CONSOLIDER-INGENIO 2010 PROGRAMME
Call for Applications

This report of activity corresponds to the natural year 2009

PROGRAMME REFERENCE: *Consolider TCP, CSD2007-00058*
Coordinating Researcher: *Prof. Felipe Criado-Boado*
Programme Title: *Research Programme on Technologies for the conservation and valorization of Cultural Heritage – ACRONIMUS: TCP*
Managing Institution[1]: *CSIC*
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The follow-up report has to be written in English following **strictly** the indicated structure, page and font (12pt) size limitations:

I. Summary of key activities initiated by the Programme from the start of the funding period [one page]

Due to their thematic diversity, scientific quality, practical relevance and the variety of scholars and institutions involved, Cultural Heritage studies are acquiring a relatively well-consolidated position in the Spanish R&D system. This has increased the level of requirements to respond to demands for scientific and technical research on Heritage. At the same time, it means that it is necessary to react to changes, tensions and expectations with regard to research on Heritage that arise in a dynamic field of this kind. One of the most recent changes has come about as a result of the announcement, as part of the anti-crisis measures adopted by the Spanish Government, of facilitating the re-conversion of the construction sector towards architectural rehabilitation, which will create new opportunities and tensions, and obliges us, through a Programme of this kind, to provide new solutions.

The TCP Programme was conceived as an opportunity to consolidate the lines of research into Cultural Heritage of the 16 groups that comprise the Team through the integration of approaches, synergies between results and grouping the activities and abilities of each Group within a shared programme. The aim is not to do anything that differs from the activities involved in their medium-term scientific strategy, but instead to strengthen them by establishing positive interactions with the strategies of other Groups, at the same time as strengthening the scientific capacities and abilities to generate additional resources of the Group as a whole.

The basic objective of the TCP Programme is to provide an underlying structure for what has been till now a quite dispersive and unintegrated field of knowledge (Aim 1), at the same time as attempting to provide substantial progress in the area of research (Aim 2) and to increase institutional capacities (Aim 3). The actions associated with Aims 1 and 2 are explained in further detail in section II. Due to its general nature, the actions and results associated with Aim 3 are detailed below.

Thanks to the strengthening of the Groups and research favoured by the TCP Team, a series of institutional initiatives have been developed as a result that consolidate the capacities of the Spanish Heritage R&D system by providing advanced support through the creation of new institutional research structures and infrastructures (indicating in brackets the TCP Group that serves as the core of these initiatives): the new *Centro de Investigación "Zaín"* in Vitoria (created from the GIAA), established as a Foundation with its own legal status, with the participation of the Basque Government, the EHU, the Regional Administration of Álava and the City Council of Vitoria, which focuses on technological development for the study and conservation of Heritage; the new *Instituto de Ciencias del Patrimonio* in Santiago de Compostela (created from the LaPa, Sincrisis and GEMAP), established as a centre of the Spanish National Research Council (CSIC); the new *Instituto de Geociencias* in Madrid (PAP), established as Joint Centre between the CSIC and the Complutense University of Madrid; and the preliminary approval of the *Campus de Excelencia en Patrimonio Cultural y Natural* coordinated by the UJA (CAAI) and with the participation of all of the Andalusian universities.

At the same time, the TCP has actively collaborated and will continue to collaborate on new Spanish and international institutional initiatives such as the *JPI on Cultural Heritage and Global Change*, the *Net-HERITAGE* ERA-NET, the *OPIs 2020 Strategy on Cultural Heritage*, the *CYTED Iberoamerican Programme* which has situated Heritage in a central position in its strategy for scientific cooperation, and the proposal for the creation in Spain of a new *Science and Technology Network for Heritage Conservation*.

II. Degree of Programme objective achievements measured according to the indicators listed in Section 8 of the Implementation Agreement [four pages]

Due to the importance of Heritage, it is necessary to develop specific research into it of a transverse and multi-disciplinary nature. One of the constant challenges facing the TCP Programme is to reclaim a field of activity that shows that research on Heritage is not limited to

Conservation. The TCP carries out research *about* Heritage. As a result, with the advance of the research programme, it is becoming increasingly vital to understand how Heritage is constituted as a social product, in the past and in the present. This concept of research on Heritage necessarily leads to the pragmatics of a Public Science, understood as *science with people*. The main thesis of a "public science" is that the public are not only viewers, but that instead they are the users, promoters and even the producers of science and knowledge in their own lives. This is clearly illustrated in the case of Heritage, due to its close interrelationship with society and the community. In this case, the TCP Programme will not only contribute towards the advance of knowledge and the structuring of capacities on Heritage research, but also towards anticipating solutions for some of the major problems currently affecting the interaction between scientific knowledge and society.

Following the changes made to the composition of the team throughout 2009, the TCP Programme now comprises 147 people (86 male and 61 female), including 81 staff scientists and 18 post-doctoral researchers (42 female and 57 male).

