



European
Commission



EU research

Cultural Heritage

*Research and
Innovation*

EUROPE DIRECT is a service to help you find answers
to your questions about the European Union

Freephone number (*):

00 800 6 7 8 9 10 11

(* Certain mobile telephone operators do not allow access to 00 800 numbers
or these calls may be billed

LEGAL NOTICE

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of the following information.

More information on the European Union is available on the Internet (<http://europa.eu>).

Luxembourg: Publications Office of the European Union, 2013

ISBN 978-92-79-32320-1

doi:10.2777/31094

© European Union, 2013

Reproduction is authorised provided the source is acknowledged.

Images: Cover: © Circumnavigation, #39871954, 2013. Inner cover: © JackF, #53350003, 2013 Section 1: © vrabelpeter1, #53415689, 2013. Section 2: © ankomando, #38236115, 2013. Section 3: © ayutaroupapa, #39624505, 2013. Source: Fotolia.com

The importance of research in cultural heritage

Europe's cultural heritage is invaluable for its citizens and is irreplaceable. It provides an opportunity to gain understanding of the past and promotes a sense of social and common identity. Overtime, however, the fragility of European cultural heritage has increased and its vulnerability to the harmful effects of climate change, pollution, natural and man-made disasters, neglect, vandalism and tourism become more evident. Changing landscapes, deforestation and coastal erosion due to increasing urbanisation also take their toll. To avoid irreversible damage and loss, appropriate action is needed at every level.

The EU's Seventh Framework Programme (FP7) supports research programmes that promote the long-term future protection and conservation of cultural assets. The study and preservation of cultural heritage signifies the preservation of the European identity, cultural diversity, well-being and wealth. This is not only for the present but for future generations.

As an economic sector, European Cultural Heritage is estimated to generate an annual revenue of over 300 billion EUR, with close to 9 million jobs in the tourism sector which are directly or indirectly linked to it. The market for heritage conservation is estimated at about 5 billion EUR per year.

Research priorities

Research efforts in FP7 have focused on developing materials for the protection, conservation and restoration of cultural heritage assets, predictive models, early warning devices, technologies for adaptation and mitigation strategies. This will help to **safeguard and enhance European cultural heritage for future generations** to come. On the other hand, at a time when climate change poses a threat to infrastructure it is vital to improve our approach to the refurbishment of historic buildings. Historic building can be a source of greenhouse gas emissions and rising energy bills, and finding innovative solutions for **tackling energy efficiency of historic building** is key.

In order to ensure a more concerted research action on cultural heritage from member states, the EU supports and encourages initiatives which **strengthen collaboration and cooperation** between member states and non-EU countries.



Safeguarding and enhancing cultural heritage for future generations

Climate change and extreme events such as earthquakes, fires, floods pose serious threat to cultural heritage, both moveable (e.g. artefacts, paintings) and immovable (e.g. buildings, monuments). Other factors such as pollution can also severely affect the exterior facades of historic buildings, and collections preserved inside historic buildings are also at risk.

In order to tackle these issues, it is essential to develop predictive models, early warning devices and novel materials, technologies for adaptation and mitigation strategies. These will help to monitor preservation and the impact of environmental change on cultural heritage assisting also the development of guidelines, standards and policies for the protection and preservation of cultural heritage.

Furthermore, more research is needed with regards to materials used for the protection, conservation and restoration of cultural heritage assets. In general, traditional materials and techniques are used for conservation work. New materials and techniques (e.g. nanotechnology) may offer additional and longer lasting solutions. However, these advanced materials and technologies should be environmentally friendly as well as harmless for the user. The EU also supports research done in new methods for mapping, assessment and excavation of underwater cultural heritage as well as research in innovative technologies and tools for assessing, protecting and managing cultural landscapes.



Adapting to climate change

*The **CLIMATE FOR CULTURE** project gives us a better idea of the damage to cultural heritage that could be triggered by changing regional climates. Strategies to adapt to or lessen the impact of climate change can be fine-tuned, and their costs can be defined more precisely by using simulation tools. Combining high resolution regional climate modelling with whole buildings simulation will allow to give also estimates on future energy demands of buildings.*

Reacting to damage

Understanding all these effects is crucial for improving policies and developing innovative technologies for preserving moveable and immovable heritage. For example, the EU-funded project **Firesense** has developed an early warning system which monitors the risk of wildfire and storms on remote archeological sites. Another project **Perpetuate** designs innovative, low impact and reliable strengthening interventions to prevent damage to historical structures.

