Project no. SPI-CT-2008-219301-NET-HERITAGE

NET-HERITAGE

EUROPEAN NETWORK ON RESEARCH PROGRAMME APPLIED TO THE PROTECTION OF TANGIBLE CULTURAL HERITAGE

Deliverable 3.3

Position paper on research gaps to generate recommendations for future joint activities and European RTD work programme

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Ministry of Cultural Heritage and Activities (Italy)

Project coordinator: Antonia Pasqua Recchia

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Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

INDEX

Executive Summary

1. Introduction

2. Identification of research gaps

3. Identification of high scientific priorities
3.1 High scientific priorities

4. Needs, Strengths and high Scientific Priorities of European countries
4.1 Geographical distribution of high scientific priorities

4.2 Relationship between needs and strength of research topics related to high scientific priorities

5. Recommendations

Executive summary

For the first time since the EU Framework Programmes on Research, a common strategic research agenda in the field of research and cultural heritage based on consultation within European Countries, has been implemented within the NET HERITAGE Project.

The present Deliverable focuses on the analyses of the high scientific priorities, needs and strengths to be considered as constituting a common platform for the RTD programme.

The geographical distribution of the highest scientific priorities and analyses of the related evaluation of needs and strengths are reported.

Major recommendations arising from this survey are:

- European Countries have common priorities and should look for common solutions in the field of research on cultural heritage.
- The list of high research priorities must be used to develop common programmes.
- Cultural heritage research needs to be included on the National research agenda.
- The presented survey can be used as a tool for an *a la carte* approach, on which to base Joint Programming Initiatives (JPI).
- The list of common high priorities should be taken in due account for the definition of the 8th Framework Programme.
- The survey shows the strength of European research in the field of cultural heritage. It is recommended that this research capability, which is assumed as a world reference point, be exploited to reinforce European competitiveness.

Finally the priorities identified within the NET HERITAGE Project should be integrated within the research policies of other sectors, such as energy, construction, ICT, nanotechnologies, and smart cities .

1. Introduction

The work performed for the first time within the NET HERITAGE Project, WP 3 "I*mplementation of strategic activities between RTD programmes applied to the Protection of Tangible Cultural Heritage",* aims to provide the following:

- enhanced coordination framework for Partners engaged in national programmes and activities in the field of protection of tangible cultural heritage;

- better integration within a European Research Area (ERA) network

- new approach leading to the convergence of long-term research strategies;

- prerequisites for joint transnational research activities on a European scale;

- fostering and implementation of debate within the national research networks in the field, including national research institutions, universities, stakeholders and technology platforms;

- identification and analysis of common strategic RTD priorities.

The work performed within this WP are described in detail in Deliverable 3.1 and Deliverable 3.2

The present Deliverable focuses on the analyses of the high scientific priorities, needs and strengths to be considered as constituting a common platform for the RTD programme.

Previous analyses led to the identification of three common priority thresholds, in the form of high, medium and low priorities.
Finally, focusing on the highest scores and levels, twelve subtopics were identified as main scientific priorities.

The geographical distribution of the highest scientific priorities and analyses of the related evaluation of needs and strengths are reported in the present Deliverable.

2. Identification of research gaps.

Within the ERA-NET Project 'European network on Research Programme applied to the Protection of Tangible Cultural Heritage - NET-HERITAGE', the activities of Work Package 3 on "I*mplementation of strategic activities between RTD programmes applied to the Protection of Tangible Cultural Heritage",* coordinated by MIUR, starting in January 2009 has focused on:

- Identification of the RTD priorities and topics most relevant for creating a sustainable approach to tangible cultural heritage protection.
- Development of joint strategies for addressing and implementing research and technological activities of strategic importance for European governments in this specific sector.
- Establishment of a strategic framework and partnership for RTD programmes among the Partner Member states.
- Providing recommendations on possible strategic test issues for transnational exploitation.

In order to identify and define the RTD priorities and topics most relevant for creating a sustainable approach to tangible cultural heritage protection, the Partners were involved in setting up Consultation Panels.

The National and Technical Consultation Panels were composed of national representatives and technical experts from the most important organizations in the field at the national level: research institutions (e.g. CNR, CNRS, CSIC….), universities (Centres of Excellence…), cultural heritage institutions (ICPAL, ISCR...), stakeholders (Conservator Associations…..), technology platforms (ECTP...).

Within the period April 2009 and October 2009 the National Consultation and Technical Panels were invited to identify the most relevant RTD priorities in order to create sustainable approach to tangible cultural heritage protection. This activity includes also:

- Research topics and subtopics in term of gap identification.
- State of the art and description of the identified topics and subtopics
- Discussion with universities, national stakeholders (Regional Authorities, Conservator Associations) and technology platforms (ECTP)

The National Consultation/Technical Panels were asked by 15 June 2009 to:

- Propose new topics under the broad heading of protection of tangible cultural heritage, with a maximum of three subtopics.
- Propose subtopics to the existing topics if deemed essential.

MIUR gathered all comments and topics received from the Participating Countries, which were discussed at the Project Meeting in Sofia September 2009 .

After this process of discussion the final list of topics and subtopics was identified as reported in the following pages.

LIST OF THE IDENTIFIED RESEARCH TOPICS AND SUBTOPICS

TOPIC 1	**TOPIC 2**	**TOPIC 3**	**TOPIC 4**
Environmental assessment and monitoring (pollution, climate change, seismic risk)	**Investigation of damage mechanisms to establish preventive conservation strategies**	**Measurement instruments of practical relevance for end-users**	**Innovation on materials and technologies for conservation and maintenance**
1.1 Critical levels of synergic pollutants in a context of environmental condition (indoor/outdoor).	2.1 Multidisciplinary approach on the synergic interactions between environment and materials.	3.1 Portable instruments for in situ measurements.	4.1 Development of new and appropriate materials and technologies for the upgrading or the construction of conservation buildings/rooms.
1.2 Preventive approach against extreme natural events (seismic events, flooding, storms, landslides, fire), and first aid measures.	2.2 Interactions between specific environmental factors (temperature, humidity, …) and complex artefacts made by different materials.	3.2 Non invasive instruments and methodologies for diagnosis and monitoring.	4.2 Development or improvement of products for restoration and conservation with low impact on the historical content of artefacts.
1.3 Impact of climate change on materials and structures and adaptation of technologies to mitigate the negative effects.	2.3 Best conservation practices against specific attacks (physical, chemical, biological, ..) to prevent damage on specific materials.	3.3 Intelligent multi-sensor systems for early warning (modelling, local network for monitoring systems), including telediagnosis.	4.3 Identification and assessment procedures to evaluate the fitness for use of new and goal oriented products to define common guidelines and pre-standards.

1.4 Changes in hydrogeological conditions in the ground : technologies for stabilising the historic structures.	2.4 Damage mitigation - to include salvage, recovery, recycling and reuse of materials.	3.4 Re-engineering of instruments and techniques to simplify and to adapt their use.	

TOPIC 5	TOPIC 6	TOPIC 7	TOPIC 8
Evaluation of treatments and materials used in conservation at present and over recent decades, assessing their suitability and future consequences	**Alteration and conservation of materials with special focus on modern materials used in Contemporary Art and Architecture and also as cultural information storage (CDs, DVDs, etc)**	**Anthropic pressure evaluation and management**	**Security technologies and systems in museums, libraries, archives and for the movement of artefacts**
5.1 New solutions for development, assessment and reporting of analysis protocol for the time effects evaluation of treatments (e.g. cleaning, biocides…) and materials.	6.1 Development of strategies and procedures for storage and preservation of multi media supports and readability of the stored content.	7.1 Development of management systems on quality and sustainability of indoor/outdoor cultural heritage environments.	8.1 Development of sensors and devices for a safe handling, movement, transport and exhibition of artefacts and related guidelines.
5.2 Innovative solutions for compatibility, durability and reversibility of new materials and treatments.	6.2 Innovative proposals for conservation and durability of contemporary art materials (i. e. plastics, ceramics, new alloys, glasses, new dyes, concrete, mortars)	7.2 Development, testing and validation of mobility models to reduce environmental impacts to unmovable cultural heritage (emission, vibration..).	8.2 Development of integrated systems for effective prevention, detection and reaction to risk situations at different scale (e.g. fire, theft, vandal attacks, etc).