The quantitative results of the TCP Team, listed accorded to the classification included in the *Implementation Agreement*, are the following (brackets show the yearly compromise of that indicator):

ISI Papers 41 (50); **Other non-ISI Papers** 106 (145), including No ISI international papers, national papers and book chapters; **Books** 7, including 4 e-books (15); **Conferences contributions** 116 (25); **Patents** 0 (4); **Spin-offs** 1 (1); **Competitive R&D funds** 3,054,000 € (500,000 €); **Private funds** 1,219,000 € (400,000 €); **International research proposals** 4 (1); **Ph.D.** 6 (10 yr); **Postgraduate credits** 70 (120)**; associated Predocs** 22 (40 yr); **associated Posdocs** 30 (40 yr)

These indicators only include the activity of the Team that is directly associated with the TCP Programme. The funding figures refer to the total amount of current funding obtained by the Team in 2009; it is not distributed over the yearly periods for which the projects last.

The full production of TCP Groups, including those items what are not directly related to Heritage research, show the following figures: **ISI Papers** 115 (50 yr); **Other non-ISI Papers** 271 (145), including No ISI international papers, national papers and chapter on books; **Books** 20 including 4 e-books (15); **Conference contributions** 160 (25); **Patents** 0 (4); **Spin-offs** 1 (1); **Competitive R&D funds** 5,576,874 € (500,000 €); **Private funds** 1,646,442 € (400,000 €); **International research proposals** 8 (1).

In order to give meaning to these quantitative indicators, it is necessary to examine the qualitative achievements from 2009 in each of the working packages of the Programme: the scientific activities included *Joint Activities*, which comprise the Basic Research core of the Programme, *Transverse Activities*, which comprise the Applied Research core and the *demonstration projects*; the transferring activities included *knowledge transfer*, *dissemination* and *training*. After a first year in which the whole of the structure of the TCP Programme was set underway, considerably delayed due to budgetary and administrative problems, 2009 has been a year in which it was possible to start the activities of each Group and lay the foundations for shared work.

As a result, this year has seen considerable progress in the ***Joint Scientific Activities***. The most tangible result has been the creation of an integral network of Heritage and Archaeometry laboratories, consisting of thematic oriented laboratories in different locations. In many cases these are newly created laboratories, based on the layout of new facilities. In other cases these are previously existing laboratories which, thanks to being staffed with specialised personnel through the TCP Budget, have been able to include a line of active research on Heritage.

All of the research activities are a result of the convergence of at least two or three different disciplines on the same scientific problem. This is the most characteristic feature of the TCP Programme: it is something that can only be achieved in a programme of this kind that mobilises an exceptional critical mass   from 16 Research Groups and more than 20 different scientific disciplines, organising all of them through shared working plans and theoretical/methodological proposals (based on the model of the Heritage Value Chain).

Landscape Archaeology and Cultural Landscapes
- Typification of cultural landscapes through late prehistoric, ancient and medieval history.
- Construction of agricultural landscapes from prehistoric to modern times.

- Landscape Archaeology advances research on rural and mining landscapes. Morpho-historical approaches.
- Combining Landscape Archaeology, Archaeology of Architecture and History of Art to get new insights into urban morphology and development. Pilot study of the cultural history of the Galician Baroque.
- Materiality for building up a frontier between Spain and Portugal: the Portuguese Restoration War in the landscape and architecture.
- Protocols to record and preserve cultural landscapes.
- Integrative approaches to cultural and environmental heritage and landscapes.
- Creation of the Laboratory of Landscape Archaeology and Heritage of Uruguay (LAPPU), action of scientific cooperation together with AECID and Universidad de La República de Uruguay.

Paleoenvironment and paleoclimate
- Reconstruction of past natural landscapes forms combining multidisciplinary approach.
- Relationships between climatic and cultural changes and paleoeconomic adaptation strategies from an archaeobiological point of view.
- Improving (paleo-)environmental reconstructions from natural sciences (e.g. physics, chemistry, anthracology, palynology) repercussions in the social sciences (e.g. history, archaeology, ethnography and even anthropology).
- Contributing to climate and global change studies and prediction through analysis of environmental and human-environment interaction from heritage research.
- Developing several molecular characterisation methodologies to introduce them into fields of archaeological and heritage sciences for initiating various innovative lines of research.

Geoarchaeology
- Creation of the Laboratory of Paleoenvironment and Geoarchaeology (GEMAP-LaPa)
- Geoarchaeology and mining techniques.
- Non-destructive techniques: field survey protocols and documentation.
- Natural and social history of fire through archaeological, historical, palynological and geochemical indicators. Molecular characteristics of thermally modified organic substances (also known as Black Carbon) applied to the detection of Black C in complex mixtures of soil organic matter chemotypes and for the estimation of its degree of charring, including fire temperature and duration.

