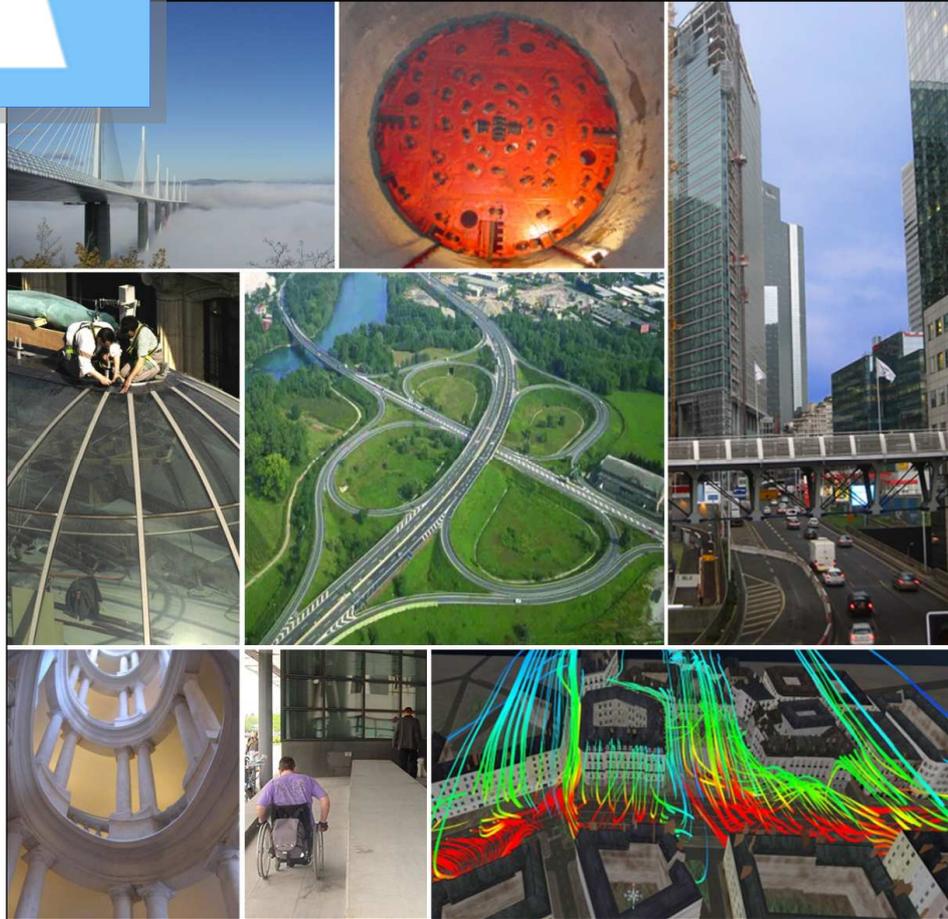




# CULTURAL HERITAGE



## Strategic Research Agenda

### Focus Area Cultural Heritage

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European Construction Technology Platform (ECTP)

[www.ectp.org](http://www.ectp.org)

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## 0. Preamble

This single document is the 8th public version of the Vision 2030 and Strategic Research Area of the Focus Area Cultural Heritage (FACH), which is expected to be integrated in further documents of both the overall 2030 Vision and the Strategic Research Agenda documents of the European Construction Technology Platform (ECTP).

The ECTP initiated in 2004 reflects the response of the Construction Sector to the demands of European society, acting as an umbrella for research initiatives in Europe, and creating a better synergy between European and national industries, between the public and the private efforts involving all relevant stakeholders (industry, SMEs, practitioners and architects, producers and suppliers, scientists, public authorities etc.).

The Focus Area Cultural Heritage (FACH)<sup>1</sup> was initially established in agreement between the Commission Services and the Support Group of the ECTP and has been endorsed by the ECTP High Level Group.

The FACH Strategic Research Agenda, which is presented here, is the base document to identify main research topics in Cultural Heritage that should be developed to face the societal, economic, industrial and environmental challenges that European Cultural Heritage has to tackle from now to the 2020<sup>th</sup>. This document has been prepared by the FACH coordinators and has been reviewed and approved by the FACH General Assembly.

This document calls for a periodic consultation and updated versions including all interested parties but it already shows how it will make a significant contribution to the whole ECTP while also “cross-cutting” some of the tasks implemented by other Focus Areas of this Technology Platform for Cultural Heritage Protection and Adaptive Re-Use of the built environment. Besides, the links with the PPP E2B are also considered. PPP E2B will speed up research on key technologies and develop a competitive industry in the fields of energy efficiency and is interested towards Cultural Heritage sector.

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<sup>1</sup> A specific area of the ECTP website [www.ectp.org](http://www.ectp.org) is allocated to the Focus Area on “Cultural Heritage”

## 1. Executive Summary

### **A LIVING CULTURAL HERITAGE IN AN ATTRACTIVE EUROPE**

A living cultural heritage makes Europe attractive for its inhabitants and visitors, and stimulates economic competitiveness and a better quality of life.

European cultural heritage is the testimony of our shared past and the root of our identity. It enriches the collective memory, which will make the future of Europe more humane and civil for its population, so it needs to be conserved with great care.

The importance of this cultural wealth can be measured in economic and social terms, such as growth in employment, job creation and unified communities, and it has a considerable impact in many areas such as the environment, construction, tourism and regional development to enhance European competitiveness and skills through technical innovation and traditional skills.

Built cultural heritage has a high societal importance: quality of life in cities, the feeling of social safety and cultural identity are closely related with the presence of heritage and heritage buildings. It improves welfare and well-being of people in urban areas. Built monuments constitute an important value in the context of urban development.

The European construction industry will achieve greater competitiveness as well as a better ability to satisfy societal needs through research, development and innovations oriented towards protecting and enhancing cultural heritage, and adaptive re-use of existing buildings. Today, about 40 % of construction activities are devoted to adaptive re-use, repair and maintenance. Beyond that, focus on Cultural Heritage is a key issue to enhance the sustainability of the Construction Sector, in Cultural Heritage the three basic pillars of sustainability: Environment, Society and Economy, are connected.

We are now contributing to the cultural heritage of future European generations: a strong knowledge-based approach must be used to protect and promote our cultural heritage to keep it alive in an attractive Europe.

*The global objective of the FACH is to promote new sustainable and preventive strategies, concepts, methodologies and techniques for conservation and restoration of cultural heritage in order to improve the quality of life of citizens and the attractiveness of Europe, particularly its cities, buildings, monuments and landscapes.*

The interventions of the European Construction Sector in cultural heritage must follow a knowledge-based and interdisciplinary approach for the sustainable protection of cultural heritage underpinned by the principles of safety, authenticity and compatibility to ensure minimal intervention to avoid damage to cultural heritage and to enable it to be protected from environmental and human causes of destruction. It should also include the integration of cultural heritage into the natural and urban environment to tackle a common management of the whole environment.

