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EU RESEARCH FOR SUSTAINABLE URBAN DEVELOPMENT AND LAND USE CULTURAL HERITAGE



NEW TECHNOLOGIES FOR THE FUTURE OF OUR PAST



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SUSTAINABLE DEVELOPMENT, GLOBAL CHANGE AND ECOSYSTEMS

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SOCIAL DUTY, ECONOMIC IMPERATIVE

To many people, the Eiffel Tower is more than a mountain of metal. Ireland guards its ancient manuscript, the Book of Kells, like a royal princess. And the Tower of London, Granada's Alhambra, the Acropolis in Athens, and the Gothic cathedrals of Portugal, France, Spain and Germany are infinitely more valuable to the people of the cities that house them than the stone from which they were built.

Such symbols of a nation's heritage are tangible reminders of past civilisations. These historical sites and artefacts owe their existence to artists, engineers, architects, masons and artisans who may never have dreamed that they would become national treasures for the admiration of future generations. But we do value these cultural icons, which are under constant threat from mistreatment, pollution, micro-organisms and pests, and a host of natural and man-made forces. Protecting them is a matter of historical, scientific, aesthetic and even political concern.



Europe is proud of its rich history – a multicoloured tapestry of peoples, languages and cultural experiences. But recent generations have, for one reason or another, underestimated the significance of their patrimony. We are failing in our duty to take care of historical physical artefacts, both indoors and outdoors.

Today, the preservation of Europe's cultural heritage is not just a social duty. The growing success of the cultural tourism sector in Europe gives it a strong economic rationale as well. Despite this, the priority currently accorded to achieving economic growth, especially in an enlarging Europe, constantly threatens to push cultural heritage down the political agenda.

Through its research programmes and specific initiatives – in particular, the 'City of tomorrow and cultural heritage' key action of the Fifth Framework Programme for Research (FP5) – the Commission supports conservation of what it calls the "physical, movable and immovable cultural heritage". The overall goal of the Directorate-General for Research is to reinforce the scientific and technical basis for protecting and rehabilitating European cultural heritage.

Cristina Gutierrez - Cortines

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MEMBER OF THE EUROPEAN PARLIAMENT

A THREATENED LEGACY

Civilisations evolve over hundreds of years. The tangible traces they leave behind enable future generations to trace their roots and to understand the past. Ancient ruins, cities of culture, delicate artefacts and historical remnants are prominent among the rich reminders of how our forebears lived their lives.

Europe has a larger share of UNESCO's world heritage list than any other part of the world, with well over 200 entries of cultural and natural significance. It is perhaps no accident that Europe is also the region most visited by international tourists, according to figures from the World Tourism Organisation. Each year, millions of people flock to see Europe's cultural treasures. But although this patrimony is culturally and economically valuable, it is also fragile.

Nearly 50% of Europe's tangible cultural heritage has been lost in just 100 years. What remains is under stress from the effects of climate, water damage, air pollution, chemicals and mass tourism. Poor management, coupled with gross underestimates of the damage costs – especially those caused by the 'externalities' of modern living – is a major threat to our cultural heritage.

Problem solved

The challenge for the Union, especially as it expands to include new members, is to find better and more sustainable ways to protect its cultural heritage. Many different actors must play their parts, including the scientific community and the end-users of research, enterprises, national and local authorities, private owners and managers of cultural heritage, architects and restorers – not forgetting policy-makers.



Cultural heritage is often shrouded in emotional language centred on social and environmental concerns. But this should not hide the fact that it is also good business, especially in the new EU Member States. A quarter of Cyprus' gross domestic product (GDP) comes from tourism, for example. Even in industrial countries like Germany and France, tourism accounts for 8% and 7% of GDP respectively.

New technologies, tools, materials and processes coming out of research related to cultural heritage, especially from small and medium-sized enterprises, contribute to national economies by creating more jobs, better skills and training, and new business opportunities. A valuable transfer of technologies between industry and cultural heritage is already under way – laser cleaning has been applied to historic buildings, for example, while new antibiotics have been developed from bacteria discovered in the caves of Altamira, in Spain.