Archaeobiology
- Strengthening of the Laboratory of Paleobiology (CCHS).
- High resolution paleoclimatic reconstructions from fossil pollen records. Relationships between current vegetation, available environmental data and modern pollen rain from both natural and human-induced vegetation types, as an aid for paleoenvironmental reconstructions.
- Non-pollen palynomorphs: a new paleoenvironmental proxy record to establish ecosystem dynamics (erosion processes, fire events, etc).
- Landscape Archaeology and paleoenvironmental studies in rural and urban archaeological sites. Study of cultural landscapes by means of pollen and anthracological analyses.
- Recovery of traditional ethnobotanical knowledge.
- Past and present potential distribution of Iberian plant species: a phytogeographic approach using fossil pollen data and species distribution models (based on Artificial Neural Networks and GIS).
- New development for statistical processing of pollen data to correlate with several environmental proxies.

Remote sensing. Archaeological applications
- Creation of the Laboratory of Archaeological Spectroscopy - ArqueoSpec (CCHS). Equipment, calibration of instruments.
- Proposal of formalisation of Collaboration with UPM through a Joint Unit on Archaeological Spectroscopy and Photogrammetry.

- Creation of the Laboratory of Geometric Representation (LaPa) for advancing applications on 3D scanning and high-resolution topographical techniques applied to building and mobile heritage.

Information and semantic technologies (approaches to "Digital Humanities")
- Creation of the Laboratory of Computing for Digital Humanities (LaPa).
- Research and developments on SDIs and Heritage Information Systems
- Implementation of specific SDIs and HISs based on Archaeological projects and DBs: Archaeological Zone of Las Médulas (ZAM), Casa Montero and Rock Art from the east coast of Spain. Design of SDIs based on Archaeometallurgy of the Iberian Peninsula Project; Au Project; lead isotope analysis DB.
- Coordination of proposals on archaeological SDIs: CCHS and CSIC. Joint initiative for the creation of a sub-working group on cultural heritage within the working group on the Spanish SDI. Organisation of a Workshop on SDIs and Archaeology in the CCHS (December 2009).
- Preliminary work for the development of a database on radiocarbon dating for the Iberian Peninsula.
- Development of a formal language for the description of architectural elements.
- Development of methods for engineering (i.e. software engineering) models adapted to humanities and for dealing with heritage information.
- Development of methods to deal with the temporal dimensions of heritage objects: towards a 4D Information System.
- Development of methods to introduce subjective dimensions of heritage and historical information: towards XD (multidimensional) Information Systems.
- SIP (Information System to analyse and manage Santiago de Compostela Cultural Heritage).
- Cultural Heritage Information System of Uruguay (LAPPU, action of transference of technology and collaborative research with LAPPU).

Architecture and construction
- Creation of a Joint Laboratory of Building Archaeology (GIIA – LaPa).
- Development of a Method for Territorial Optimization of research on architectural values (MOTIVA).
- Advances in the simplified and rapid recording of architectural stratigraphies.
- Chemical, physical and mineralogical characterisation of samples of architectural remains and Roman mortars.

Historical analysis of Heritage
- Approaches to archaeoastronomy and its significance in interpreting heritage elements.
- Reconstruction of Sacred Landscapes in late prehistoric and historic times, combining archaeological, environmental and historical data and interpretations.
- Contributions to the construction of the historical memory of recent times combining archaeological, historical, sociological and anthropological disciplines. Development of an Archaeology of the Present (beyond Historical Archaeology).
- Application to Spanish Civil War, Italian domination of Ethiopia, Ethiopian Civil War, Argentinean "Process" and post-colonial situations in Asia and Africa.

Analysis and technological characterization of materials
- Adaptation to research on Heritage of the Laboratory for the Synthesis, Characterisation and Recycling of Materials (CEMAPA)
- Consolidation of the line of research on Heritage of the Geomaterials Laboratory (PAP).
- Archaeometric approaches: physical, chemical, mineralogical and elemental characterization of cultural assets.
- Archaeometry and the History of technology. Analysis and technological characterization of materials: metals, glass and ceramics (from the Early Neolithic up to the 20th century). New approaches to Bell Beaker pottery, a global prehistoric European phenomena. Diagnosis. Built heritage, archaeological sites, mobile and immobile items.
- Analysis of deterioration processes. Suitable strategies for preservation and restoration.
- Impact of climatic change and pollution by means of environmental sensors. Diagnosis and mitigation.

- Integrated strategies and technologies for conservation and restoration, including aspects such as: implementation of environmental sensors, synthesis of laboratory materials simulating the original ones and subjecting them to accelerated degradation processes; pathologies, restoration guidelines and conservation plans.
- Acquisition and setting up of a mobile Raman Spectrometer with integrated microscope (DeltaNU LLC Inspector model); creation of a library to identify different types of samples.