The challenge of the application of special strategies, methodologies, techniques, materials and processes to maintain Europe's rich cultural heritage is of great importance for all players involved in these vital activities for the maintenance and preservation of European cultural identity in today's globalised processes. In addition, new strategies for management are needed to reinforce and recognise the added value Cultural Heritage gives to cities and landscapes.

The Vision 2030 of Focus Area Cultural Heritage may be summarized as:

*Holistic protection of living Cultural Heritage and its territorial setting by appropriate understanding; planning and management; monitoring, conservation and restoration, maintenance; encouragement of its sustainability and added value for Society and the Construction Sector; recognition of integration and diversity of cultural assets in relation to the environment and citizens.*

The input of cultural heritage activities in the economy ( from the Construction sector to the Tourism sector passing through the cultural creative sector), the urban and natural environment, and the welfare of European citizens is significant and brings higher environmental, social and cultural benefits.

However, the specificity of the Cultural Heritage Sector and therefore of this Focus Area must also be recognized. In particular it must be emphasized that some standards, codes and principles used in construction, tourism and other economic fields may not apply directly to cultural heritage. Moreover, conservation principles (i.e. the 'heritage value') of Cultural Heritage should be considered when synergies between environment (including natural heritage, energy and climate change) and cultural heritage are established. In this light it is rather tragic to conclude that public funding progressively decreases in the tangible cultural heritage research field in many European countries, whereas it strongly depends on the public sector. The risk involved is clear and therefore this problem urgently needs a solution.

## 2. Introduction

### 2.1 – The importance of Cultural Heritage

#### Impact in the sustainability of Europe

*"Each community, by means of its collective memory and consciousness of its past, is responsible for the identification as well as the management of its heritage. Individual elements of this heritage are bearers of many values, which may change in time. The various specific values in the elements characterize the specificity of each heritage. From this process of change, each community develops an awareness and consciousness of a need to look after their own common heritage values."*<sup>2</sup>

The Conservation of the existing Cultural Heritage is a strong societal need, as we have to maintain the Architectural Heritage, as well as the Mobile Heritage and Intangible Heritage, for future generations. Besides, Tourism, closely related to Cultural Heritage, is, nowadays, the main industry in the world and has become one of the fastest growing economic sectors. It generated more than 5% of the EU GDP, with about 1,8 million enterprises employing around 5,2% of the labour force<sup>3</sup>. One in every 11 jobs all over the world are generated from tourism, according to UNWTO Tourism Highlights, 2013 Edition. Moreover, Creative and Cultural industries employed a total of 6.4 million persons in 30 European countries in 2009<sup>4</sup>. In fact, regions with high densities of creative and cultural industries have Europe's highest prosperity levels.

The diversity of Cultural Heritage in Europe is one of the most valuable assets. It forms a major part of the continent's identity. As yet, however, the full potential of this asset remains under exploited, as are opportunities for further innovation. Culture is one sector of future employment.

The growing importance of culture is closely linked to recent economic development trends. Firstly, the expansion of culture is related to the evolution of societies away from traditional industries towards the service sector. Secondly, changes in lifestyle and growing leisure time create more demand for leisure activities, including culture. Third, in a globalisation market, where emerging countries seriously hinder some European industrial sectors, the economy of culture could not be delocalised to any other place, as it is inherent to the riches of a specific territory. These trends tend to encourage economically viable aspects of culture.

The cultural sector is characterized by growing close and varied interrelations between cultural life and the cultural economy. In this context, culture can contribute significantly to employment. Cultural products and industries offer opportunities for job creation, adding significantly to the effects of more "classical" measures such as the preservation or development of cultural heritage. Culture is not merely a public occupation creating extra costs but also an increasingly important part of the private economy with considerable growth potential, fostering creative, innovative and productive effects for regional economies.

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<sup>2</sup> Kraków Charter 2000, Principles for Conservation and Restoration of Built Heritage, Kraków – Wawel, 26 October 2000

<sup>3</sup> European Commission. The European Tourism market, its structure and the role of ICTs. 2012

<sup>3</sup> The European Cluster Observatory. Priority Sector Report: Creative and Cultural Industries. Uppsala University, April 2011

<sup>4</sup> The European Cluster Observatory. Priority Sector Report: Creative and Cultural Industries. Uppsala University, April 2011

Besides, cultural heritage is narrowly linked to the environment. It highly contributes to minimise the environmental impact of unnecessary demolition of buildings, but it is also very vulnerable to the environmental aggressiveness and climate change. On top of that, cultural and natural environment are strongly connected, especially in a relatively small territory such as Europe, where human activity has acted in the majority of natural landscapes since generations, creating, in many cases, valuable landscapes, with a mixed anthropic and natural origin.

### **Impact for the Construction sector**

In the XXIst century, European Society is facing an overwhelming number of challenges: demography changes, climate change, globalisation, economic crisis and the gloomy perspectives of declining natural resources. And yet, European Society is very much relying on the Construction Sector to obtain better living and working conditions from its built environment<sup>5</sup>. For the Construction Sector, this represents a dramatic upturn: to convert a technology-push industry into a demand-driving sector. The new key for development is sustainability, and Cultural Heritage is now an essential topic to reach a new dimension (Culture), added the three basic pillars of sustainability: Environmental, Societal and Economic aspects.

The city, village and territory are probably one of the most important working places for the Construction Industry and an addressable market. Their urgent need for restructuring and re-qualification has already been observed everywhere in Europe. Knowing that these "territories" contain significant remaining parts of past structures (*natural* (relief, green and water structures), and *human* (communication networks, past activity remains and housing kernels)) it could be useful to reuse them systematically as a basic support for restructuring the place.

As above-mentioned, conservation of our Cultural Heritage is a major aim that should be strived for by the Construction sector, as, if no action is taken, a further 10% of our tangible cultural heritage may have been lost by 2030. Therefore, Construction sector through the conservation of Cultural heritage (both preventive and curative), could strongly contribute to improve the sustainability needs of European citizens. Not only to this aim, but also to ensure the required proper management of cultural assets, ICT will play a decisive role.

The necessary saving of natural resources leads to a better reuse of existing infrastructures and buildings, as approximately 80% of the buildings and structures of the future city are already constructed. As a consequence of that, it is expected an increase of the activities of refurbishment and rehabilitation, representing, nowadays, about 40 % of construction activities, thus being a promising area of activity for the Construction sector.

