst constructing a sustainable conservation, because the historic city, far from being a problem, could be a model and a reference of urban efficiency and sustainability. We spend most of our time in buildings which account for around 40% of Europe's energy consumption, but existing buildings also represent the greatest potential for energy-efficiency improvements. EU is making real efforts to improve the energy efficiency of Europe's buildings which represent a rich cultural patrimony. About 70 projects were funded by the Intelligent Energy Europe programme, the European Commission gave great importance to the Joint Technology Initiative, a toll for the research support. Besides, the European Commission considered energy efficiency as a key point in the valorization of historical centers in the 7th Framework Programme by centering some of the Environment calls to this topic (e.g. ENV.2010.3.2.1.1 "*Compatible solutions for improving the energy efficiency of historic buildings in urban areas*").

It is worth noting that European policies are focusing on existing building as, also if the construction of new buildings was made following only energy efficiency criteria, long period of time are required to appreciate significant impacts on the built environment's renovation (between 0,5% and 2% annually). It is foreseen that only by the energy improvement of the existing building stock it is possible to achieve the objectives of CO2 reduction and accomplish the Kyoto commitments.

2.1 SECHURBA [1]

One of the projects related to energy efficiency in which Labein Tecnalia is currently collaborating is SECHURBA- Sustainable Energy Communities in Historic URBan Areas-, an ongoing project, which started on September 2008, cofinanced by the European Commission under the Intelligent Energy Europe programme and coordinated by the Marches Energy Agency (UK).

Aim of the project is to demonstrate that sustainable interventions in historic urban area, while respecting culture, heritage and local character are possible and to ensure that historic areas will be given priority in future energy policies and local development programmes. Historic buildings were excluded from the Energy Performance of Buildings Directive 2002/91, and yet existing buildings allow most potential for energy efficiency. The engagement of different actors, as local policy makers, researchers, energy actors and communities guarantees to spread to all key actors the message of opportunities and potential prospects which sustainable energy intervention in historic urban areas can generate. Based on the philosophy that modern society and historic resources can coexist by respecting cultural and historic significance, SECHURBA project will demonstrate how historic assess should not be seen as a burden but as a challenge for economic growth and progress and that is possible to promote and replicate innovative approaches, as especially the one proposed within this project. Also if actually there are many RUE and RES solutions available in the market, most of them are not applicable in the historical context, due to restrictions that usually define the historic urban areas. However, there is an increasing tendency in introducing new energy efficiency technologies in historic

areas and buildings characterized by a high level of protection, as the problem related to these specific areas seems to sensibly affect local and national authorities.

Within this problem the SECHURBA project will analyze barriers, including planning and conservation legislation and will propose solutions and produce guidelines with possible applicable technologies and techniques to be applied both at individual building and community level, while respecting conservation principles. In order to facilitate policy makers and key actors involved in the identification of the best solution for their specific case, a new, highly innovative and comprehensive softwarebased Intelligent Application Tool has been developed. The tool is based on a multi criteria analysis and will guarantee the achievement of the best solution by the involvement of a qualitative analysis carried out by independent contributions from key actors and target groups involved and will be implemented in all the case studies.

Case studies communities and buildings have been selected between seven European countries in order to propose appropriate options, tools and mechanisms which may be applied to a wider European level. During the first months of the project a state of the art and investigation studies have been carried on with the aim of defining the portfolios of each case study, by identifying constrains, barriers and prospects.

Besides, energy audits of buildings will be carried on and financing solutions and mechanism will be studied, as a “Historic Community Climate Change Strategy” will be produced for each case study community, which could be used as a template for replication by other local authorities and government departments across the partner regions. Local and regional authorities will be actively involved in the procedure and formation of the climate change strategy plan.

The project will also introduce a SECHURBA award to historic areas having demonstrated significant steps towards becoming historic sustainable energy communities in view to the general public, in order to increase competitiveness and create a new benchmarking system for sustainability. By the achievement of the project objectives it will be possible to assess the contribution of energy market and climate change objectives beyond statutory requirements for acknowledgement in future energy policies in historical buildings and areas and it will guarantee replication in other historic communities or buildings.

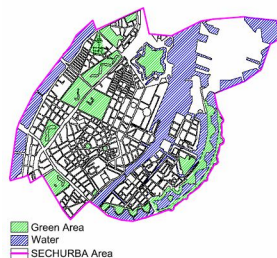
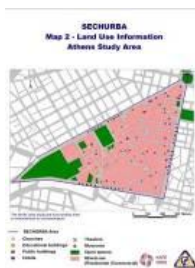




Figure 1: Sechurba case studies: (Athens, Copenhagen, Santiago de Compostela, Shrewsbury, Szentendre inner city, Castle of Zena and Chieti)

2.2 E2CH

E2CH project (“Eficiencia energética para la ciudad histórica”), which is in its starting phase, is intended to define the criteria, the methodological approach and the tools that are necessary to face the energetic rehabilitation of the historic cities taking into account that historical cities could be handled as a reference model for contemporary urban development.