Technologies for conservation and restoration
- Some of the collaborative research activities have been developed within the framework of demonstrative projects: Bierzo RVN, Cathedral of Vitoria-Gasteiz, Pino de Oro, Veranes, Carmona and the *civitas* of Gijón.
- Orientation towards Heritage of the Laser, Nanostructure and Material Processing Laboratory (LANAPAC)
- Consolidation of the line of research on Heritage of the Laboratory of Geo-ecology, Biogeochemistry and Environmental Microbiology (MICROPATH).
- Applications of Nanotechnology for the conservation of heritage.
- New laser methodologies for the cleaning of Cultural Heritage materials and substrates.
- Implementation of the GEMS (Geochemical equilibrium modelling by Gibbs Energy Minimization) thermodynamic modelling tool to predict the durability of materials in environments with different aggression levels.
- Studies on the invasion of fungi in the cave of Lascaux (France) and other prehistoric caves, in order to discover their origin and the processes of formation of black stains that affect the paintings.
- Bio-deterioration studies on mural paintings from Etruscan tombs from the sixth to fourth centuries BC, and the definition of control measures for its elimination.
- Characterisation of materials from the built heritage of different monuments, and the analysis of the effects produced by the micro-climatic conditions in their interior when faced with aggressive environments.
- Study of the products of alteration and processes of deterioration produced on the surface of materials in different aggressive environments, including anthropic actions and aggressions.

TCP and other research projects. TCP is becoming a meeting point for networks and new chance for collaborative and innovative projects, such as:
- National and International research programmes and other connected research projects.
- GEOMATERIALS: Durability and conservation of the geomaterials of built heritage.
- Participation in the CLIVAR Thematic Network (Climate variability and predictability) - Spain, dependent on World Climate Research Programme.
- Participation in the GBIF Biodiversity Database (Global Biodiversity Information Facility in Spain).
- Participation in the steering committee of the ESF/COST Interdisciplinary Science Initiative (ISI). A Network of Networks: "New Perspectives on Landscape Studies". Writing of the Science Policy Briefing "Landscape in a changing world: bridging divides, integrating disciplines, serving society".
- ACE (Archaeology in Contemporary Europe: Professional Practices and Public Outreach) Project, in EU Culture 2007-2013 Programme.
- ARCHAEOLANDSCAPES, project in EU Culture 2007-2013 Programme.

III. Description of the Programme's scientific and administrative management activities [one page]

According to the plans designed for the Integration and Management Activities of the TCP Programme, the most important action in 2009 was the organisation and creation of the *Technical Coordination Unit* (TCU), divided between Santiago (LaPa – CSIC) and Madrid (CCHS – CSIC). The following have been designed and implemented: a database for controlling the personnel involved in the Programme and their dedication (which includes all of the institutional changes and is produced according to a gender perspective), a database for economic management, and a database on scientific and activity indicators. This database

includes all of the output of the Groups that comprise the Team, differentiating between those that are directly connected with and are a result of the TCP Programme, and those derived from the disciplinary lines of research carried out by the Groups. When available, it also includes URLs that make it possible to connect to the digital repositories where the contents are available. This has made it possible to systematise all of the information that will finally be included on the website of the TCP Programme, which is currently in the design stage.

The TCU has also provided support for all of the Groups in practical aspects associated with the management of the Programme, as well as technical support to apply to calls, take advantage of resources or draw up contracts and collaboration agreements with private bodies and public authorities. This has made it possible to increase the success index of all of the Groups.

The logotype of the TCP Programme has been designed, for use in different activities and on posters.

Several meetings of the TCP Coordination Team and the TCP Executive Board have been held. At the end of 2009 (on 10 December in Madrid), a plenary meeting of the TCP Core Group was held, consisting of all of the IPs (Group leaders), in which all of the activities carried out in 2009 were reviewed, and the activities for 2010 were discussed.

The renewal of all contracted personnel has been carried out based on the presentation of a report on the activity performed and a working plan for the next year. This report was supervised by the Group Leader for each contracted member of staff, and subsequently evaluated by the TCP Coordination Team, which finally approved the renewal of these contracts.

Although they are not strictly Management Activities, here we have included the Transfer of Knowledge activities that took place. During 2009, two main actions were carried out that were the first of their kind. Firstly, a study was made of the professional sector and employment market in the field of Heritage, in order to analyse its requirements in terms of technological innovation, its contribution towards socio-economic development and its features in terms of entrepreneurship. This led to the first national questionnaire on Archaeology companies in Spain, initially carrying out surveys to assess the dimension of the restoration company sector: a total of 273 archaeology companies were identified in Spain together with 600 restoration companies, with the total turnover of the sector estimated at 240,000,000 euros, generating 4,000 full-time jobs. While underway, these studies were adapted in order to diagnose the effect of the economic crisis and the construction crisis on the sector, although logically this was not predicted in the working plan produced in 2007.

Secondly, an analysis has been carried out on the capacities in terms of technological services of the various groups of the TCP Team, comparing them with the characteristics of the sector in order to produce a 'package' consisting of a technological offer and a strategy for the commercialisation of Services and collaboration work. Based on these pilot experiences, the aim is to extend the market survey to the whole of the Heritage sector, and the analysis of capacities for the transfer of knowledge to all of the groups in the TCP Team, in order to configure a transfer strategy based on the creation of External Services from the Groups, as well as the generation of spin-offs and start-ups.