The active engagement of European construction industry in cultural heritage safeguarding gives the unique opportunity for its transformation into R&D intensive industry. Construction activities and heritage preservation needs will however be in conflict if they are not considered together at the initial planning stage of any development. For this reason, the active engagement of the European construction industry working together in interdisciplinary teams with institutions dealing with the preservation of cultural heritage is crucially important for future generations.

Change and continuity will be the 'leitmotiv' in building and conservation activities related to cultural heritage. Maintenance, re-design, re-use and adaptation of function of historic buildings

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<sup>5</sup> Strategic Research Agenda – European Technological Construction Platform

will be the focus points for architects, authorities and building industry. Ambition for 2030 is to be able to deal in a sound way with the balance between new requirements on one hand and authenticity / compatibility of conservation assets on the other. . The dilemma will be very often how to balance new functions for historic buildings and monuments with their heritage values.

Finally, integration of cultural heritage in its natural environment needs to adapt the infrastructures needed to cross European territories with a higher focus on getting the minimum impact in our valuable assets.

## 2.2 – The needs and goals

At present, the protection of cultural heritage has taken on substantial importance. Cultural heritage is no longer about the preservation of symbolic heritage or the importance of a single asset; it is an essential part of the living environment and the fulfilment of societal needs. Considering cultural heritage as an essential part of life, new approaches and definitions are needed: definition of cultural heritage in contemporary global environment with special attention to its integration into the natural and urban environment, through space planning, re-evaluation of current values of cultural heritage, implementation of heritage understanding into practice, and holistic approach to heritage protection that takes into account the interaction of immovable and movable heritage with the intangible heritage.

This new understanding of cultural heritage has to be incorporated in the physical, political, public and professional environment. Besides, it is necessary to develop appropriate strategies to understand Culture as a new economic sector of Europe that could not be delocalised to any other place and constitutes our most valuable sign of identity. Cultural heritage contributes to a new knowledge-based economy that could significantly contribute to the global European economy.

Moreover, the impact of cultural heritage on the environment should be considered, as it brings environmental benefits and the environmental protection from a reduction in raw materials consumption, pollution and waste, and increased energy saving. However, it should be also considered that the environment may also significantly affect cultural heritage.

Cultural heritage research has been undertaken for years for the European Commission, and many methodologies, systems, technologies and materials frequently used at present to protect cultural heritage arise from previous EC research activities. Main topics consisted in the development of assessment and diagnosis knowledge and technologies; intervention materials and techniques; preventive conservation; ICT-based services; and, recently, improvement of energy efficiency.

However, until now, just limited effort has been dedicated to the interaction of cultural heritage and its natural and urban environment. Historic towns, villages and buildings, in their territorial setting, represent an essential part of our universal heritage, and should therefore be seen as a whole with the structures, spaces and human factors, normally in the process of continuous evolution and change.

This involves all sectors of the population, and requires an integrated planning process, consisting of a wider range of different activities. Conservation in the urban or natural context deals with ensembles of buildings and open spaces, which are part of larger urban areas or protected natural areas, including intangible values. In this context, intervention refers to the city and territory in its morphological, functional and structural whole, as part of its territory, its

environment and surrounding landscape. Even though buildings that form historic areas may not always have a special architectural value in themselves, they should be safeguarded because of their organic unity, distinctive dimensions, cultural identity, and their technological, spatial, decorative and chromatic characteristics as connecting elements.

Besides, the influences of cultural heritage into the environment and vice versa, the influence of the environment into cultural heritage, are crucial aspects to deep into knowledge. In the first case, cultural heritage should also contribute to minimise the raw material and energy consumption. In the second case, aggressive environments (mostly caused by climate change and natural disasters) may hinder cultural heritage conservation, and there is a strong need to establish new conservation strategies in relation to these new environmental requirements.

### **2.3 – The strategy**

Considering the above mentioned needs, the main topics to be addressed by the FACH focussed on the relation between natural environment and cultural heritage, have been categorised in 3 main blocks:

#### **1. Conservation of cultural heritage exposed to climate change, natural and man-made hazards:**

##### **❖ Risks assessment and management, including:**

- Development of novel technologies, protocols and tools for preventive conservation, controlling the potential causes of damages, advanced forecast and improving the resilience to hazards
- Development of procedures and protocols, as well as retrospective monitoring of interventions for preventive conservation, also leading to innovative instruments for decision support on and documentation of interventions, and emergency plans to minimise the potential damages and the resilience to hazards.
- Unification of systems to record information in order to prevent or address illicit trade, theft or loss
- Elaboration of standards for the inclusion of the specificity of cultural heritage in emergency plans
- Protection and mitigation of heritage sites from modern farming and foresting techniques
- Development of capacities and resources to implement actions and standards

#### **2. Join management and promotion of natural and cultural assets:**

##### **❖ Cultural and natural landscapes, including:**

- Promotion of responsible and sustainable tourism strategies at local, regional, national and transnational level while respecting needs of the population and improving their living conditions

- Development of new technologies for the detection, diagnosis, visit and representation of inaccessible sites, including underwater heritage
- Encouragement of diversifications of the rural economy and management of the socioeconomic transformation of the natural territory
- Development of strategies and tools for the protection, management, visualisation and enhancement of natural, industrial, archaeological and historical landscapes

❖ **Vernacular Architecture**, including:

- Study, promotion and visualization of sustainable vernacular architecture
- Boost rural territories by evaluating the potential of traditional structures within the modern context
- Promotion and optimisation for the recovering and production of cost-effective sustainable and reliable traditional materials

❖ **Public spaces and historic urban landscapes**

- Development of new strategies and policies to record, list, protect, recover and promote ancient public spaces and their assets, historic gardens and parks
- Development of a common methodology for the inventory and exploitation of "minor green spaces", such as old orchards, manors' gardens and agricultural areas.
- Creation of normative framework for the protection of buffer zones between cities and landscapes.