5.3 Modelling and simulation for predictive evaluation and validation of materials and treatments.		7.3 Development of scientific criteria and tools to measure and regulate tourist impact on cultural heritage sites.	8.3 Development of techniques to support the identification of fakes or stolen artefacts with special reference to the insurance issues
5.4 Impact of modern finishing materials and techniques on historic structures.			8.4. Techniques for inventory, cataloguing and traceability of cultural heritage objects.

TOPIC 9	**TOPIC 10**	**TOPIC 11**
Tele-survey and Geographic Information System for protection and management of tangible cultural heritage	**Contemporary cultural heritage in spatial contexts**	**Prenormative studies for the guaranteed protection and management of tangible cultural heritage**
9.1 Web mapping and Web GIS innovative tools for the tele-monitoring and remote control of the archaeological sites and cultural landscapes.	10.1 Preservation of industrial heritage: objects, buildings and landscape.	11.1 Development of Quality Management Systems (planning, implementation, assessment, reporting and quality improvement) addressed to the process of conservation of cultural heritage.
9.2 Development of innovative and aesthetically acceptable devices for the tele-survey of movable artefacts.	10.2. Preservation of 20th century military heritage: objects, buildings and landscapes.	11.2 Prenormative activities goal-oriented to improve the reproducibility and repeatability of testing results.
9.3 Development of advanced systems for the tele-survey and remote fruition of underwater cultural heritage.		

3. IDENTIFICATION OF HIGH SCIENTIFIC PRIORITIES

3.1. High scientific priorities

The research topics and subtopics identified by the Participating Countries were given a rating from 1 (low) to 5 (maximum) according to the categories of needs, strengths and scientific priorities, which are defined as follows:

- *Needs : recognized gap in knowledge concerning the protection of tangible cultural heritage*
- *Strengths : capacity to perform research in the specific subtopic*
- *Scientific priorities : importance in terms of research need*

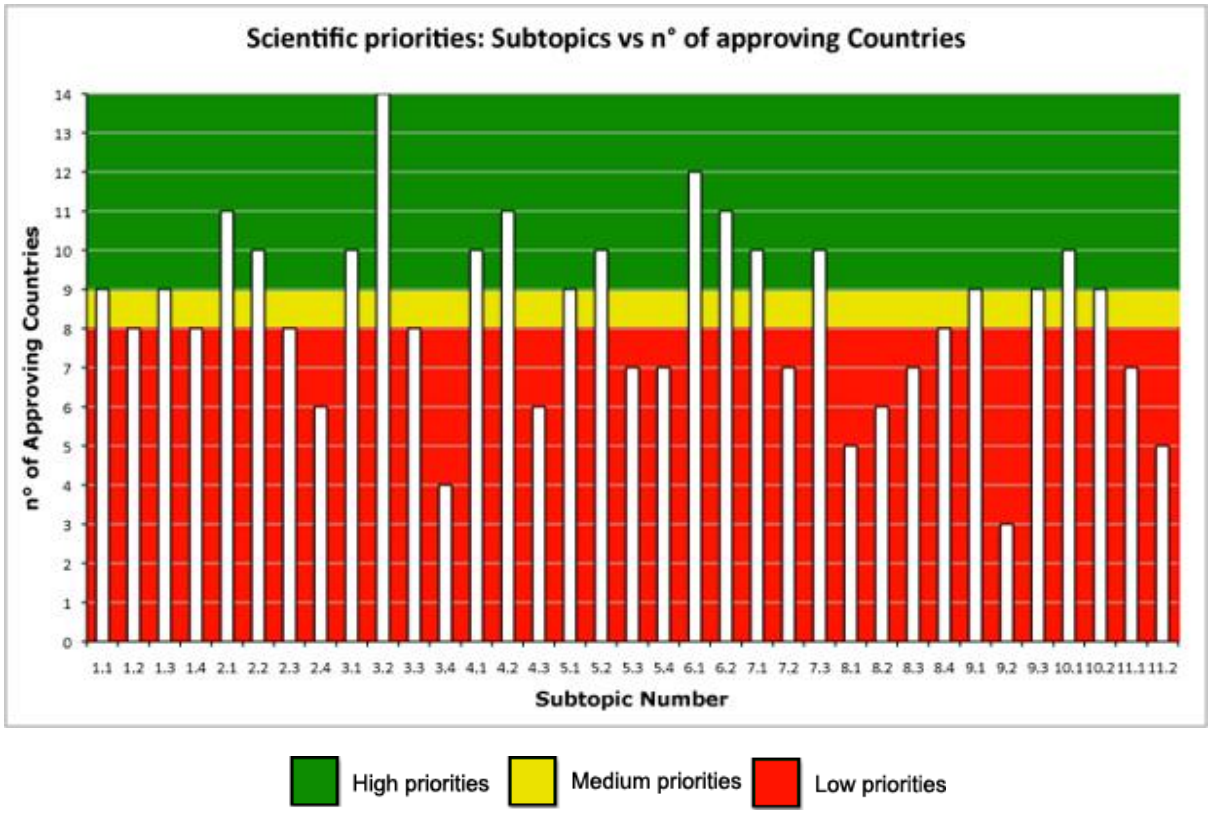
The Participating Countries decided to consider as common RTD priorities the subtopics receiving an evaluation score of 4 or 5. Thus, for any subtopic it was sufficient to receive one score ≤ 3 to be excluded. However, after the overall analyses of the evaluation results, the criterion turned out to be too restrictive because only one subtopic met the requirement.

Finally, three thresholds for common priority identification were agreed at the NET HERITAGE Meeting held in Madrid 19-22 March, 2010, as high, medium and low priorities.

high priorities: 10-14 countries out of 14 giving scores 4 or 5

medium priorities : 8 - 9 countries out of 14 giving scores 4 or 5

low priorities : less than 8 countries out of 14 giving scores 4 or 5



Following the evaluation process, twelve subtopics were identified as common high scientific priorities. They were:

2.1 Multidisciplinary approach on the synergic interactions between environment and materials.

2.2 Interactions between specific environmental factors (temperature, humidity..) and complex artefacts made by different materials.

3.1 Portable instruments for in situ measurements.

3.2 Non invasive instruments and methodologies for diagnosis and monitoring.

4.1 Development of new and appropriate materials and technologies for the upgrading or the construction of conservation buildings/rooms.

4.2 Development or improvement of products for restoration and conservation with low impact on the historical content of artefacts.

5.2 Innovative solutions for compatibility, durability and reversibility of new materials and treatments.

6.1 Development of strategies and procedures for storage and preservation of multi media supports and readability of the stored content.

6.2 Innovative proposals for conservation and durability of contemporary art materials (i. e. plastics, ceramics, new alloys, glasses, new dyes, concrete, mortars).