The traditional architecture was developed to operate in a time when energy was really expensive; consequently it had to be necessarily sustainable. From a thermal point of view, there is an important change from the traditional architecture to the industrialized one. The preindustrial buildings were designed taking into account the climatic environment and using local resources and materials, but over time, the interaction between buildings and environment changed, due to the use of new buildings materials with different thermal properties [2].

Therefore in order to work in historic environments a specific energetic approach is necessary for the following reasons:

- Heterogeneity of the envelope due to the stratification of different stages of construction and re-built generates a very complex building context where different materials and construction systems coexist, so a strict diagnosis phase is necessary.
- Pre-industrial building techniques and local materials have to ensure material and technical compatibility of the interventions, by means of understanding historic buildings in terms not only of their special cultural interest but also of how the building works as technical and constructional system: how it accommodates structural movement, how they relate to patterns of air and moisture movement, and how easy it is to damage these balances by carrying out standards ‘improvements’.[3]
- Historic buildings are a reservoir of embodied environmental and energy capital [3] that makes repair a better strategic choice than replace, moreover compared to the relatively small amount of their operational energy.

- Lack of deeper knowledge in the energetic performance of the traditional buildings as an “environmental system”. The hygrothermal behavior of its porous and permeable materials responds to air and moisture in very different ways instead of waterproof materials used in most modern buildings and work with greater thermal inertia. Traditional buildings need more ventilation than newer ones, in order to accommodate evaporation of moisture from the building fabric.
- Presence of unique bioclimatic solutions characteristic of the built heritage of the historic center, which must be preserved and reused.
- Limitations on the admissibility of certain solutions because of the needs of conservation and protection of cultural values and the urban landscape

This new approach should begin from the belief that energy conservation and building conservation are complementary, that the issue of improving energy efficiency in historic cities should not be faced as a conflict between sustainability and preservation. The only reasonable way to face the problem is to improve the knowledge of energy performances within the historic centre as a system, studying the efficiency and adaptability of traditional buildings to the environment. In order to achieve this goal the project seeks to develop a comprehensive methodology and different tools for the decision-making and the management of energy at urban-scale level.

The case of study of this project is Santiago of Compostela. For the past 17 years the Consortium of Santiago has been a pioneer in the design and development of programs to rehabilitate the historic city and to improve its livability, respecting its assets represented by their historic dwellings. During the year 2010 the Consortium encourages, as part of its multi-annual programming, an urban infrastructure master plan that will address a plan of renovation of the infrastructures and urban services in the historic city of Santiago. This plan to modernize infrastructure and urban services could not be understood without facing the issue of the various energy scales of the city in the search for energy efficiency and energy conservation. The E2CH aims to develop the framework for a “second generation” rehabilitation of his historic urban context, which connects the improvements of the energetic performance with the preservation of its authenticity.

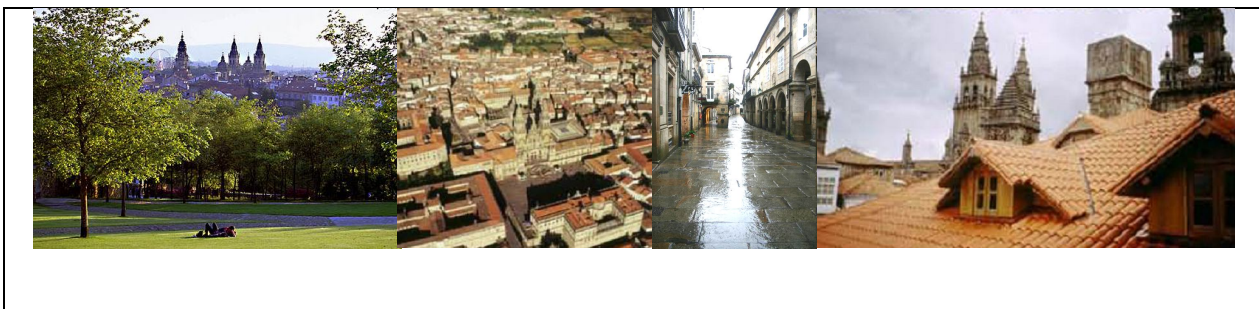


Figure 2: E2Ch case study (Santiago de Compostela)

3 Universal access to the historic built heritage

Accessibility is another determinant factor in the liveability of the historical building environment. The Patrac [5] project (“Patrimonio Accesible: I+D+i para una cultura sin barreras”) was approved as “Strategic and singular project” by the Ministry of Science and Education of Spain in 2007 and its overall goal is the development of strategies, products and methodologies to facilitate access and to contemplate the historical building heritage in a non discriminatory way and compatible with its specific values.