### **3. Horizontal issues to enhance sustainability of cultural heritage:**

❖ Preserving and enhancing **Cultural heritage values**, through:

- Develop models for the assessment of heritage values (from 'just' historic buildings to listed monuments)
- Develop models for decision support when balancing sustainability / energy performance on one hand and technical risks and risks for heritage values on the other hand

❖ **Resource efficiency**, through:

- Development of ecological building materials and products based on compatible solutions and/or recycled waste
- Development of the conservation materials supply change by introducing standards and methods for assessment
- Improvement of durability of advanced conservation materials for long lasting solutions with a significant lower need for material exchange

- Promotion of local, unconventional and natural materials use in the productive and construction sectors
  - Improvement of resource and energy use during the life-cycle of the construction of buildings with cultural value and refurbishment of existing historical buildings
  - Improvement of use of RES in cultural heritage environment (historic centres, public spaces or rural landscapes)
  - Development of strategies for the implementation of a life cycle approach and environmental impact assessment for the reduction of the environmental impact
- ❖ **Enhancement of local and European Identity**, through:
- New strategies for the use of cultural heritage as a vehicle for mitigating social pressures in multicultural environments and conflict areas.
  - Development of strategies to for the optimal reuse of cultural heritage buildings
  - Encouragement of transnational culture.
  - Development of new cost effective technologies and devices for widespread diffusion of cultural heritage to the public
  - Involvement of young generations in the knowledge, conservation, valuation, use and economic activities of cultural heritage
- ❖ **Economic values of Cultural Heritage**, including:
- Development of new tools and evaluation models to assess socioeconomic values universally applicable
  - Creation of new models and use concepts for the public/private exploitation of cultural heritage
  - Development of strategies to increase well-being in Europe aimed at smart, inclusive and sustainable growth in urban and rural settings
  - Development of creative economies based on the understanding of the environment and the identification of opportunities and new development models based on cultural heritage.
  - Management of unpopulated rural areas and their valuation through cultural heritage

### 3. Strategic Research Agenda (S.R.A.)

The objectives of Vision 2030 can be achieved by research, development and innovative actions with involvement of all stakeholders interested in Cultural Heritage. The main strategy is to develop research and innovation that could meet the challenges identified in previous paragraphs. It should be implemented through a knowledge-based and interdisciplinary approach for sustainable protection of cultural heritage assuring safety, authenticity and compatibility applying minimum intervention.

As mentioned in the previous section 2 – The strategy, the detailed distribution of research efforts will follow three main blocks containing a series of research priorities. The first group covers predominantly *Conservation of cultural heritage exposed to natural hazards and climate change*. The second group is oriented to develop *Joint management and promotion of different kind of natural and cultural assets*; These areas are horizontally linked with a third group covering crucial issues to enhance sustainability of cultural heritage from a wide perspective, including social, economic and environmental aspects.

Issues addressed by this Focus Area interact also with the issues of all other ECTP Focus Areas what contribute to the homogenisation of activities across the whole European Construction Technological platform. Besides, a close link with the PPP EeB initiative should also be promoted in order to take advantage of the possible synergies and to guarantee the best results in the development of efficiency energy services and products specifics for cultural heritage sector.

The S.R.A will give rise to an appropriate Action plan specifying a series of priorities to be implemented through private and public research initiatives at European level. As regards public funding, it is expected that the European Union will take these priorities into account in the definition of its work programmes and calls for proposals.

### **3.1. Conservation of cultural heritage exposed to natural hazards and climate change**

#### **3.1.1 - Risks assessment and management**

##### Challenge:

In recent years, cultural heritage conservation has evolved from criteria based primarily on intervention to maintenance based on preventive intervention slinked to the long-term preservation, especially in relation to risk management.

Risk management is a process that seeks to anticipate and then minimize and control damages to cultural heritage before they occur. This consists mainly in the understanding and control of deterioration factors to which cultural heritage is exposed, in order to act on the conditions that may represent a risk for the historic materials and structures, thus minimizing reconstruction and restoration interventions. Risk management allows an integrated approach to address all damages to cultural heritage and their possible mitigation, providing strategies for the conservation and establishing priorities in interventions.

Cultural heritage is exposed to various kinds of risks such as natural hazards and anthropogenic factors, which may vary depending on the nature, specific characteristics, vulnerability and geographical environment of the site. Natural risks can be divided in two main categories: 1) Immediate impact on cultural heritage such as flood, earthquake, fire, landslides or volcanic eruption, which are usually related to catastrophic factors and physical damage and cumulative and 2) Cumulative, slow effects, such as erosion, material decay, pollutants and pests, which are usually related to environmental conditions and, if not considered, also have a destructive power. Anthropogenic risks are the result of different human activities, which include looting, tourism, vandalism, development pressure, inappropriate management and lack of maintenance.

Risks management, as an integrated methodology, is therefore essential for the prevention and mitigation of possible damages to cultural heritage, as well as for reducing authenticity losses and economic impacts. Furthermore, special attention should be given to more vulnerable areas, where population density, living conditions and social aspects may influence on the impact of damages.

Also if prevention measures are most effective than disaster recovery, facing damages of hazards is still a reality that should be considered. Cultural heritage risk management should therefore consider disaster planning, preparedness requirements and emergency response plans.

##### Research areas:

- To minimise potential damages and improve resilience to hazards by the application of technologies, procedures and protocols by considering multiple hazard and social and economic vulnerability. Quantitative and qualitative methods and integrity, authenticity and sustainability impacts assessment should be considered for the analysis, monitoring, prioritization and decision making.
- To develop standards for the inclusion of the specificity of cultural heritage in emergency plans by integrating conservation principles in the disaster planning from the removal of material, evaluation of damages to emergency stabilisation.

- To develop cost effective, friendly and easy to install preventive or remedial measures for the control and mitigation of risks. Additional consequences that may be beneficial or negative should be considered in terms of technical risk, economic cost, life cycle analysis and environmental impact.
- To improve effectiveness of inventories by unifying systems of recording information with the objective of identifying cultural heritage in a quick and confidential way, in order to prevent or address illicit trade, theft or loss. Legal aspects should be considered.
- To develop capacities and resources to face an effective and active implementation of preventive actions and standards.

### **3.2. Joint management and promotion of natural and cultural assets:**

#### **3.2.1 Cultural and natural landscapes**

##### Challenge:

Coming from an expansion of the concept of cultural heritage, UNESCO adopted, in 1962, "the recommendation concerning the safeguarding of the beauty and character of landscapes and sites". European landscapes are the basis of the culture, identity and beliefs of the people who live within them and are the direct consequence of the interaction of climate conditions, varied geology and morphology and centuries of pre- and post-industrial land use, modelled by people within the framework of a variety of cultural processes.

Cultural and natural landscapes are characterised and shaped by natural and human factors, cultural and natural values are threatened by significant environmental and anthropic changes, from climate change factors to socioeconomic pressures, such as tourism and development. Landscapes, as historic testaments, are the result of interaction between different objects, uses and cultures from a visual, spatial, symbolic, functional and environmental point of view, thus being the main contributors to the European biodiversity. Developments in agriculture, forestry, industrial and mineral production techniques and in regional and town planning, transport, infrastructure, tourism and, at a more general level, changes in the world economy, lead to the loss of the values and the consequent degradation of landscapes.

Landscapes transcend national boundaries and contribute to the understanding of European cultural history and diversity. Particularly, rural settlements provide a variety of information about the environment and the society, their activities and societal relations.