TRANSNATIONAL RESPONSE TO COMMON PROBLEMS

With the necessary resources and motivation, researchers can help natural historians and curators understand the causes, mechanisms and consequences of deteriorating cultural heritage. They can develop practices and technologies to control this deterioration and, in many cases, offset the harmful effects. But first they have to quantify the damage.

The European Union has long supported the development of scientific and technological solutions to the loss of its physical and tangible cultural heritage. Since 1986, a range of new standards and legislation has been introduced. For example, the Clean Air for Europe (CAFÉ) thematic strategy assesses the impact of air pollution on health and also on the built cultural heritage, and will make air quality recommendations.

The projects funded by the EU under successive research Framework Programmes have encouraged around 500 stakeholder organisations to take a multidisciplinary and cross-border approach to the problem. Biologists from Hungary and chemists from Germany, for example, are able to work with engineers from Greece and climatologists from the UK, with input from technologists in Sweden and museum curators in Belgium. The scale of the research is as large as it needs to be to solve the problems – an average project has around ten partners, runs for three years and receives EC funding of €1-1.5 million.

This unique approach, in which common problems are tackled by pan-European consortia, gives project partners the chance to develop and compare methods, tools and materials, to identify and test the best technologies and techniques in the field, and to spread good practice rapidly and widely.



| Working together

This publication highlights just a few examples of the projects supported by the EU's Fifth Framework Programme for Research, and begins to formulate future directions for cultural heritage research and policy.

In order to improve communication among cultural heritage researchers, the European Commission arranges events where professionals and various stakeholders can meet and discuss progress in the field.

Ancient artefacts, like Ireland's Book of Kells, also form part of our cultural heritage.

"Rational management of tourism may contribute significantly to the protection and development of the physical environment and cultural heritage, as well as improving quality of life . . . on the basis of the concept of 'sustainable development'."

Commission Communication
'Basic orientations for the sustainability of European tourism', November 2003

INNOVATION IN CONSERVATION

.06

NEW TECHNOLOGIES FOR THE FUTURE OF OUR PAST



Integration of urban cultural heritage – Prague's historic Old Town Square and (right) in a photomontage used to test public response to a planned development.

School of Architecture, Queens University Belfast

Over the past 20 years, the EU has invested more than €100 million in research to help its Member States safeguard their historical and cultural treasures. Under the Fifth Framework Programme (FP5) alone, the Commission set aside €50 million for research in this field.

The Commission's work plan for the 'City of tomorrow and cultural heritage' key action makes clear that funding should help to protect, conserve and enhance European cultural heritage. Research proposals are aimed at:

- | improving **damage assessment** on cultural heritage
- | developing **innovative conservation** strategies
- | fostering **integration of cultural heritage** in the urban setting

Around 40 high-quality projects were selected for funding which ranged from €500 000 to over €2 million. Transnational research teams worked on new research models, tools, maps, sensors and methods, as well as analysing and establishing standards and thresholds. Twelve additional research projects were supported through other FP5 programmes such as INCO-MED (International Co-operation for Mediterranean Countries) and the CRAFT scheme for SMEs.

| High stakes, excellent return

Europe's leadership in basic research, knowledge, expertise and technological development in the field of cultural heritage protection is recognised worldwide. In July 2004, for example, the American Optical Society awarded the OSA Leadership Award to a European laser scientist for his contribution to the field of laser applications to art conservation, developed through a number of EU-funded projects. Europe has also created an unrivalled and cohesive network of specialist scientists, architects, engineers, conservators, cultural heritage managers, end-users and SMEs.

To maintain this lead, and to guarantee long-term conservation and protection of buildings and artefacts, EU funding programmes should be coordinated with complementary national schemes. The Commission has proposed:

- | that model cultural heritage conservation projects be used as a vehicle for continued exchanges of scientists and practitioners
- | that know-how continues to be shared transnationally, especially with Eastern European Member States

new research to address fraud detection and the verification of authenticity, as part of the effort to stamp out illicit trade in cultural artefacts

Demonstration and communication

The new tools, technologies or standards produced by many research projects are already being applied to solving real problems. For example, the CATS project analysed lighting conditions at Roman tourist sites and came up with a set of recommendations to mitigate microbial damage. LIDO has designed a patented 'light dosimeter' for monitoring potentially harmful light changes (see *Prizewinner*). Picture is helping to assess the socio-economic impacts of the relationship between cultural heritage and tourism, while projects like Noah's Ark and Multi-Assess are studying the effects of pollutants on cultural heritage, and establishing threshold levels of damage to monuments and historical materials.