7.1 Development of management systems on quality and sustainability of indoor/outdoor cultural heritage environments.

7.3 Development of scientific criteria and tools to measure and regulate tourist impact on cultural heritage sites.

10.1 Preservation of industrial heritage: objects, buildings and landscape.

4. NEEDS, STRENGTHS AND HIGH SCIENTIFIC PRIORITIES OF EUROPEAN COUNTRIES

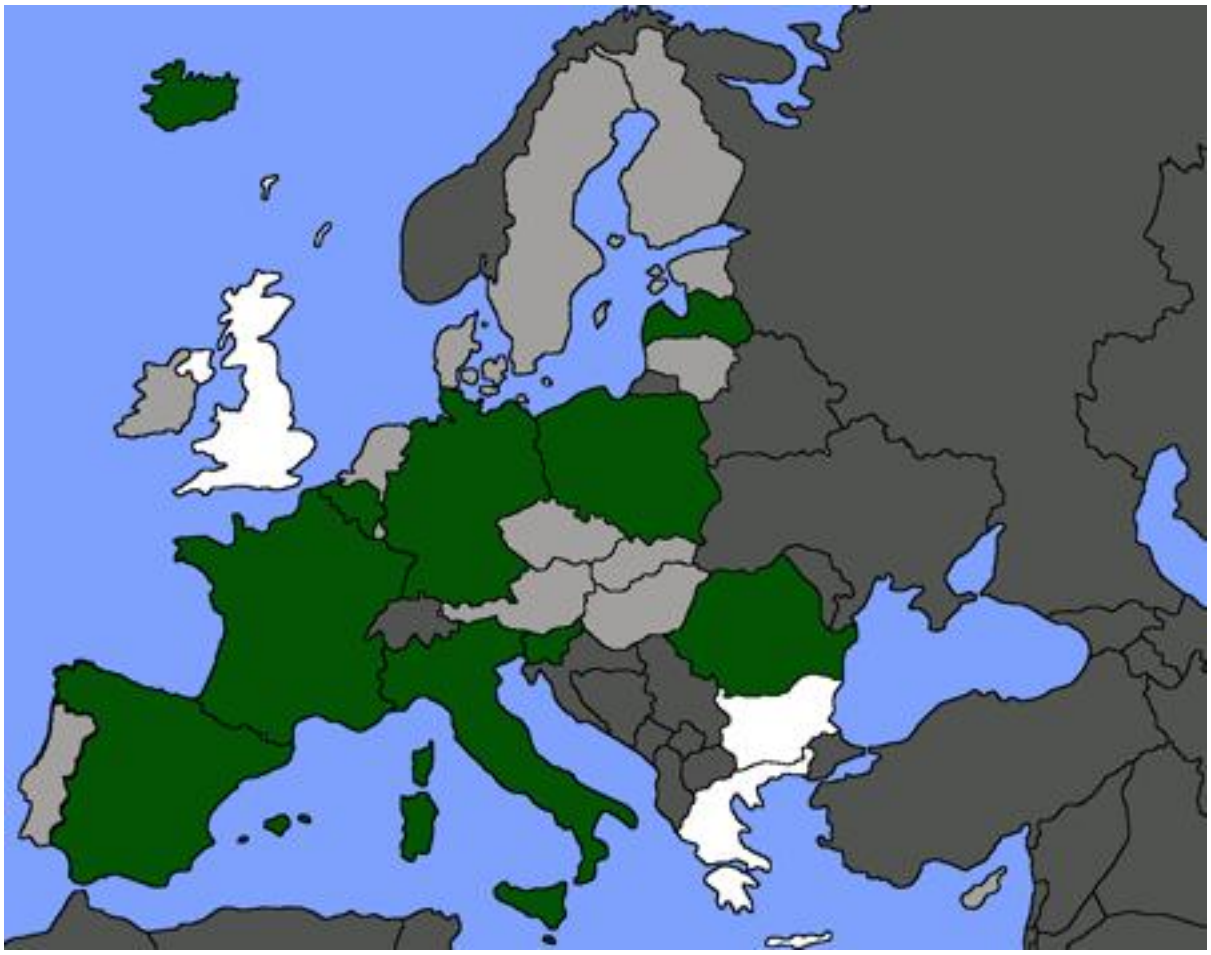
The results obtained were processed in order to obtain evidence of the national distribution of scientific priorities, needs and skills/expertise, and to identify convergences on common priorities.
Starting from the working key words − needs, strengths and scientific priorities − given by the NET-HERITAGE partnership, different graphical representations will be presented in this chapter.

4.1 Geographical distribution of high scientific priorities.

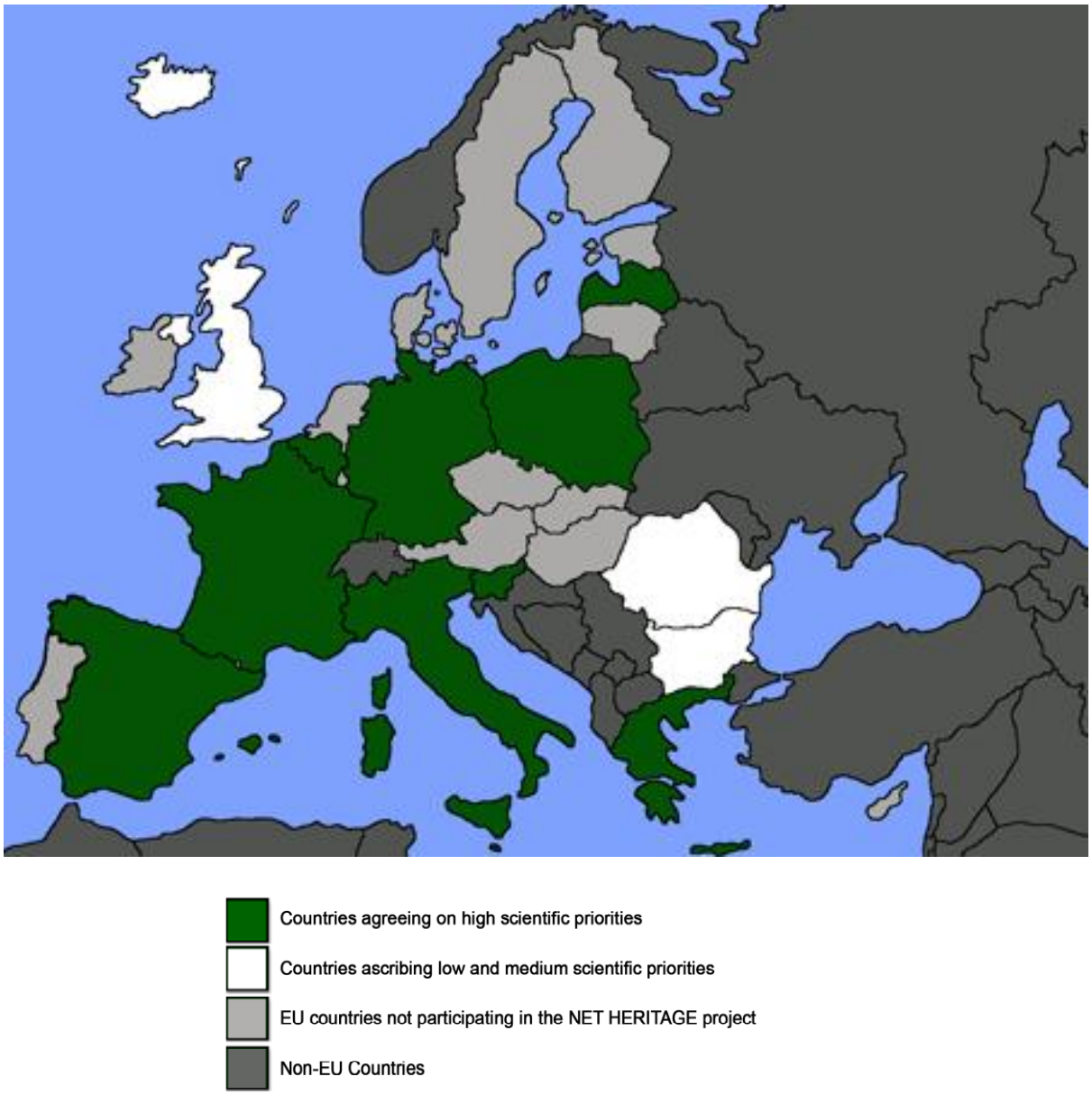
The geographical distributions of countries with common high scientific research priorities are displayed in the following figures, which provide a visual representation of the RTD convergence of Members States and Associated Countries on the identified subtopic. It can be noted that the majority of these subtopics assess a wide concentration of interests among the European countries.
This result should be considered a tool for making decisions and formulating research actions toward the definition of common research programs.
The process will assure in advance a successful outcome for the future common research initiatives.