The adoption of the European Landscape Convention aims at establishing and implementing policies and instruments for landscape protection, management and planning. The understanding of Europe's cultural landscape is the basis for the achievement of a sustainable management and the trans-national level should be addressed in order to improve cooperation among different countries.

##### Research areas:

- Promoting responsible and sustainable tourism while respecting needs of the population, improving their living conditions and conservation issues. Strategies addressing new sustainable forms of tourism should be addressed with the objective of preserving natural heritage and biodiversity and making optimal use of environmental resources. Environmental

management systems and sustainability strategies should also focus on intensively exploited tourist destinations.

- New technologies to supply support to inaccessible sites. And to allow access to sites for people with disabilities
- To promote transnational actions in the field of tourism, rural development and promotion of cultural landscapes.
- To develop new technologies for the diagnosis and representation of underwater and terrestrial assets based on 3D models and laser scanning tools to assist in their enhancement, management and conservation.
- To encourage diversifications of the rural economy, by promoting sustainable tourism, and adding value to agricultural products through location branding and differentiation.
- To develop management strategies based on the socioeconomic transformation of the natural territory, considering the relation of the small cities and towns with their rural environment.
- To develop methods and management strategies to mitigate the conflict between cultural heritage sites and agriculture and forestry techniques
- To develop strategies and tools for the protection, management and enhancement of natural, industrial, archaeological and historical landscapes. Tools for the prediction of changes in cultural landscapes, related to its natural evolution and human transformation processes, should be considered.
- Innovative development models based on green and eco-innovative activities for a sustainable development of rural areas.
- Development of new technologies, based on virtual/augmented reality and 3D models, for visualization of natural and cultural landscape that facilitate and enhance the communication and understanding of information to the user, improving the capture of public perception, directly related to the concept of participatory mapping.

### 3.2.2 Vernacular Architecture

#### Challenge:

Vernacular architecture is based on local needs and construction materials, reflecting local traditions and identity, by responding to conditions of everyday life and ways of organising social life. It evolved over time to reflect the environmental, cultural, technological, and historical context in which it exists.

There is an increasing interest in improving knowledge in this field, due to the environmental crisis, including issues of resource depletion, global warming, and energy crises. Vernacular architecture is characterised by using small percentage of available energy resources, without negatively affecting the surrounding environment, and generally speaking in a sustainable manner. The importance of climate change, as well as the need of reduction of energy consumption and CO<sub>2</sub> emissions, indicates that it is necessary to find sustainable materials,

considering all the life cycle of a building, from the production to the waste treatment. For these reasons, the recovery and valorisation of materials and techniques used in the past can contribute to explore new ways of green design.

While in the past, the use of materials and labour was strictly local and strongly related to the environment, nowadays, the use of new technologies and building techniques, has introduced elements which are totally foreign to the local environment and have a strong visual impact on the landscapes. This is especially accentuated in the case of rural areas, where rural heritage and countryside are linked together. Construction materials were sourced, manufactured and installed locally making for harmonious landscapes. Now this link is broken with materials mass produced with inexpensive components in regions far away from where they are installed.

The disappearance of traditional skills hinders the availability of traditional materials and techniques and raises the costs for their implementation. The inclusion of dynamising elements, such as innovative and creative economies based on traditional skills, can contribute to the economic sustainable development of local communities.

#### Research areas:

- Study and enhanced understanding of sustainable vernacular architectural solutions and building materials
- To demonstrate the advantages of local materials and buildings techniques by bridging the gap between traditional achievements and modern needs
- To evaluate the sustainability (energy efficiency, comfort...) and structural resistance of vernacular architecture, especially of timber, stone and mud structures
- To optimise the production of traditional materials, thus lowering costs associated to their use and promoting the recovery of traditional buildings using traditional techniques by implementing specific financial schemes
- To develop the value chain for traditional materials by standardization and quality assessment methods
- To boost rural territories by evaluating the potential of traditional structures within the modern context and their relation with the landscape, also in terms of innovation and creative economy potentialities.
- To promote social awareness and to contribute to improve the valorisation process of vernacular architecture, the process of maintenance and long term preservation as well as to promoting the integration of vernacular architecture in local strategies of sustainable urban and rural environment.
- Technologies for automated and cost effective 3D modelling of large heritage sites, as a base for scientific analysis as well as for the understanding of cultural heritage by citizens.

### 3.2.3 Public spaces and historic urban landscapes

During last decades, research focused mainly on the preservation of natural environment related to large and bio-diverse ecosystems or with individual animal or vegetal species, either endangered or threatened with extinction. Less attention was given to small green areas in cities, which are close to the daily lives of people and contribute to their quality of life.

In more and more urbanised areas, the concept of sustainable cities has spread all over the world, although is still mainly related to urban planning and community development. Cities usually offer small green areas, which were used in the past, as historic gardens of manors or orchards- quite characteristic of monasteries- which are not taken into account in green space planning.

The role of parks and green open spaces in urban areas is often underestimated, while the potential of these areas to improve both the quality of life of city dwellers and urban sustainability has not been fully realised.

Green spaces are an essential part of the urban heritage, a strong element in the architectural and aesthetic form of a city. They play an important role in the ecological aspect as well as in the social interaction and increase the attractiveness of the city. Also, public space represents physically defined structures, but even more importantly a social space offering possibilities of encounter and activity otherwise not displayed in the city. These qualities might be perceived as heritage values and significant constituents inherent in public space. This makes public space the keeper of values that are seen as "quality of life" indicators.

Green areas are strongly related to local history and traditions, but for many reasons, are still generally in decline and do not achieve the social, economic, recreational or environmental benefits for which they were intended. Besides, many cities still related to their landscapes, especially in rural areas, where the working activities are still reliant upon nature.

#### Research areas:

- To develop new strategies to recover public spaces and their mobile assets (sculptures, fountains, ...) through archaeology and local traditions and enhance their potentiality in relation to their cultural context
- To increase awareness, skills and create policy strategies for the conservation and promotion of historic gardens and parks in Europe.
- To develop new technologies and strategies for the reduction of criminality in public spaces, including intelligent management of lighting and devices for security improvement.
- To develop a common methodology for the inventory of "minor green spaces", such as old orchards, manors' gardens and agricultural areas and propose strategies for their exploitation.
- To create a normative framework for the protection of buffer zones between cities and landscapes, with the objective of preserving the visual relation of the territory from the city.
- To develop assessment tools to identify and protect values of public spaces (comfort, sound, environmental,...) and link them with cities.

### **3.3. Horizontal issues to enhance sustainability of cultural heritage:**

#### **3.3.1 Cultural values of intervention**

##### Challenge:

In the last decades, there is an increasing tendency to reuse and adapt cultural heritage to highly contribute to the economic trends and societal values of the community and citizens, including revaluation of cultural heritage for tourism development, and adaptation of European old cities to the new requirements of our modern society in terms of comfort, energy efficiency and accessibility.