Dealing with the underwater heritage, **ARROWS** aims at reducing the cost of mapping, diagnosis and excavation while **SASMAR** is developing best practice guidelines to locate, assess and manage archaeological sites.

As for nanotechnology research in the field of cultural heritage protection, the NanomeCH cluster strengthens synergies among five projects: **HEROMAT**, **IMAT**, **NANOFORART**, **NANOMATCH**, **PANNA**.

Tackling energy efficiency of historic buildings

European cultural heritage is the testimony of our common past and a source of our identity, it enriches the collective memory that makes the future of Europe more tangible and human for Europeans. Its conservation could contribute to the creation of a new image of cities, where Cultural Heritage is a valuable element that should be accessible for all. Historic quarters give uniqueness to European cities. They are a living symbol of Europe.

However, historic buildings are not energy efficient and are substantial contributors to greenhouse gas emissions and rising energy bills. At a time when climate change poses a threat to humanity and its infrastructure, it is vital to improve our approach to the refurbishment of historic buildings and prevent their destruction. However, these interventions should respect the historic and cultural value of the buildings.

Research in this area aims to promote green technologies and the development of energy efficient systems and materials in historic buildings — with a view to radically reducing their energy consumption and CO₂ emissions. This is supported by the EU's 'Energy –efficient buildings' initiative which is made up of partners from public and private sectors.

The EU funded project **EFFESUS** is exploring the energy efficiency and sustainability of European historic urban districts. It is trying to develop measures and tools in order to make significant improvements whilst protecting heritage values. The main output of this project will be the Decision Support System. This software tool will help prioritise improvement measures, suitable for use within historic urban districts, to achieve significant energy efficiency improvements and carbon emission reductions. EFFESUS will also support the development of technologies suitable for use within historic urban districts ranging from aerogel insulation products to intelligent energy management systems.



Restoring heritage with technology

3NCULT demonstrates the feasibility of "Factor 4" to "Factor 10" reduction in energy demand of historic buildings, depending on the case and the heritage value.

Key achievements include the development of several prototypes including conservation compatible windows, enhanced internal insulation and low impact ventilation.

Application and solution guidelines and diagnosis, and planning tools will also be developed. 3NCULT has come up with a successful approach to do this. The project has collaborated with the BUILD UP project to capture the energy efficiency solutions developed in a virtual library. 3NCULT has also put strong emphasis on trying to develop standards for heritage buildings.

Coordination of national research programmes and priorities

Protection of cultural heritage in the face of global change is fast becoming a major concern for decision-makers, stakeholders and citizens in Europe. Research into strategies, methodologies and tools is needed to safeguard cultural heritage against continuous decay. Before irreversible damage is done, concerted actions, based on sound science, are needed to protect, strengthen and adapt Europe's unique cultural heritage.



A New Challenge for Europe

HERITAGE PLUS is an EU-funded project that aims to pool the necessary financial resources from the participating national programmes and the EU. It aims to launch a single Joint Call for Proposals for research projects in the cultural heritage that will be evaluated and managed jointly by the participating programmes. This collaborative approach will provide a better use of public resources by proposing concrete solutions for pooling national expertise and resources, and establishing closer collaboration among the participating States in the field of cultural heritage, while the EU contribution to the Joint Call budget will stress the high interest generated by this common action.

The EU encourages and supports efforts from Member States and non-EU countries to jointly programme their research activities. Public authorities, funding agencies, research organisations and private companies are joining forces and working in research.

A concerted research action has been put in place to allow Member States to maximise and exploit at best their research efforts in order to help achieve a European Research Area (ERA) on cultural heritage. The Joint Programming Initiative on Cultural Heritage and Global Change (JPI CH) provides a framework where Member States can jointly address areas where public research programmes can respond to major societal challenges.

NET-HERITAGE is a significant initiative which sets out to coordinate national research programmes at member state level, and support European programmes in research applied to the protection of tangible cultural heritage.