By sharing skills and expertise, Europe's scientists keep abreast of cultural heritage developments. Indirectly, this helps other stakeholders to ensure that Europe remains the most visited centre of cultural heritage in the world. To support communication, the Commission has organised conferences, workshops, advanced courses for post-doc students, and seminars in cities all over Europe such as:



Research clusters

After careful evaluation of their type of activity and the merits of the research being proposed, the Commission has grouped the projects into clusters, according to their objectives:

Cluster 1: Air pollution and global change effects on cultural heritage

Caramel, Multi-Assess, Vidrio, Cult-Strat*, Noah's Ark*

Cluster 2: Damage to historic buildings

ASSET, DIAS, ROCEM, Compass, ITER (CRAFT), Firetech (Thematic Network), Fortmed, Onsiteformasonry, Histo-Clean (CRAFT), Saltcontrol*

Cluster 3: Environment inside museums, historic buildings & libraries

Impact, Collapse, LIDO, Friendly Heating, Inkcort, Papyrus, Laseract, Master, IDAP, MIMIC, MODHT, MIP (Thematic Network)

Cluster 4: Microbiology and cultural heritage

Coalition, Bioreinforce, Biobrush, Bacpoles, Biodam, CATS

Cluster 5: Integration of cultural heritage into urban settings

SUIT, Appear, Picture*

Further information | <http://www.cordis.lu/eesd/ka4/home.html>

* = Sixth Framework Programme (FP6) projects

- | Symposium 'Science, technology and European cultural heritage', Bologna, Italy (1989)
- | Workshop 'Research on the effects of the environment on indoor cultural property', Würzburg, Germany (1995)
- | Advanced study courses 'Cultural heritage protection in a sustainable society' London, United Kingdom and 'Innovative technologies and materials for the conservation of monuments' Athens, Greece (2003)



Prizewinner

Like other delicate artefacts, works of art are extremely sensitive to light. But variation in the source and intensity of light makes the effect hard to quantify and mitigate. Most damage is done by light of shorter wavelengths – closer to ultraviolet – whose photons behave more aggressively. The effect increases with greater exposure over time. Installing reliable measuring and monitoring systems is possible but expensive.

European research teams in the **LIDO** project tackled the specific problems of conserving fragile art works in museums and historic houses, with the aim of designing a simple and inexpensive paper-based 'light dosimeter' within three years. The result is the patented LightCheck® mini-sensor whose photosensitive coating changes colour according to its 'accumulated' exposure to light.

Further information | <http://www.lido.fraunhofer.de/>

In December 2003, the LIDO team was awarded the Pan-European Grand Prix for Innovation in the field of cultural heritage for their LightCheck mini-sensor.

The EU has also organised five major international conferences and supported dozens of publications promoting specific aspects of cultural heritage research. Rome hosted the first major conference, in 1997, entitled 'Research for the protection of cultural heritage: opportunities for European enterprises'. Similar events followed in Aachen (Germany, 1998), Santiago de Compostela (Spain, 1999), Strasbourg (France, 2000) and Cracow (Poland, 2002). The sixth EU conference is planned to take place in London, in September 2004.

Pan-European co-operation

Since 2000, efforts have been made to foster co-operation between east and west, and to assess the state of the art of cultural heritage research in an enlarged Europe. Particular attention has been paid to the control of bio-deterioration, conservation strategies for organic objects in museums, methods for damage assessment of heritage artefacts, air pollutant guidelines, and monitoring of cultural heritage.

The central challenges are likely to be:

- | Integrating cultural heritage into the living city
- | Education and training needs for the conservation and protection of cultural heritage
- | Meeting user needs – SMEs and research
- | The conservation of cultural heritage for sustainable development

These themes were the focus of discussion at the most recent conference in Cracow in 2002.