For each subtopic, the following figures show the Countries among the 14 Member States and Associated States participating in the HERITAGE Project, which agree on high scientific priorities, and the Countries ascribing low and medium scientific priority. The EU countries not participating in the NET HERITAGE project and non-EU Countries are also displayed.

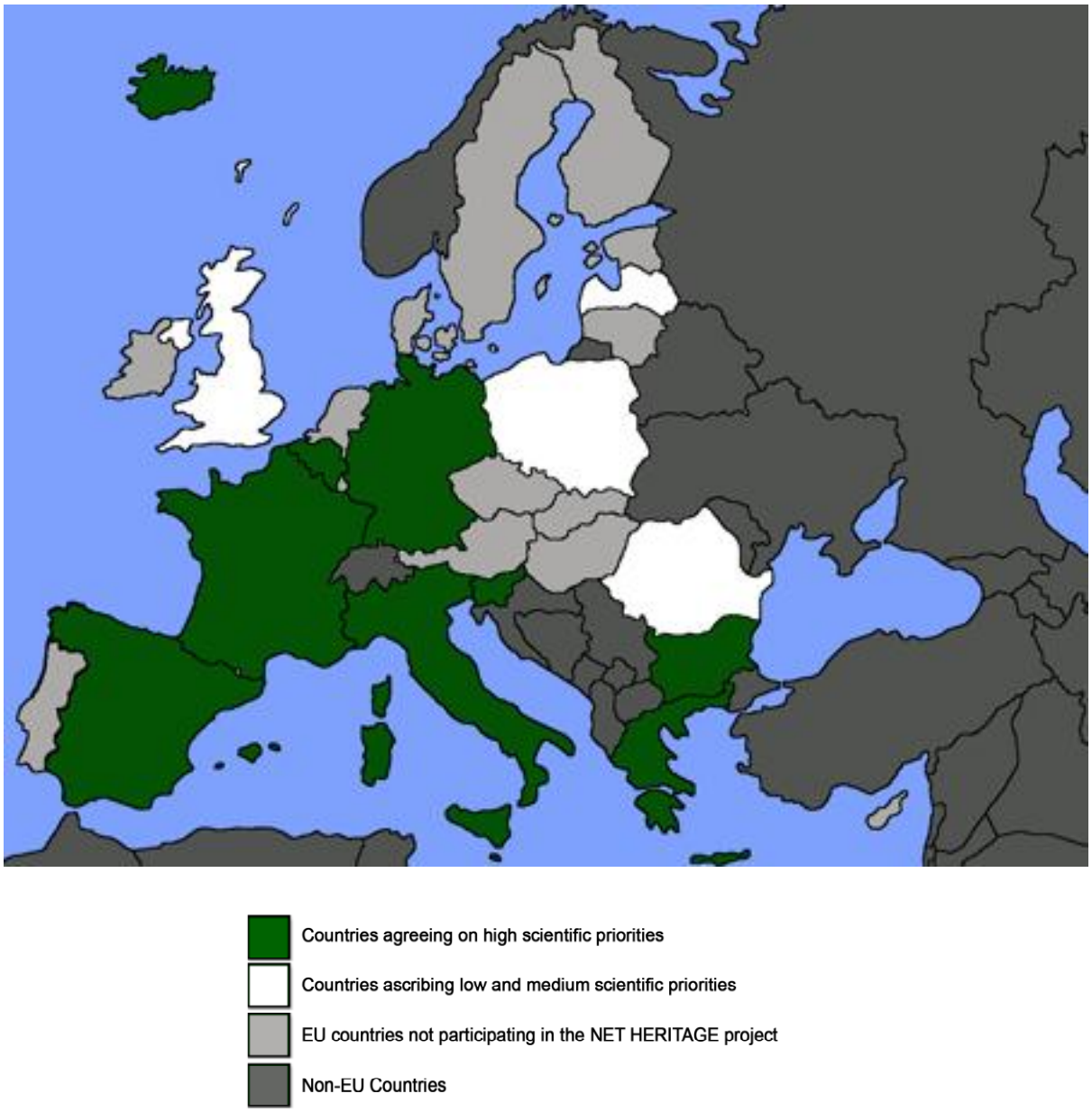
2.1 Multidisciplinary approach on the synergic interactions between environment and materials.



2.2 Interactions between specific environmental factors (temperature, humidity..) and complex artefacts made by different materials.