IV. Description of budget expenditures according to Programme objectives and activities, including a distribution of partners' budgets [one page]

The description of the budget corresponding to the research activity programme is as follows:

> **Personnel:** A total of 25 contracts (for researchers and technical personnel) have been awarded for a total of €617,960. These contracts have been awarded in order to recruit the specialised personnel for the research services detailed in section II. Part of this expenditure is also applied to the maintenance of the TCU (Technical Coordination Unit).
> All of the expenditure detailed in this chapter has been implemented and managed by the Technical Coordination Unit, except in the case of the participating universities: the University of Jaén and the University of Santiago de Compostela. In these cases it was decided to sign specific implementation agreements for the transfer of funds, which include personnel costs and operating costs.

Inventoriable items: The *Research Programme on Technologies for the Conservation and Revalorization of Cultural Heritage* is aimed at producing models for the diagnosis, evaluation and intervention of moveable, immoveable or territorial heritage elements. Its objectives include the specific aim of the "*Physical, chemical, mineralogical and elemental characterisation of cultural elements".* However, in many cases the "taking of samples" is neither possible nor recommended, meaning it is necessary to carry out diagnoses on site and using non-destructive analytical techniques. Within this context, the use and potential of Raman spectroscopy have been clearly demonstrated as a non-destructive analytical technique for the molecular characterisation of materials of interest in the field of Heritage and their conservation (pigments, mortars, waterproofing, etc.). For this reason, within the framework of this CONSOLIDER programme, the need has arisen to acquire a *portable Raman spectrometer with integrated microscope.*

Also, with regard to section V, the need has been identified to acquire the following equipment: an *analytical system using X-ray fluorescence spectrometry* and a *spectral characterisation device.* Both devices contribute towards completing the equipment and guaranteeing the fully effective operation of the TCP laboratories. In both cases, due to the high cost of the equipment, it has been decided to finance a percentage of the costs.

Consumables: As may be seen in the economic justification, most of the expenditure has been focused on laboratory consumables (chemical reagents, latex gloves, cuvettes, etc.) necessary for the work of the TCP laboratories.

Expenses and others: This includes the expenses derived from taking part in conferences, meetings, seminars, etc.

Distribution of Partners' Budgets:

Group	Amount	Item
CAII-UJA	100,000	Personnel and operating costs
LPPP-USC	40,000	Personnel and operating costs
LaPa – CSIC	32,000	Operating costs
CCHS-CSIC (Labtel, Gyft, Est-Ap, Arqbio, Cervitrum, Arqueometal)	73,000	Operating costs
MICROPATH-CSIC	45,000	Operating costs
CEMAPA-CSIC	45,000	Operating costs
PAP-CSIC	45,000	Operating costs
LANAPAC-CSIC	45,000	Operating costs

V. Brief description of the Research Activity Plan to be accomplished between January 1, 2010 and December 31, 2010, as stated in Section 7 of the Implementation Agreement [two pages]

All of the working units and Groups of the TCP Programme have a detailed working plan for this year which, in particular, details the plan for *Joint Scientific Activities* and explores in greater detail the lines of work set underway in 2009. The most important actions for 2010 are: (1) reinforcing the laboratories that have been created, (2) the complete structuring of the plan for *Transversal Scientific Activities*, (3) maximizing all of the actions for interrelation and the implementation of multiplying synergies within the TCP, and (4) reinforcing the role of the TCP as a meeting point for projects and networks, increasing its visibility and impact.

With regard to point (1):

It is a priority to strengthen and standardise the complete operability of the laboratories that have been created (or adapted from existing laboratories by orienting them towards studies on Heritage, thanks to the inclusion of specialised personnel). This involves completing their equipment, guaranteeing the complete operability of their scientific equipment, increasing the networking of all of the laboratories, and establishing protocols for operating conditions according to which they function as laboratories with the "TCP label".

With regard to point (2), Structuring of the Plan for "Transversal Scientific Activities":

These transversal activities will preferably be carried out within the framework of demonstrative and exploratory projects. Although these have already begun, they will be fully implemented throughout 2010.

The structuring of the "Transversal Activities" Plan includes:

- Standardising of recording, inventory control, cataloguing and data gathering procedures, and the contextualisation of sampling. Initially, these were two different plans, but after the first few projects, it was considered preferable to combine them in a single working package and Task Force.

- Development of models for protocols for the operation and management of Heritage laboratories, differentiating between Protocols for Humanities and Sciences. These models must include procedures and techniques (the methodology used); the aim is not to recommend how things must be done, but instead to describe what the Groups do, defining when, how and why a certain technique should be used in the analysis of heritage elements.

- Construction of a metadata model for Heritage (which basically includes geoinformation technologies, IDEs and a metadata documentation model). This project depends on the previous two, meaning that it will be developed after them. One specific objective of this project is to consider the possibility of developing a specific metadating tool.

- The design and modelling of a Heritage information system. This project depends on the former, meaning it will not be dealt with in full until 2011. Only preparatory work will be started in 2010.

Each of these activities is entrusted to a Task Force, which must present their working plan, methodology and internal organisation for supervision by the Coordination Team.