In order to develop an intervention strategy for the rehabilitation, conservation and valorisation of the historical heritage within the framework of “Design for All” the project is to provide a decision support system for planning improvements in accessibility ensuring that the optimal solution is adopted according to criteria of universal access, respecting cultural values and economic viability. The issue of providing universal accessibility to environments that were built centuries ago with very different usability criteria is not an easy task and one of the reasons is that the improvements in accessibility are particularly difficult to implement when we are dealing with severe intervention restrictions because of the historical and/or protected nature of the historic building. Although, often the main obstacle to progress in this objective is the skepticism based on preservation or economic reasons.

Therefore, they are necessary diagnostic tools that enable a systematic and precise level of accessibility and decision support tools that ensure that the choice of interventions will be guided, in addition to the criterion of improving accessibility, by criteria such as preservation of the heritage values, respect for law and analysis of cost / benefits.

The project has developed a prototype of a tool for calculating and displaying the accessibility of cultural heritage at both scales: building and urban scale. The tool, called ACC3DE, implements a diagnostic methodology that feeds from data semi-automatically obtained by terrestrial laser scanning, and presents the accessibility information of routes and path elements using 3D graphics and textual explanations in the building scale case and generates automatic accessible routes at urban scale. This tool can also display the diagnosis of accessibility for different disabilities.

Once the diagnosis is possible, the next step is to decide where, how and when to intervene. The tool assist the agent responsible for intervention in deciding the type of intervention to improve the level of accessibility, taking into account normative, economic and respect for heritage. These criteria, which may be in conflict or be incompatible with each other, are resolved within the framework of Multiple Criteria Decision Making, so the tool will provide a framework for identifying the most appropriate solutions, ensuring minimal intervention to achieve accessibility. The tool is completed with a systematic data collection that allows an easier and economically viable compilation of all the data necessary for the strict evaluation. This feature adds the benefit of documenting the original accessibility conditions and deepens the knowledge of our cultural heritage.

The case of study of this project at building scale is the Maritime Museum of Barcelona which is situated in a building used as dockyard since the 13th century and listed as a protected monument since 1937.

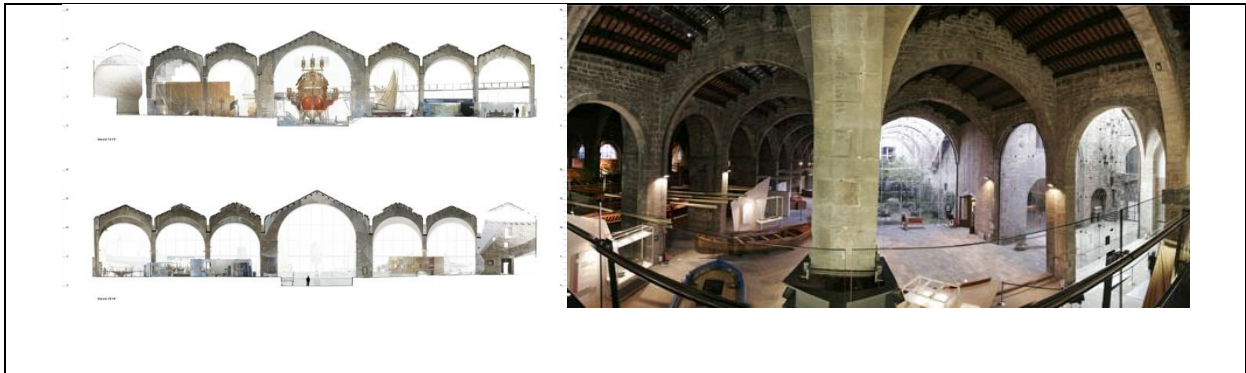


Figure 3: Patrac case study at building scale (Maritime Museum of Barcelona)

At urban scale, the case of study is the historic center of Tossa del Mar, which is characterized by an urban fabric that adapts to the topography with narrow, winding and steep streets.



Figure 4: Patrac case study at urban scale (Historic center of Tossa del mar)

4 Conclusions

Three projects are presented in this paper which aims to develop urban renewal strategies for the historic cities based on the belief that heritage preservation is compatible with livability criteria. These projects intend to deal with two key issues for this livability, energy efficiency and universal accessibility, by means of develop intervention strategies for the rehabilitation, conservation and valorisation of the historic city, based on a specific approach and methodologies and tools developed to identify what should be protected and what could be changed to allow a controlled evolution of the historic city.

Dealing with historic assets has always been a great challenge. Research programs have progressed in developing new techniques and technologies for interventions in the historic city, but these practices

should be now meet authorities and heritage managers' requirements. It is important to work directly with key actors and end users to understand problems that they have to handle in their everyday practices and to meet policies criteria for the implementation of norms in this specific field. It is impossible to think about sustainable historic cities without the support of politicians or administrator, as they have a direct control on the interventions and policies carried out in a determined period. Sustainability should not be seen as an ephemeral trend, but as a long term process where every key actor, from citizens to national authorities, is involved to achieve a common objective. To make this possible, main objective of these three projects described is to develop tools and methodologies for the decision making support.

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