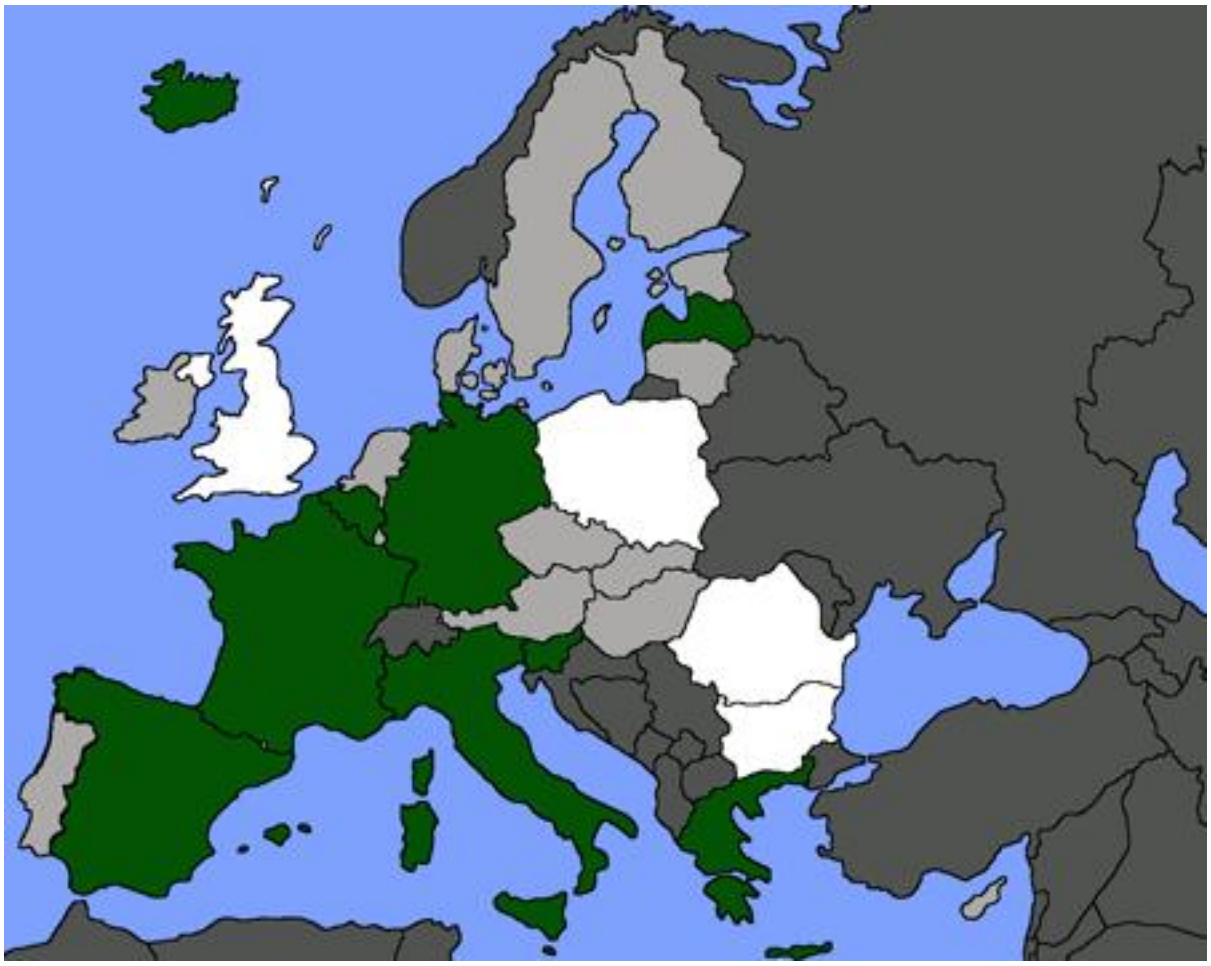


3.1 Portable instruments for in situ measurements.

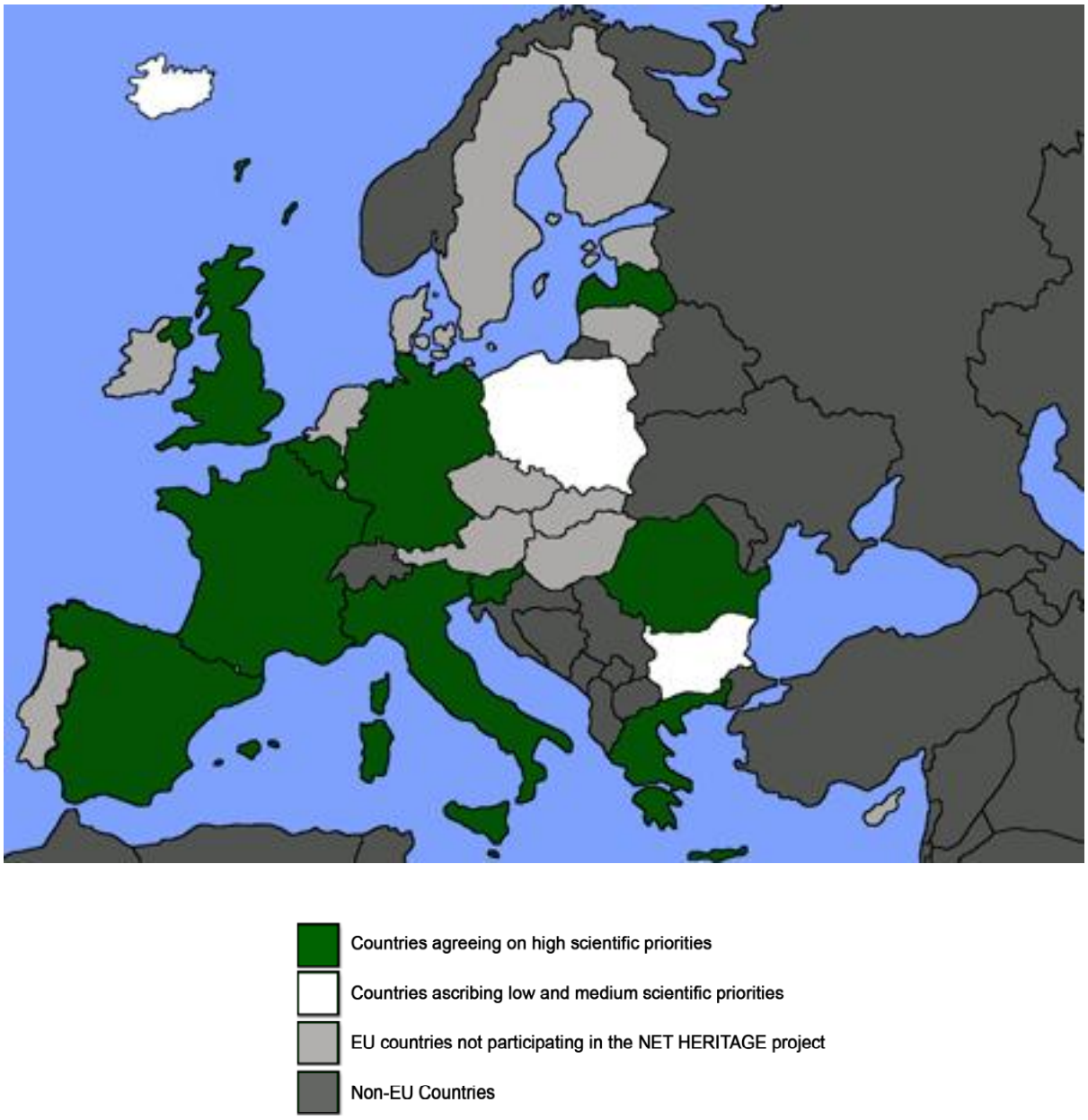


3.2 Non invasive instruments and methodologies for diagnosis and monitoring.

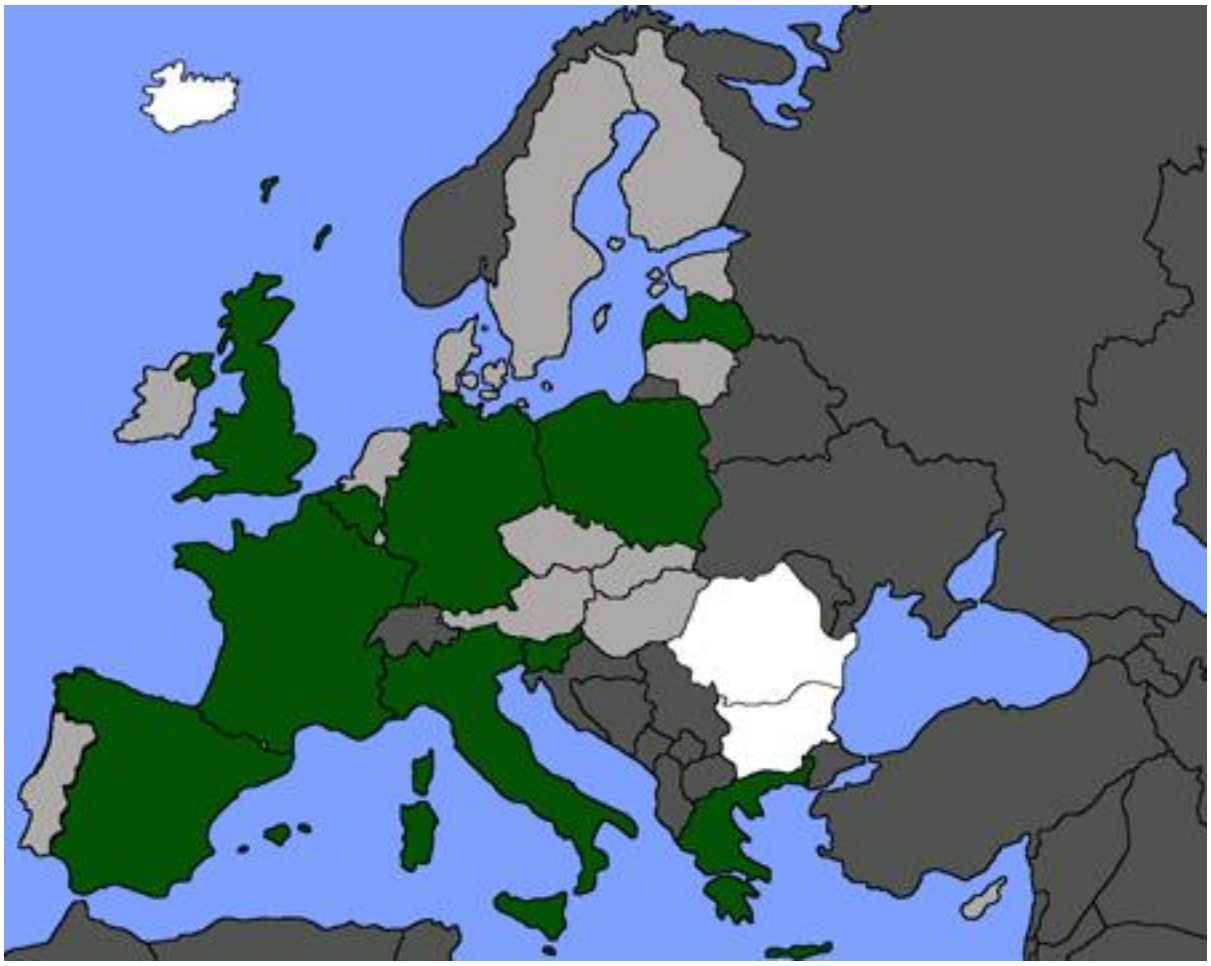
4.1 Development of new and appropriate materials and technologies for the upgrading or the construction of conservation buildings/rooms.