With regard to point (3):

- The previous experience and results of the TCP indicate that it is necessary to identify products (other than publications) that can be maximised (such as patents, utility models, portals, thematic websites, etc.), although in this case they require additional financing that permits their development and valorization. The following products have been identified: an open access repository of all radiocarbon dates from Spanish prehistory and archaeology; a repository of radiocarbon dates from paleoenvironmental contexts, specifically conceived to permit comparison between dates based on organic soil matter and dates for other materials; the website of Spanish Heritage Companies, which provides the general public and clients with a list of companies and the services they offer, as well as offering other functions designed to facilitate the work and operations of these companies; management indicators for soil fertility in prehistoric and proto-historic periods; the application of stable isotope analyses of biophilic or biogenic elements (C,N, O) and metallic elements (Pb) for paleoenvironmental reconstructions, studies on paleo-pollution and the diagnosis of the origin of materials and manufacturing techniques.

- As is usually the case, especially in a programme of this thematic scope, the TCP has a problem with regard to the inability to generate patents. This means it is necessary to design a specific strategy for promoting the production of patents, utility models and industrial and methodological specifications within the Programme.

- Research into the Economy of Heritage will be optimised.

- A specific training programme for the research programme will be designed.

- Co-authorship will be promoted within the TCP in order to optimise collaborations and synergies between different approaches and disciplines. The demonstration projects will be specifically product-oriented (whether this is a paper or a specific research output), which will not only stimulate co-authorship but which can also be made viable through it.

- Prospecting the capacities of the offer for the transfer of knowledge of all of the TCP Team and the creation of a strategy to maximise transferral through collaborative research formulae, the definition of External Service Units within the laboratories, or the generation of start-ups.

- Holding a scientific meeting of the TCP Team not only to examine the mid-way point of the Programme, but also the extension of the concept of Heritage and research on Heritage as promoted by the Programme.

With regard to point (4):

- A specific plan for the projection of the TCP Programme will be designed.

- The presence in international calls for projects will be intensified, taking advantage of the manoeuvring capacity of the Team and its favourable position in a large number of institutional and administrative contexts.
- The External Advisory Scientific Board will be created, which is still pending. It will be asked to provide an internal evaluation on the development of the Programme, the quality and relevance of its output, and the real contribution of the TCP towards extended awareness and better social use of Heritage.

VI. National and international activities carried out in order to increase the visibility of the Programme [one page]

TCP has a dynamic presence in external projection activities that do not only serve to divulge the programme, but also to produce value from research, to validate its practical results through interaction with the public, and to explore the public dimension of Heritage.

Heritage elements cannot be isolated from their valorization by the public. For this reason, any type of activity that interacts with the social environment is not limited to being an activity of scientific culture, but is itself converted into part of the research process, by introducing a reflexive stage in the work that makes it possible to clarify its multi-vocal and hermeneutic nature. These reflections on science by the public produce a dialectic or dialogal process that increases its validity, and makes its results intersubjective. In doing so, the TCP Programme constructs an approach towards a Public Heritage, and opens new horizons in the areas of Community Science, the new paradigm of social appropriation and use of science, which gradually emerges as a formula to give shape to a new interaction between science and society.

From amongst all of these activities, the following may be selected:

Submission to **international scientific calls** in order to divulge the programme and extend its networking: EU Culture 2007-2013 Programme, ERC advanced and starting grants, Marie Curie programme, 7FP, ACE Project (EU Culture 2007-2013 Programme), POCTEP (INTERREG funds) for collaboration with a Portuguese consortium to extend TCP through cross-border cooperation and with the Regional Government of Castile-León in a project which deals directly with the Pino del Oro and Bierzo demonstration projects.

Leading **international** scientific and technological events, networks and programmes where TCP has actively participated: International conferences such as TESME, Innsbruck, Durham, EAA or LACONA, Last steps COST A27, ESF/ COST ISI, Bessa. In addition, TCP has taken on research and field work in Portugal, France, Italy, Russia, Uruguay, Chile, Argentina, Peru, Colombia, Guinea, Ethiopia and Mongolia.

Main **national** events, networks and programmes where TCP has participated: organization of the Workshop entitled "Workshop on approaches of recent East-West European cooperation on archaeological heritage" held in Madrid, December 2nd and 3rd 2009; Salamanca Consolider meeting to discuss the transfer of knowledge in Humanities; Santander UIMP meeting on "The Consolider Programme: a source of ideas for Innovation".

Actions on the **Transfer of knowledge**: agreements with city and town councils, Autonomous Communities, Spanish Ministry of Culture, French Ministry of Culture for technical assistance and applied research on Heritage studies and conservation matters; Scientific and technical R&D contracts with private entities. Active participation in the COTEC report on "Needs and opportunities for Innovation on Heritage".

Dissemination and scientific culture actions: "Science Week" in Madrid, Seville, Jaén and Santiago. Oral presentations addressed to a large public both in urban and rural areas. Posters and photos exhibitions on different fields and topics related to TCP research. Altogether, these actions have involved around 5,000 persons who have filled out individual evaluation forms to assess their impact and success. Preparation of diffusion booklets and publications.