SUITable for success

Urban areas are 'living systems' of people and buildings, which include both remnants of the past and the potential for the future. Urban societies should be mindful of the role that 'urban fragments' play in the overall cultural identity of a city.

Countless examples of wholesale redevelopment in Europe's cities have – in the pursuit of progress – ignored the wider community interests which include how these changes affect cultural heritage. EU directives concerning impact assessment have to be applied soon at national level. European researchers in the **SUIT** project have devised assessment procedures which take stock of the strategic and environmental impacts of large- and small-scale urban development projects. Using SUIT's methods, local authorities are able to gauge the suitability of proposed developments, actively integrating heritage aspects into the overall urban socio-economic goals.

Further information | <http://www.lema.ulg.ac.be/>

Further information

| FP5's key action **City of tomorrow and cultural heritage**
<http://www.cordis.lu/eesd/ka4/home.html>

| Directory of all **research projects** funded by the key action (together with other relevant documents)
<http://www.cordis.lu/eesd/ka4/library.htm>

| **'Environmental Research'** website on Europa
<http://europa.eu.int/comm/research/environment/>

| For specific enquiries concerning the activities presented in this brochure, please contact
rtd-sustainable@cec.eu.int

Other international organisations and agencies

| United Nations Educational, Scientific and Cultural Organisation
<http://portal.unesco.org/>

| United Nations Environment Programme
<http://www.unep.org/>

| International Centre for the Study of the Preservation and Restoration of Cultural Property
<http://www.iccrom.org/>

| International Committee on Museums
<http://icom.museum/>

| World Tourism Organisation
<http://www.world-tourism.org/>

| Council of Europe
<http://www.coe.int/>

INVESTING IN A KEY ASSET

The Treaty of the European Union explicitly mentions the 'European identity' which depends on social, political and, especially, cultural values and behaviour resting on shared experience, memory, tradition and language. Article 151 of the Treaty indicates that safeguarding movable and immovable cultural heritage of European significance should be a priority field of conservation action and is the basis for initiatives such as cultural heritage research programmes and the 'Culture 2000' programme.



The Treaty builds bridges between culture and other segments of European policy, asking for a critical assessment of how culture is affected by policy in areas such as research, education, external relations, regional development, environment, enterprise and trade.

Beyond the Member States, the EU's championing of its patrimony is supported by international organisations, agencies and other institutions worldwide, such as UNESCO (United Nations Educational, Scientific and Cultural Organisation), ICCROM (International Centre for the Study of the Preservation and Restoration of Cultural Property), ICOM (International Committee on Museums), the Council of Europe, and Heritage Trusts.

Tough task ahead

Despite 18 years of successful EU research and co-operation in the field of cultural heritage protection and rehabilitation, there is still much to be done. Cultural heritage continues to be threatened by pollution, mismanagement, uncontrolled development, mass tourism and even well-meaning but sometimes poorly equipped conservation departments and badly informed decision-makers.

Research under the European Union's Sixth Framework Programme (FP6), which runs from 2002 to 2006, focuses on sustainable research activities, including a small part dedicated to the protection of European cultural heritage. It supports the development of new technologies and best practices for restoring, preserving and protecting Europe's cache of monuments, buildings, tapestries, paintings, cultural villages, towns and cities, and all manner of valuable historical artefacts. To do this, €10 million – just 0.06% of FP6's €17.5 billion budget – has been earmarked for tangible research projects across the enlarged European Union of 25 Member States. Clearly, further efforts have to be undertaken in the coming years, both at EU and national level, to reinforce Europe's cultural heritage research and maintain its global leadership.


European Commission

New technologies for the future of our past: EU Research for sustainable urban development and land use - Cultural heritage

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Europe's cultural heritage is threatened by water damage, air pollution, chemicals, mass tourism and poor management. This publication shows how EU research brings together expert scientists, public authorities, owners and managers, architects and restorers to develop and test new technologies, tools, materials and methods. The results of their work will enable Europe to improve the protection of its rich cultural heritage.



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