Providing this new challenge, it is now more obvious than ever to find a correct balance between the integrity of the cultural asset and its capability to be adapted to the new use, performance or characteristic. Besides, tracking of these adaptations, together with the evolution of the cultural asset through its history is needed to perform a reliable intervention.

As this SRA is mostly based on preservation, but also on the evolution and adaptation of cultural heritage to the new requirements. For this reason, it is essential to establish cultural values that should be maintained to preserve authenticity and integrity of cultural heritage.

##### Research areas:

- Develop models for the identification, tracking and assessment of heritage values of listed monuments, historic cities, vernacular architecture, cultural landscapes, cultural routes, etc.
- Develop models for decision support when balancing sustainability / energy performance / accessibility and reuse alternatives on one hand and technical risks and risks for losing heritage values and architectural integrity on the other hand

#### **3.3.2 Resource efficiency**

##### Challenge:

The resource-efficient Europe flagship initiative is part of the EU's growth strategy for a smart, inclusive and sustainable economy. It means using the limited resources in a sustainable manner while minimising impacts on the environment.

Recent developments in industrial processes have increased richness and wealth, but have rarely considered resource efficiency, especially future impacts on biodiversity, ecosystems as well as waste production. A large part of human wellbeing depends on natural resources, such as lands, water and air. Many of these ecosystems services are considered unlimited and free, thus their economic value is not considered in the final price.

60% of the Earth's ecosystem services have been degraded in the last 50 years. In Europe, only 11% of protected ecosystems are in a favourable state and more than 1,000 km<sup>2</sup> are subject to 'land take' every year for housing, industry, roads or recreational purposes<sup>6</sup>.

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<sup>6</sup> Roadmap to A resource Efficient Europe. COM (2011) 571 final. Brussels, 20/09/2011

Many decisions on land or resource use have an irreversible impact or need costly interventions to be reversible. These include several effects such as erosion, contamination, desertification, floods, etc.

Furthermore, the construction sector is one of the main agents responsible for high energy and water consumption, greenhouse gas emissions and materials extraction. Energy efficiency policies should be complemented with resource efficiency by considering a wider environmental impact based on the whole life cycle assessment, considering both construction and demolition waste as well as life time costs.

#### Research areas:

- To develop advanced ecological, natural and sustainable materials and products based on recycled waste for conservation of cultural heritage
- Promotion of the use of traditional, local and unconventional materials for their use in new architecture
- Development of the conservation materials supply change by introducing standards and methods for quality assessment
- Improvement of durability of advanced conservation materials for long lasting solutions with a significant lower need for material exchange
- To develop methods and tools for a quality control of conservation measures
- To develop strategies and materials for conservation of modern cultural heritage materials
- To reduce the need of material exchange by introducing durable solutions for conservation
- To develop strategies for the implementation of a life cycle approach and environmental impact assessment for the reduction of the environmental impact of goods and services at every stage, from raw material extraction and transportation to manufacturing, distribution, use and disposal, by including the economic value of resources used.

### **3.3.3 Identity**

Cultural heritage, in both its tangible and intangible forms contributes to the cohesion and integration of the European Union that fosters fundamental links between states, regions and citizens. Europe's cultural and natural heritage has an increasing value for Europe's economy, society and environment.

Culture is playing a growing role in the European integration process by bringing together people of different backgrounds and traditions and, at the same time, by respecting the diversity of Member States. European nations are a result of international migration flows and are becoming more and more pluriform and multicultural.

Cultural heritage encompasses not only the tangible aspects of our environment but also the intangible social aspects of how people live, work and play together. Strong, functional, connected communities provide wide ranging social and economic benefits to the region. Having a sense of belonging to and identifying with a place is essential for individuals and how

they interact within and contribute to a healthy community and contributes to increase quality of life.

Cultural heritage is not static but is constantly evolving as technologies, processes, practices, aesthetic values and other elements of society change, including socio economic and political environments. The values associated with cultural heritage are shaped by the places that we live, these places help us recognise where we come from and who we aspire to become in the future. They become over time part of who we are and are enriched with social history, tradition, ways of living, beliefs, family history, memories and stories that contribute to our past, contemporary and future cultural heritage.

Furthermore, the new concept of European citizenship should be supported by respect for cultural heritage diversity as a cohesion factor for the European identity, through the promotion of intercultural dialogue.

#### Research areas:

- To develop strategies for the use of cultural heritage as a vehicle for mitigating social pressures in multicultural environments and conflict areas.
- To develop strategies and methods to safeguard historic architecture
- To encourage transnational activities especially focused on the promotion of European cultural routes and sustainable tourism by respecting and protecting the territory. Focus should be given to activities, shared among different European countries, which contribute to shape the landscape, such as historic agricultural and industrial activities (mills, furnaces, steel factories, large industrial areas, holocaust sites, ...), religious and trade-off routes and which can contribute to a sustainable development such as genealogic and gastronomic tourism.
- To develop new tools to boost a European sense of belonging and create a concept of European citizenship by improving public awareness on cultures, places and values.
- To develop cost effective technologies and devices for widespread diffusion of cultural heritage to the public, especially the younger generation so as to allow greater and better understanding of cultural heritage and so appreciate it and preserve it. 3D technologies-based solutions should be considered, in addition to web-based new standards for the integration of 3D elements in web browsers.
- To develop new strategies and tools to involve young generations of EU citizens into the knowledge, commitment for preservation, use and reuse, habitability, enjoyment and economic activities linked with cultural heritage

### **3.3.4 Economic values**

The economic value of cultural heritage can be defined as the amount of welfare that heritage generates for society.

In the recent years, the instrumental value of heritage, as manifested in its social and economic implications, has been claimed by various advocates of heritage and recognised by many policy-

makers. Culture is now considered as one of the four pillars of sustainable development and investment in heritage can generate return in a form of social benefits and economic growth.

Cultural heritage in its broadest sense plays a central role in research on the cultural economy. The new emerging theme of the transformational role of the cultural industries in economic and social terms and the role that cultural tourism can play for regional development have also contributed to this research interest.

Preservation of cultural heritage is no longer seen as an end in itself but as a base for multiple uses. Main advantages can be seen in developing heritage-based education or on the importance that cultural heritage plays on agricultural policies, as many rural development projects supported by the EU include tourism development, village renewal or farmstead conservation.

Among other sub-sectors within the creative industries sector, cultural heritage is assessed as a cross-cutting prerequisite for economic development, particularly for the tourism /leisure industries, and the job creation related to both traditional and new high-tech skills. Such evidence is based on the interconnection between cultural heritage and the emerging research of the creative industries sector as recent growing phenomenon.