JHEP intends to structure and support the JPI CH in a changing world. It has done this by defining a common vision which needs to be translated into a Strategic Research Agenda outlining a common view of the priority research areas in tangible, intangible and digital cultural heritage. It proposes and explores the relation between Cultural Heritage and climate change, it looks at the issues of protection and security of Cultural Heritage and it investigates the relation between the protection of Cultural Heritage and its cultural uses by society.

Project List

3ENCULT – Efficient energy for EU Cultural Heritage
www.3encult.eu

ARROWS – Archaeological robot systems for the world's seas
www.arrowsproject.eu

CHRESP – 8th European Commission conference 'Cultural heritage research meets practice'
http://ec.europa.eu/research/environment/pdf/publications/fp7/cultural_heritage/chresp_preprint.pdf

CLIMATE FOR CULTURE – Damage risk assessment, economic impact and mitigation strategies for sustainable preservation of cultural heritage in the times of climate change
www.climateforculture.eu

EFFESUS – Energy efficiency for EU historic districts sustainability
www.effesus.eu

EU-CHIC – European cultural heritage identity card
www.eu-chic.eu

FIRESENSE – Fire detection and management through a multi-sensor network for the protection of cultural heritage areas from risk of fire and extreme weather conditions
www.firesense.eu

HERCULES – Sustainable futures for Europe's HERitage in CULtural landscapES: Tools for understanding, managing, and protecting landscape functions and values Website under construction

HERITAGE PLUS – ERA-NET Plus on Cultural Heritage and Global Change Research
www.jpi-culturalheritage.eu and www.heritageportal.eu

HEROMAT – Protection of cultural heritage objects with multifunctional advanced materials
www.heromat.com

IMAT – Intelligent mobile multipurpose accurate thermoelectrical mild heating device for art conservation
www.imatproject.eu

JHEP – Coordination action in support of the implementation of a JPI on cultural heritage and global change: a new challenge for Europe
www.jpi-culturalheritage.eu/jhep

MEMORI – Measurement, effect assessment and mitigation of pollutant impact on moveable cultural assets – Innovative research for market transfer
www.memori-project.eu

MUSECORR – Protection of cultural heritage by real-time corrosion monitoring
www.musecorr.eu

NANOFORART – Nanomaterials for the conservation and preservation of movable and immovable artworks
www.nanoforart.eu

NANOMATCH – Nanosystems for the conservation of immovable and moveable polymaterial cultural heritage in a changing environment
www.nanomatch-project.eu

NET-Heritage – European network on research programme applied to the protection of tangible cultural heritage
www.netheritage.eu

NIKER – New integrated knowledge based approaches to the protection of cultural heritage from earthquake-induced risk
www.niker.eu

PANNA – Plasma and nano for new age 'soft' conservation
www.panna-project.eu

PERPETUATE – Technologies for protecting cultural heritage assets from risks and damages resulting from extreme events, especially in the case of earthquakes
www.perpetuate.eu

POPART – Strategy for the preservation of plastic artefacts in museum collections
<http://popart.mnhn.fr/>

ROCARE – Roman cements for architectural restoration to new high standards
www.rocare.eu

SASMAP – Development of tools and techniques to survey, assess, stabilise and preserve underwater archaeological sites
<http://sasmap.eu/>

SMooHS – Smart monitoring of historic structures
www.smoohs.eu

SYDDARTA – System for digitization and diagnosis in art applications
www.syddarta.eu

TEACH – Technologies and tools to prioritise assessment and diagnosis of air pollution impact on immovable and movable cultural heritage
www.teach-project.eu

WRECK PROTECT – Strategies for the protection of shipwrecks in the Baltic Sea against forthcoming attack by wood degrading marine borers
www.wreckprotect.eu

Europe's cultural heritage is invaluable for its citizens and is irreplaceable. It provides an opportunity to gain understanding of the past and promotes a sense of social and common identity. Overtime, however, the fragility of European cultural heritage has increased and its vulnerability to the harmful effects of climate change, pollution, natural and man-made disasters, neglect, vandalism and tourism become more evident. Changing landscapes, deforestation and coastal erosion due to increasing urbanisation also take their toll. To avoid irreversible damage and loss, appropriate action is needed at every level. The EU's Seventh Framework Programme supports research and innovation based solutions at transnational and international level.

Research and Innovation policy



ISBN 978-92-79-32320-1



doi: 10.2777/31094