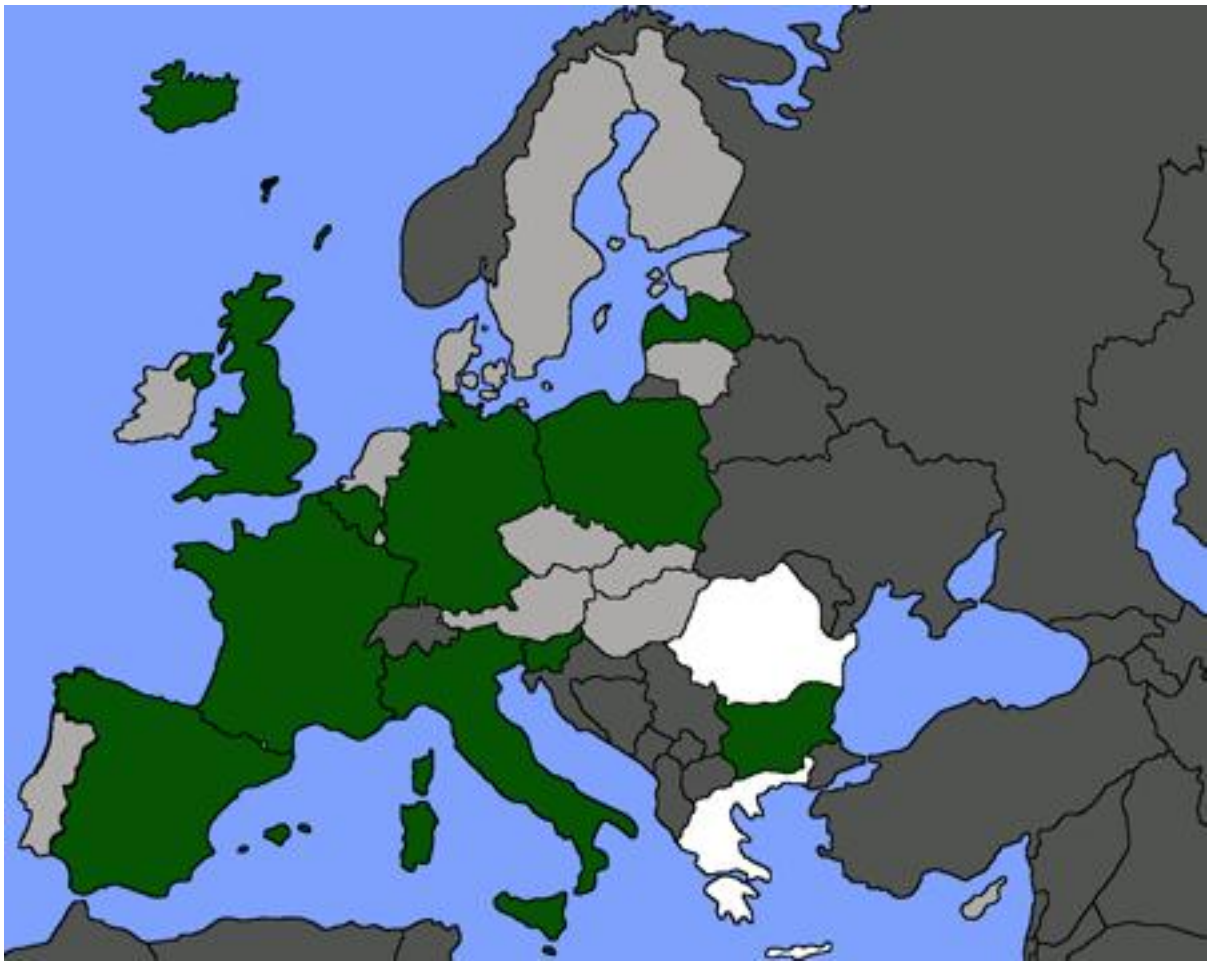
4.2 Development or improvement of products for restoration and conservation with low impact on the historical content of artifacts.



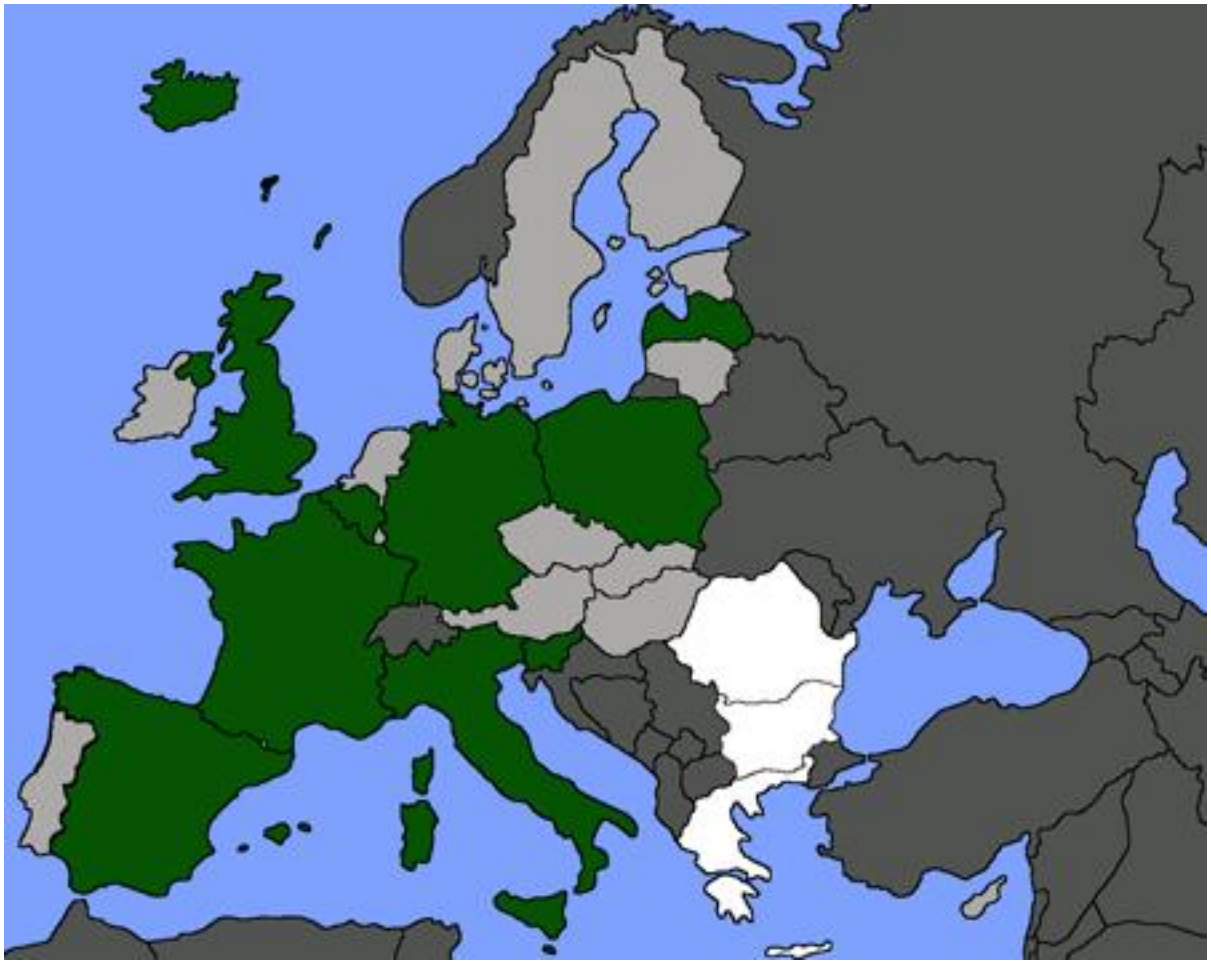
5.2 Innovative solutions for compatibility, durability and reversibility of new materials and treatments.



