

TEACH-PROJECT

AT A GLANCE

Title: Technologies and tools to prioritize Assessment and diagnosis of air pollution impact on immovable and movable Cultural Heritage

Instrument: FP7, Funding Scheme Collaborative project

Total Cost: 2.325.328,5

EC Contribution: 1.649.982,48

Duration: 3 years

Start Date: 1 December 2008

Consortium: 10 partners from 7 countries

Project Coordinator: Adriana Bernardi

Project Web Site: www.teach-project.eu

Key Words: weathering of cultural heritage, pollution change, climate change, technological devices, colour surface change, environmental kit, monitoring tools and devices

THE CHALLENGE

TeACH is a multidisciplinary project that aims to build devices and tools for use in detecting and monitoring the damage on various treated and untreated cultural heritage materials, taking into account changing trends in pollution compounds and concentrations predicted in the near and far future. While the main focus will be on outdoor measurements and effects, the project will also study the indoor consequences. The devices and tools adopted for this purpose will include commonly adopted ones, already existing devices opportunely adapted, improved or transformed, and newly developed ones.

To pursue this goal the strategy of TeACH can be divided into the following 3 phases: untreated cultural heritage materials, taking into account changing trends in pollution compounds and concentrations predicted in the near and far future.

PROJECT OBJECTIVES

This will be achieved within TeACH by developing the following main objectives:

- Identify multi-pollutants as a complex combination of gas and particles which have a changing impact in the near and far future on the immovable and moveable cultural heritage;
- Prioritize the most important multi-pollutants causing damage, to reach a sustainable protection of cultural heritage;
- Identify ways of improving the more reliable and efficient among existing technologies and tools for the assessment and monitoring of damage on cultural heritage, also in terms of cost/benefit;



- Develop new devices and tools to fill the existing gaps in the knowledge on damage processes affecting cultural heritage due to changing pollution concentrations and typologies;
- Provide a compact and economical kit of instruments comprising the new and improved existing devices for monitoring the outdoor environment both in loco and via remote systems for damage assessment of immovable and moveable cultural heritage, and to develop the software required;
- Verify field sensors, techniques and software in 6 urban localities in Europe (northern, eastern, western, southern Europe) and the Mediterranean area, with different climate and environmental conditions, by means of comparison with the respective commonly adopted measurements of the different variables;
- Develop a tool based on the results obtained on outdoor pollution behaviour to forecast current and future damage on indoor moveable cultural heritage;
- Deliver guidelines for the future prioritization of air pollution monitoring for a sustainable protection of movable and immovable cultural heritage to support policy makers and end users in preventive conservation;
- Disseminate results and market the new devices and kit;
- Perform an economic evaluation of the benefits deriving from a political management of the environment in the near and far future.

METHODOLOGY

Phase 1 is focused on the investigation of the following aspects:

- Selection of organic and inorganic materials used in moveable and immovable assets. Identification of the main pollutants changing in the near and far future will be identified, and prioritized for the protection of movable and immovable cultural heritage, in relation to the materials selected.

- After the identification of the most important pollutants that will affect complex assemblies of materials in the future, specific work will be devoted also to understanding the impact on outdoor (e.g. anti-graffiti, water repellent protective coatings, consolidant) and indoor (paper) heritage materials of organic origin.

- Evaluation of the devices made available by previous EU projects to assess whether they are suitable for integration within an economical, compact kit, either in their existing form or after modification, if necessary.

Phase 2, is focused on more technological aspects, and it include the following steps:

- A new kit, comprising existing, more recent and innovative devices will be built. In particular, an innovative device will be dedicated to the detection of the surface blackening and colour change (in particular yellowing) related to pollution change. At the same time the necessary software and services will be developed to manage the kit in real time, both in situ and in remote sites.

- Successively a series of field tests in different places in Europe (east, west, north and south) and in the Mediterranean area will be performed. The new technical apparatus will be tested and calibrated by means of chemical and physical measurements in situ and in the laboratory on the collected samples. In addition existing and acquired know-how, modelling tools and measurement instruments will be used to evaluate the indoor conservation conditions correlated to the outdoor conditions. An evaluation of the results will be discussed, to arrive at the forecast of the future outdoor and indoor weathering, and how this behaviour can be monitored in order to control the evolution of risk situations.

- At the same time, the new tool which will permit the modelling of indoor environmental conditions likely to influence the future damage of cultural heritage will be assembled. The outdoor and indoor measurements will be compared to check the reliability of the new instrument's output.



Phase 3 is focus on the development of different important aspects, with special emphasis on the followings:

□ Programmed maintenance: the guidelines for air pollution monitoring aiming towards the preventive conservation of cultural heritage will describe conservation actions related to different pollution characteristics and levels detected by the devices and tools developed in the project.

□ Economic aspects: costs of programmed maintenance will be estimated.

□ Dissemination and training aspects: the use of new technologies for preventive conservation strategies requires an effort in dissemination and the training of end users. As well as in international scientific meetings and reviews, the TeACH guidelines will be presented to Administration agents and workers in cultural heritage conservation in urban contexts.

EXPECTED RESULTS

The main aims of TeACH are

- provide an advance to the state of the art, giving first a future vision of the oncoming weathering of

cultural heritage materials, identifying the pollutants that will play the most important role in the future;

- predict future damage trends on inorganic and organic cultural heritage materials, including restoration materials;
- built an economical, user-friendly kit including existing, recent and new devices;
- built a new device for detecting the outdoor physical-chemical weathering of different surfaces in terms of blackening and colour change;
- improve the EWO dosimeter extending its use to measure indoor soiling and dust in museums, also in relation to the external measurements of particle concentrations;
- extend the application of the existing model to predict the effects of outdoor pollution changes on damage in indoor moveable and immovable cultural heritage;
- produce guidelines and contribute to the development of EU norms;
- forecast changes in demands for maintenance and related cost-effective reduction of pollutants;
- market new tools;
- exploit the results in management and policy.

PROJECT PARTNERS	
CNR - ISAC (coordinator) Italy	University of Antwerp , UA Belgium
ICIE - Cooperative Institute for Innovation Italy	Norwegian Institute for Air Research , NILU Norway
Tecno Penta Italy	University College London , UCL United Kingdom
Labein-Tecnalia Spain	Dombauverwaltung Köln , HDK Germany
ACCIONA Spain	The National Museum in Krakow , MNK Poland