Training: participation in Master courses at the Universities of Cantabria, Autónoma de Madrid, UPV, Alicante, Jaén, Santiago, Chile, Argentina, Uruguay; reception of visitors: some 25 national and international scholars and students have spent Short term scientific visits in TCP Groups; undergraduate students have received specialised, technical training, and have received an introduction to research methodologies through the CSIC JAE-Intro programme, or as students carrying out work experience on several projects.

Pilot experiences on **Community Science and Public Heritage**: projects on Neixón and Castrolandín (Pontevedra), Historical Memory of the Spanish Civil War, Archaeology of the Present, and Cultural Landscapes and Heritage in Uruguay's lowlands.

VII. Detected problems and suggestions

The main difficulties that have arisen are listed below, together with our comments on the same:

Currently, the economic crisis is strongly affecting the Heritage sector as a result of the property crisis, and will continue to do so in the foreseeable future. This has had two clear consequences: (i) it has led to the need to readjust research priorities, and to implement objectives that were not initially foreseen in order to model the impact of the crisis on the sector, its effects and the corrective measures, and (ii) it has interrupted the planned rhythm for the creation of start-ups, having been initially conceived for a dynamic sector in which there was strong demand for private Archaeology companies with a high level of specialisation. Here the obvious suggestion is to modify the strategy for the creation of spin-offs, replacing it with the creation of External Service Units in our laboratories, either by orienting them towards new models for start-ups that provide added value, a high technological capacity, which do not essentially depend on human labour, which are multi-disciplinary, and which do not focus exclusively on one sector of activity.

Delays in the definition of the Joint Unit of the USC-CSIC (necessary in order to structure one of the three Cores of the Programme) due to modifications in the institutional strategies associated with the creation of the Institute of Heritage Sciences in Santiago.

Delays in the specification and planning for the creation of the Zain Research Centre in Vitoria, together with delays in negotiations between the CSIC and EHU to collaborate on this project. This has affected the rhythm of work of the GIAA Group.

Difficulties in finding qualified technical personnel for the CERVITRUM Group, which has delayed the consolidation of the pottery and glass laboratory with respect to the rhythm of development of the other TCP laboratories. The call was declared null and void due to a lack of candidates with the necessary level of excellence and quality. The call was re-opened, although problems arose derived from the new system for part-time contracts used by the CSIC.

For this same reason, the contracting process in Madrid has been delayed for personnel to carry out scientific culture activities and provide support for training activities.

The demonstration project in El Bierzo is incomplete due to a lack of complementary actions that were planned by the public authorities involved, as the map of institutional agreements that were required by this project and which made it possible has changed completely. It will be replaced by a different demonstration project.

Amongst the problems and urgent needs of a scientific and technical nature that were not initially foreseen, we would highlight the following: a need for the innovation and improvement of the graphic representation of numerical and non-numerical data in Archaeometry; a need for specific research combining scientific requirements and graphic design proposals; and a need for methods to recognize forms and objects in laser 3D images.

Amongst the most general issues, which despite not being a problem are especially urgent, we would mention the need to coordinate the service activities of the whole of the network of TCP laboratories. In turn, this presents us with the dilemma of the contradiction between research and services, not only because these often consume the resources of the former, but also because in the latter case it is possible to lose the connection between the data and the scientific problem. The ideal solution, which we are working on from both a conceptual and pragmatic perspective, is to always incorporate the services within the framework of project collaborations.

Finally, the organisation of an Official Post-Graduate Programme within the framework of the TCP has been delayed. This idea may have to be abandoned, or it may finally appear as a way of maintaining the network and the synergies created by the TCP Programme. In any event, modifications in the regulations affecting official Post-Graduate courses, their implementation at different rates in each university, and the diversity of interest shown by university in relation to Post-Graduate teaching, have all influenced the impossibility of satisfying this goal for the time being. This obviously has a negative effect, as the TCP includes a substantial number of pre-doctoral students (22) who, instead of being included in a single doctoral programme, are instead resolving their university link based on individual alternatives.

NOTE: Please be advised that any modification of grant conditions requires the submission of a formal application by the coordinator stating a valid reason for the change. This application must be submitted before the project end date and requires the specific approval of the designated funding agency likewise before this date.

CUMPLIMENTAR ESTA SECCIÓN SÓLO EN EL CASO DE QUE POR EL TIPO DE GASTO A EJECUTAR PROCEDA SU CUMPLIMENTACIÓN

A. PERSONAL ACTIVO EN LA ACTUACIÓN DURANTE EL PERÍODO QUE SE JUSTIFICA.

En el cuadro siguiente debe recogerse la situación de todo el personal del o de los Organismos participantes que haya prestado servicio en la actuación en la anualidad que se justifica, o que no haya sido declarado anteriormente, y cuyos costes (salariales, dietas, desplazamientos, etc.), se imputen al mismo.