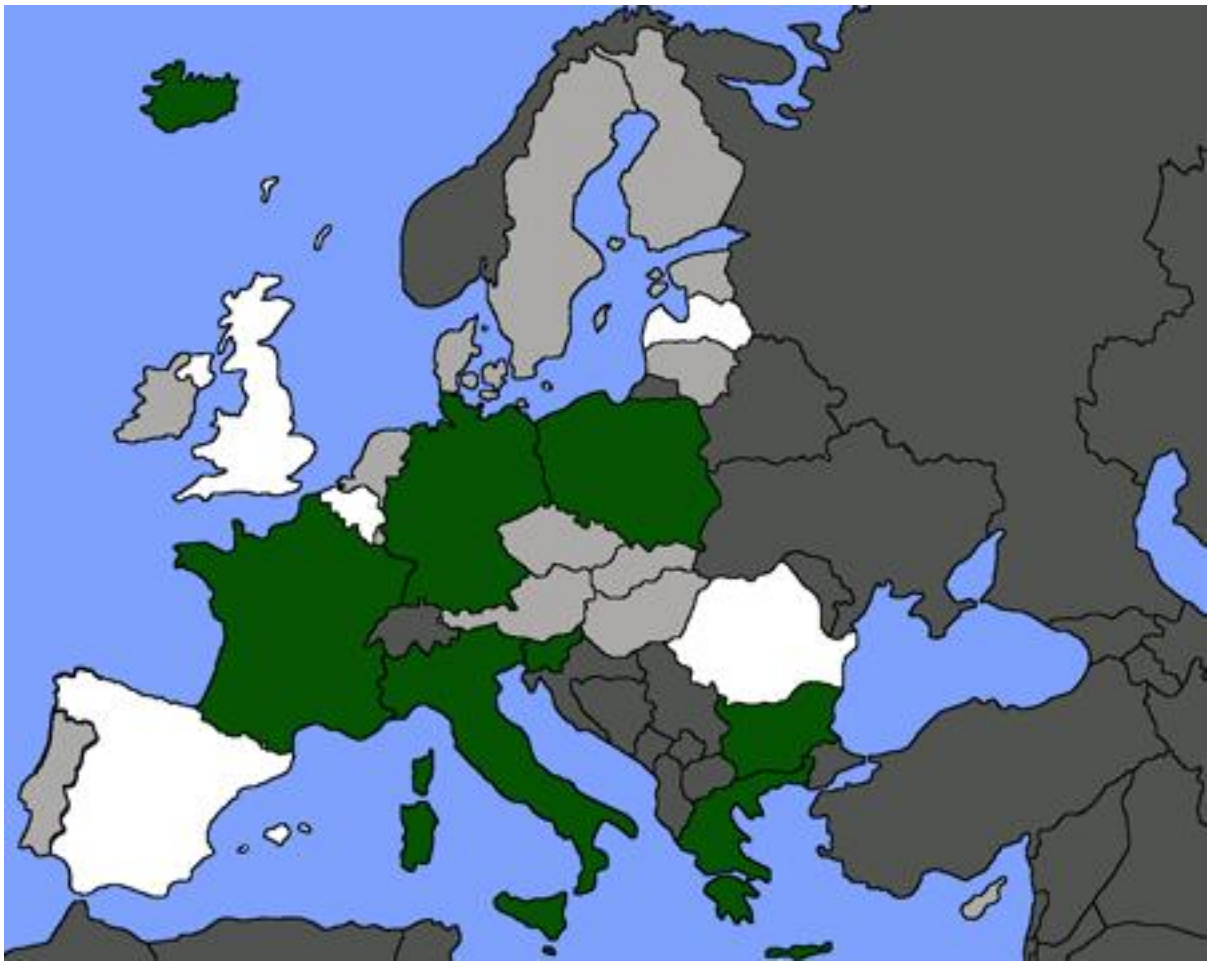
6.1 Development of strategies and procedures for storage and preservation of multi media supports and readability of the stored content.



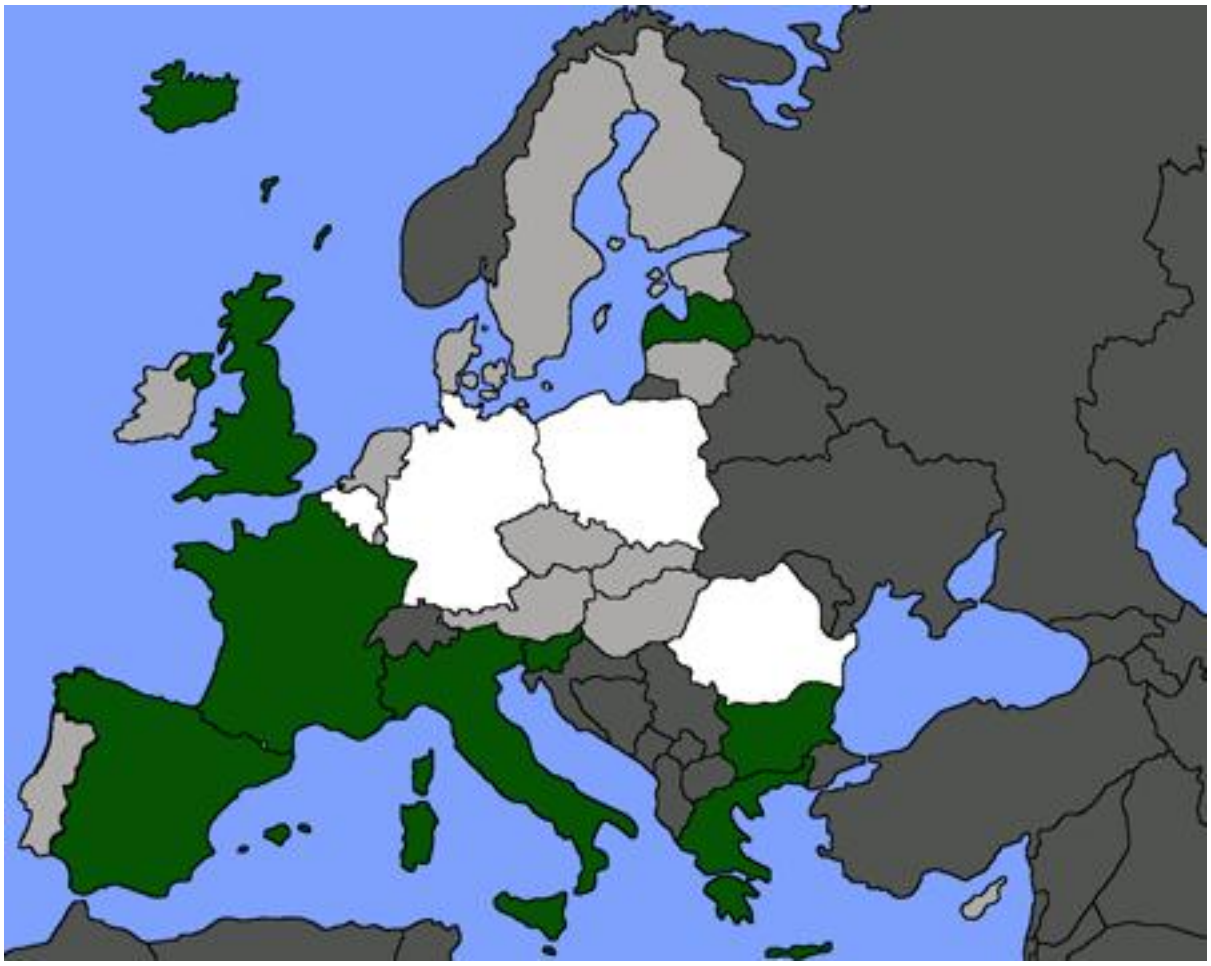
6.2 Innovative proposals for conservation and durability of contemporary art materials (i. e. plastics, ceramics, new alloys, glasses, new dyes, concrete, mortars).