Cultural heritage can be crucial in achieving smart, inclusive and sustainable growth. As multiple researches have shown in many European regions, cultural heritage has a great potential for skills development but also for generation of direct, indirect and induced jobs. Along with drawing investment and tourists, heritage institutions, projects and programmes appear as efficient tools for providing social and territorial cohesion. In the cities and regions with a culturally-mixed population or divided communities, properly-designed and managed heritage projects can serve as efficient means for the policy of social inclusion, intercultural dialogue and conflict resolution.

#### Research areas:

- To develop new evaluation models based on both quantitative and qualitative aspects, considering the social impact of cultural heritage
- To create new models for the public/private exploitation of cultural heritage
- To develop tools to analyse the economic impact of cultural heritage as well as sustainable management models.
- To create a cross-border European framework of the economic impact of cultural heritage by developing guidelines for Countries where data are not available
- To better understand the social impact of tangible and intangible cultural heritage in conflict areas oriented to improve intercultural dialogue
- To develop strategies to increase well-being in Europe aimed at smart, inclusive and sustainable growth in urban and rural settings
- To develop creative economies based on the understanding of the environment and the identification of opportunities and new development models based on cultural heritage.
- To manage isolated rural areas, becoming more and more unpopulated, recovering their life and valuation through cultural heritage

## 4. Organization and FACH membership

The organization of FACH is structured in a very simple way.

There are two coordinators:

- Roko Zarnic, from University of Ljubljana
- Isabel Rodríguez-Maribona, from Tecnalia.

Besides, Adriana Bernardi, from ISAC CNR acts as a liaison person between FACH and PPP EeB. Other FACH members, like Rob Van Hees, from TNO and Milos Drdácý, from ITAM CAS are members also of the JPI in Cultural Heritage. Therefore, most relevant European initiatives for FACH are represented in the group.

On top of this organisation, there is a FACH General Assembly, formed by all FACH members, including:

Abuzeid Nasser	(University of Ferrara)
André Caroline	(ACE/CAE)
Augenti Andrea	(Università di Bologna)
Badia Francesco	(University of Ferrara)
Bernardi Adriana	(CNR-ISAC)
Binda Luigia	(Politecnico di Milano)
Bitelli Gabriele	(Università di Bologna)
Bonilla Alberto	(TECNALIA)
Bonilla Javier	(ACCIONA)
Bosiljkov Vlatko	(ZAG)
Bou Solsona Encarna	(ITC - AICE)
Bourdeau Luc	(CSTB)
Bruno Roberto	(Università di Bologna)
Caballero Pedro	(CARTIF)
Cappelletti Francesca	(University of Ferrara)
Carile Antonio	(Università di Bologna)
Casali Franco	(Università di Bologna)
Colla Camilla	(Università di Bologna)
Corrado Sylvie	(CSTB)
Crolard Myriam	(Saint-Gobain)
Cuppini Giampiero	(Università di Bologna)
Danielsen Svein Willy	(SINTEF Building and Infrastructure)
D'Ayala Dina	(UCL)
De Block Roger	(Saint-Gobain)
de Luxan Maria Pilar	(IETcc, CSIC)
de Miranda Stefano	(Università di Bologna)
De Vries Bauke	(Eindhoven University of Technology)
Degani Marco	(Università di Bologna)
Di Giulio Roberto	(University of Ferrara)
Donato Fabio	(University of Ferrara)
Drdácý Miloš	(ITAM CAS)
Dumoulin Claude	(Bouygues Construction)
ECTP General Secretariat	(CSTB)
Engberg Kristian	(Saint-Gobain)
Enjily Vahik	(BRE)
Eyraud de Fay Pétronille	(VINCI Construction)

Fabbri Rita	(University of Ferrara)
Fantazzini Paola	(Università di Bologna)
Fiès Bruno	(CSTB)
Finat Javier	(University of Valladolid)
Fiori Cesare	(Università di Bologna)
Fontano Federica	(University of Ferrara)
Franzoni Elisa	(Università di Bologna)
Frick Juergen	(Universität Stuttgart)
Fuente Jose Vicente	(AIDICO)
Garcia Oihana	(TECNALIA)
Géradin Michel	(Public)
Giambruno Maria Cristina	(Politecnico di Milano)
Gokce Umut	(UCC)
Golez Mateja	(ZAG)
Gualtieri Sabrina	(ISTEC CNR)
Guerreschi Antonio	(University of Ferrara)
Gumilar Vladimir	(CCS)
Gutierrez Eugenio	(Public)
Gutierrez-Cortines Cristina	(Public)
Hambouri Ekaterini	(EC)
Hamelin Jean-Pierre	(Soletanche Bachy)
Hansen Helge	(Danish Technological Institute)
Hauke Bernhard	(Bauen mit Stahl)
Havermans John	(TNO Built Environment and Geosciences)
Høiseth Karl Vincent	(NTNU)
Johansson Erika	(Chalmers)
Kittang Dag	(SINTEF Building and Infrastructure)
Krigsvoll Guri	(SINTEF Building and Infrastructure)
Langer Sarka	(SP)
Lazarus Deborah	(ARUP)
Leiss Marilena	(University of Ferrara)
Leissner Johanna	(Fraunhofer Building Innovation Alliance)
Lerones Pedro Martín	(CARTIF)
Lesniak Christophe	(EC)
Luebke Chris	(ARUP)
Lydon Adele	(EC)
Malaga Katarina	(SP)
Mardaras Javier	(ACCIONA)
Massaretti Pier Giorgio	(Università di Bologna)
Mazzeo Rocco	(Università di Bologna)
Mazzeti Cecilia	(University of Ferrara)
Meiling Pär	(Chalmers)
Meng Birgit	(BAM)
Montanari Angela	(Università di Bologna)
Morselli Luciano	(Università di Bologna)
Müller Urs	(BAM)
Munna Antonella	(Università di Bologna)
Ottosen Lisbeth	(DTU Civil Engineering)
Papayianni Joanna	(Aristotle University of Thessaloniki)
Pardi Livia	(Autostrade per l'Italia)
Pascale Giovanni	(Università di Bologna)
Passarini Fabrizio	(Università di Bologna)
Pattanaro Giulio	(EC)