Si la persona estaba incluida en la solicitud original, marque "S" en la casilla correspondiente y no rellene el resto de casillas a la derecha.

Indique en la casilla "Categoría Profesional" el puesto de trabajo ocupado, el tipo de contratación: indefinida, temporal, becarios (con indicación del tipo de beca: FPI, FPU, etc.,), etc.

En el campo "Función en la actuación" indique el tipo de función/actividad realizada en la actuación, (p.ej., investigador, técnico de apoyo,…).

Recuerde que:

- En este capítulo sólo debe incluir al personal vinculado a los Organismos participantes en la actuación. Los gastos de personal externo (colaboradores científicos, autónomos…) que haya realizado tareas para la actuación debe ser incluido en el capítulo de "Varios".

- Las "Altas" y "Bajas" deben tramitarse de acuerdo con las instrucciones de la convocatoria

Apellido 1	Apellido 2	Nombre	NIF/NIE	Catgª Profesional	Incluido en solicitud original	Si no incluido en solicitud original:		Observaciones
						Función en la actuación	Fecha de Alta	
Aboal	Fernández	Roberto	32647955F	G1	NO	Técnico de apoyo	2008	
Quiroga	Limia	Sofía de María Jesús	34954468B	G1	NO	Técnico de apoyo	2008	
Seoane	Veiga	Yolanda	76575412V	G1	NO	Técnico de apoyo	2008	
Ferro	Vázquez	María de la Cruz	33301892P	G1	NO	Investigadora	2008	
Blanco	Rotea	Rebeca	36124359F	G1	NO	Investigadora	2009	
Rodríguez	Fernández	Ricardo Julio	36066719M	G1	NO	Técnico de apoyo	2009	
Kaal		Joeri	X6915566H	G1	NO	Investigador	2009	
Carmona	Quiroga	María Paula	02917539N	G1	NO	Investigadora	2009	
Beltrán	Ortega	Alejandro	01924591C	G1	NO	Investigador	2009	
Gener	Moret	Marc	40329317J	G1	NO	Investigador	2009	
Renzi		Martina	X4876820S	G1	NO	Investigadora	2009	
Ruiz	Alonso	Mónica	20221968T	G1	NO	Investigadora	2009	
Pérez	Díaz	Sebastián	44136519W	G1	NO	Investigador	2009	
Montes	Moya	Eva María	75021098C	G1	NO	Investigadora	2009	
Navarro	Pérez	Mercedes	25970381T	G1	NO	Investigadora	2009	
Gómez	Cabeza	Francisco de Paula	77329842R	G1	NO	Investigadora	2009	
Millán	Lence	Matilde	33272190E	G3	NO	Técnica de apoyo	2009	

B. GASTOS DE EJECUCIÓN: MODIFICACIONES DE CONCEPTOS DE GASTO CON RESPECTO A LA SOLICITUD ORIGINAL.

Recuerde que los trasvases entre gastos de personal y gastos de ejecución deben tramitarse de acuerdo con las normas de la convocatoria.

   a) Equipamiento:

En el cuadro adjunto, rellene una línea por **cada equipo adquirido no previsto en la solicitud inicial** que dio lugar a la concesión de la ayuda para la actuación y justifique brevemente su adquisición. Si se ha adquirido un equipo en sustitución de otro que figuraba en la solicitud de ayuda inicial (por mejorar sus prestaciones, por obsolescencia del anterior…), indicarlo también en la casilla correspondiente.

Identificación del equipo	Importe	Justificación adquisición	Sustituye a ...(en su caso).
Raman portátil con microscopio integrado	34.684,00	la potencialidad y la utilidad de la espectroscopía Raman como técnica de análisis no destructivo para la caracterización molecular de materiales de interés en el Patrimonio y su conservación lo hacen indispensable para el buen desarrollo del proyecto.	
Sistema de análisis mediante espectrometría de fluorescencia de rayos X	46.995,95	Contribuye a completar el equipamiento y garantizar la plena operatividad de los laboratorios TCP.	
Equipo de caracterización espectral	33.180,08	Contribuye a completar el equipamiento y garantizar la plena operatividad de los laboratorios TCP.	

   b) Viajes/Dietas:

En el cuadro adjunto se justificará la imputación de gasto en viajes y dietas sólo en el caso de que **este tipo de gasto no estuviera previsto en la solicitud inicial.**

No hay ningún gasto fuera de los ya especificados en la solicitud

   c) Material fungible:

Se describirá y razonará en el siguiente cuadro la adquisición del material fungible incluido en la justificación, sólo cuando **este tipo de gasto no estuviera previsto en la solicitud original.**

No hay ningún gasto fuera de los ya especificados en la solicitud

d) Varios:

Se describirán en el siguiente cuadro los gastos varios más relevantes incluidos en la justificación y **no previstos en la solicitud original,** justificando brevemente su inclusión. En este apartado se incluirá, entre otros, al personal externo y, en el caso de que el gasto justificado se refiera a colaboraciones científicas, se identificará al colaborador.

No hay ningún gasto fuera de los ya especificados en la solicitud