Pereira Roders Ana	(Eindhoven University of Technology)
Planchon Dominique	(EC)
Porro Antonio	(TECNALIA)
Prearo Guido	(University of Ferrara)
Pritchard Ian	(ACE/CAE)
Quirke Ian	(Zueblin)
Revel Gian Marco	(Università Politecnica delle Marche)
Rincon Lopez Jesus	(IETcc, CSIC)
Rodriguez-Maribona Isabel	(TECNALIA)
Ruiz Angela	(ACCIONA)
Sala Benedetto	(University of Ferrara)
San Jose Tomas	(TECNALIA)
Sanchez-Beitia Santiago	(UPV/EHU)
Sandrolini Franco	(Università di Bologna)
Santarato Giovanni	(University of Ferrara)
Schouenborg - SP Björn	(SP)
Sijanec Marjana	(ZRMK)
Skapin Andrijana	(ZAG)
Soffritti Gabriele	(Università di Bologna)
Syrda Elzbieta	(ASM)
Thun Hohenstein Ursula	(University of Ferrara)
Tilche Andrea	(EC)
Tomazevic Miha	(ZAG)
Tontini Susanna	(Università di Bologna)
Troi Alexandra	(EURAC / E2BA)
Turkieltaub Nathalie	(VINCI Construction)
Ubertini Francesco	(Università di Bologna)
van der Linden Thomas	(Deltares)
van Hees Rob	(TNO Built Environment and Geosciences)
Van Rompaey Sara	(ACE/CAE)
Vandini Mariangela	(Università di Bologna)
Vanhellemont Yves	(BBRI)
Vestergaard Peter B.	(Danish Technological Institute)
Vinot Céline	(CERIB)
Vittuari Luca	(Università di Bologna)
Vyncke Johan	(ENBRI)
Weise Frank	(BAM)
Zalama Eduardo	(CARTIF)
Zanchini Enzo	(Università di Bologna)
Zanzi Luigi	(Politecnico di Milano)
Zarnic Roko	(ZRMK)

General assembly meetings are organised twice a year, and all FACH members, EC representants, ECTP secretariat and other relevant institutions are invited to these meetings.

## 5. Links between FACH and PPP EeB

The growing importance of culture is closely linked to recent economic development trends. Firstly, the increasing importance of CH in Europe is related to the evolution of societies away from traditional industries towards the service sector. Secondly, changes in lifestyle and growing leisure time create more demand for leisure activities, including culture. At the same time the human comfort is one of the main goals of the life. Both trends tend to encourage economically viable aspects of culture.

The city and village are probably one of the most important working places for the Construction Industry and an addressable market. Their urgent need for restructuring and re-qualification has already been observed everywhere in Europe. Knowing that these territories contain a significant quantity of existing buildings and monuments, the necessity arises to re-use them systematically as a basic support for restructuring the place. Re-use, upgrading and adaptation to new functions of historic buildings are a pre-requisite for sustainable development and for conservation of the historic environment.

The need to save energy and reduce CO<sub>2</sub> emissions make it necessary to adapt our cities to mixed use (housing, services and working places in the same area), so that traffic movements are reduced. This means the historic centres of European cities have to be transformed to a better place to live, work and visit. This concept is also linked to the concept of improving the level of accessibility of our cities, as retail activities are literally flowing outside city centres, which threatened the sustainability of historic centres.

Many building assignments take place within the historic context of existing buildings, urban structures or cultural landscapes. Building in the historic context requires an attitude of architects and planners to be conscious of existing qualities in their plans and designs.

Apart from conservation of monumental values, the necessity of saving natural resources, without renounce of the reached human comfort, in general leads to a better re-use of existing infrastructures and buildings. Already approximately 80% of the buildings and structures of the future city are already constructed. As a consequence of that, it is expected an increase of the activities of refurbishment and rehabilitation, representing, nowadays, about 40 % of construction activities. Historic buildings, c.q. monuments may perform an exemplary role. Research closely related to the process of intervention and transformation is necessary.

Further, Cultural Heritage is closely related to other economic activities, as tourism. As the conservation and transformation of Cultural Heritage buildings may be considered very knowledge intensive, the effective implementation of new and innovative technologies will lead to an important economic impact, mainly related to the creation of new jobs. Further, a general change of the local image and the increase of visitors and activities related to them are economically important. Cultural Heritage is a key to the economic competitiveness of Europe, with €340 billion annual turnover and 8 million workers.

To promote the importance of the historic centres as key areas to improve sustainability, it is crucial now to ensure that the present requirements demanded by the citizens, in terms of habitability and comfort, that are usually achieved in new housing, are also reached by transformation of historic buildings and centres in historic areas. These requirements mostly refer to energy efficiency, accessibility, new functions and infrastructures.

In spite of the need to fulfil these requirements, the integrity and authenticity of Cultural Heritage buildings of these areas should be preserved, and, therefore, most of the solutions designed and used for normal buildings cannot easily be applied in rehabilitation and/or refurbishment of

historic buildings. On top of that, historic buildings are excluded from the Energy Performance of Buildings Directive 2002/91. This often offers new opportunities for sustainable technologies that are not subject to legislative, social, technical and economic barriers. Nevertheless the conservation, modification, intervention and transformation of architectural and urban heritage in a broad sense need to become an important aspect of the architectural practice.

These old solutions and new discoveries developed mainly in a civil contest aimed to save energy and preserve our environment needs to be modified, improved and adapted for the particular needs of the immovable and moveable Cultural Heritage.

The necessity to solve this conflict is restraining the potentiality of the historic areas as an ideal place to live, work and visit, and urgent research is needed to establish the means to determine habitability requirements and to design new (transformation) solutions able to reach them.

The overall objective of PPP EeB is to deliver, implement and optimize building and district concepts that have the technical, economic and social potential to drastically cut the energy consumption and reduce CO<sub>2</sub> emissions from the existing and new buildings at the overall scale of the European Union.

PPP EeB will speed up research on key technologies and develop a competitive industry in the fields of energy efficient products and services, with the main purpose of reaching the goals set forth for 2020 and 2050 to address climate change issues and contribute to improve EU energy independence thereby transforming this challenge into a business opportunity.

## 6. Financial aspects

The resources to be used for the implementation of activities and tasks of the working FACH groups will come mainly from the participating organizations, by covering their own costs.

From end of 2006 to march 2008, some support from EU DG Research was obtained particularly to assist the FACH Secretariat and coordination of activities including the reimbursement of travelling costs of the Group Members. This funding was established through CHRAF proposal, an EU project developed under the call for proposals FP6-SSP5 5A, 8.1. B.3.6 "Task 7" to support cultural heritage research activities: to help identify priorities and develop strategies as input to the European Construction Technology Platform (ECTP) and its strategic Research Agenda, as well as to future FP7 activities regarding cultural heritage research; in particular to support the organisation of the Focus Area "cultural heritage" of the ECTP. EU budget: 150.000 €. The duration of CHRAF was 18 months (starting date: 01/10/2006).

Once this EC support has been finished, all the organisations are covering their own costs again. No additional financing is foreseen for a near future.