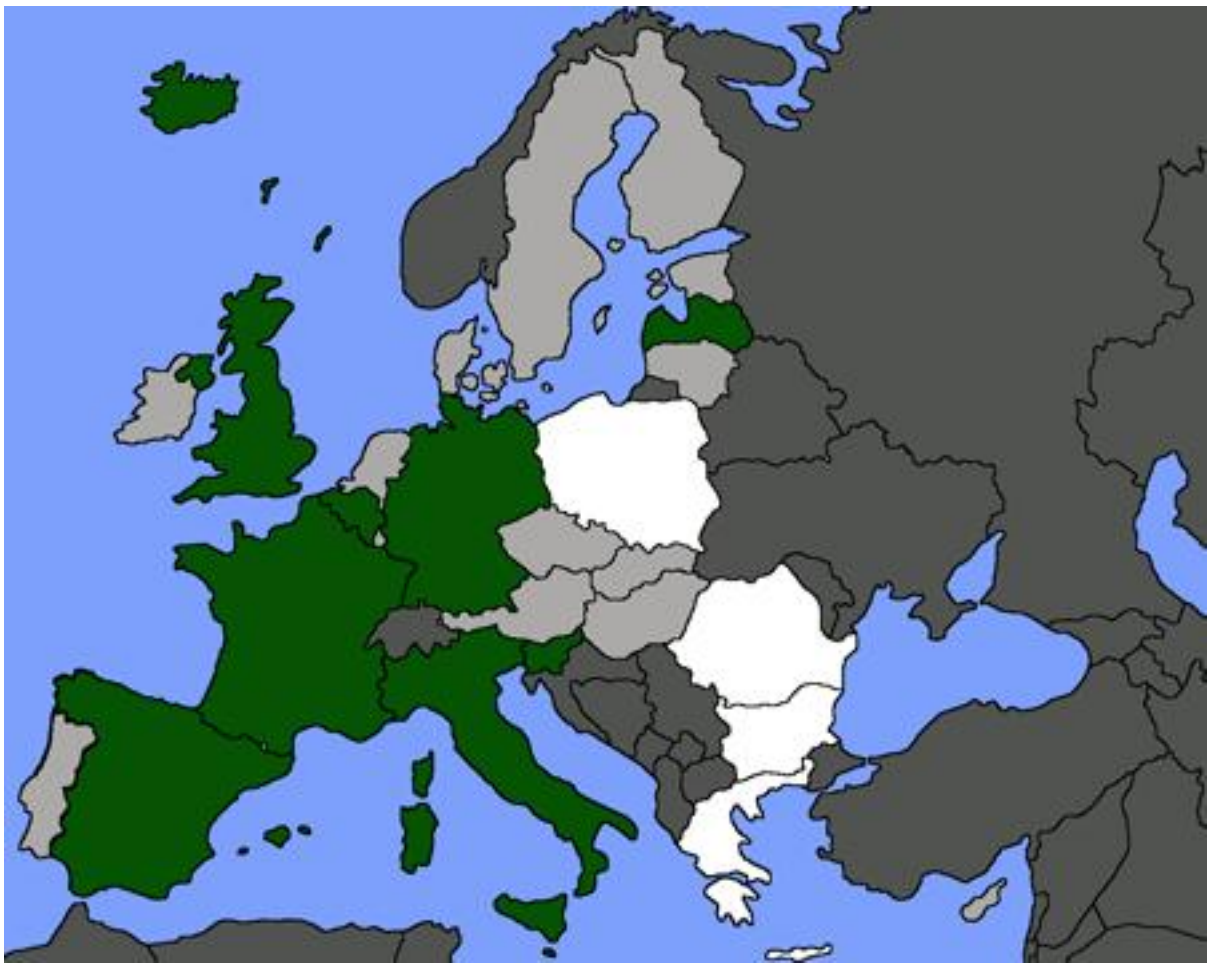
7.1 Development of management systems on quality and sustainability of indoor/outdoor cultural heritage environments.



7.3 Development of scientific criteria and tools to measure and regulate tourist impact on cultural heritage sites.



10.1 Preservation of industrial heritage: objects, buildings and landscape.



4.2 Relationship between needs and strengths of research topics related to high scientific priorities.

A great amount of attention was paid to finding the best and most simple way of attaining a transferable synthesis of the expression of interest between needs and strengths evidencing differences and convergences.

For each defined subtopic, the cumulative histogram of needs and strengths shows the scores and the countries that assigned a specific score.

For the two categories, needs and strengths, this permitted the identification, for the specific sub-topics, of:

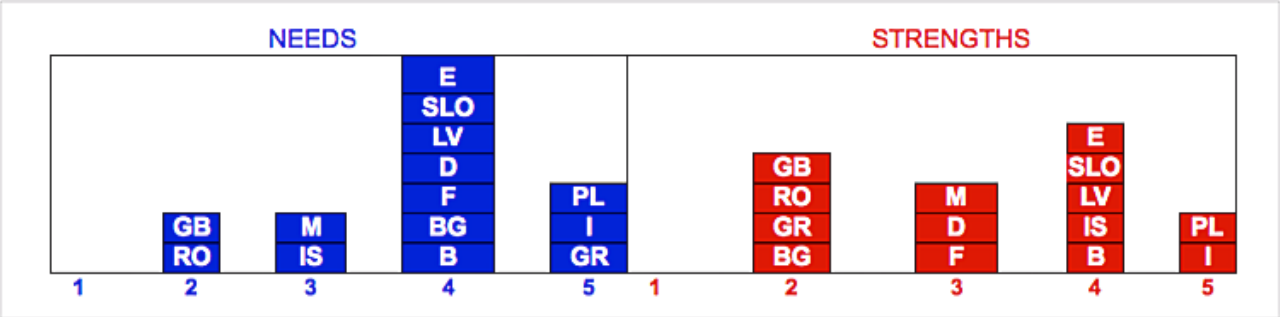
- the countries with the higher needs
- the strongest countries for each scientific field
- the identification of coupling of the countries with high needs with countries with high strengths.

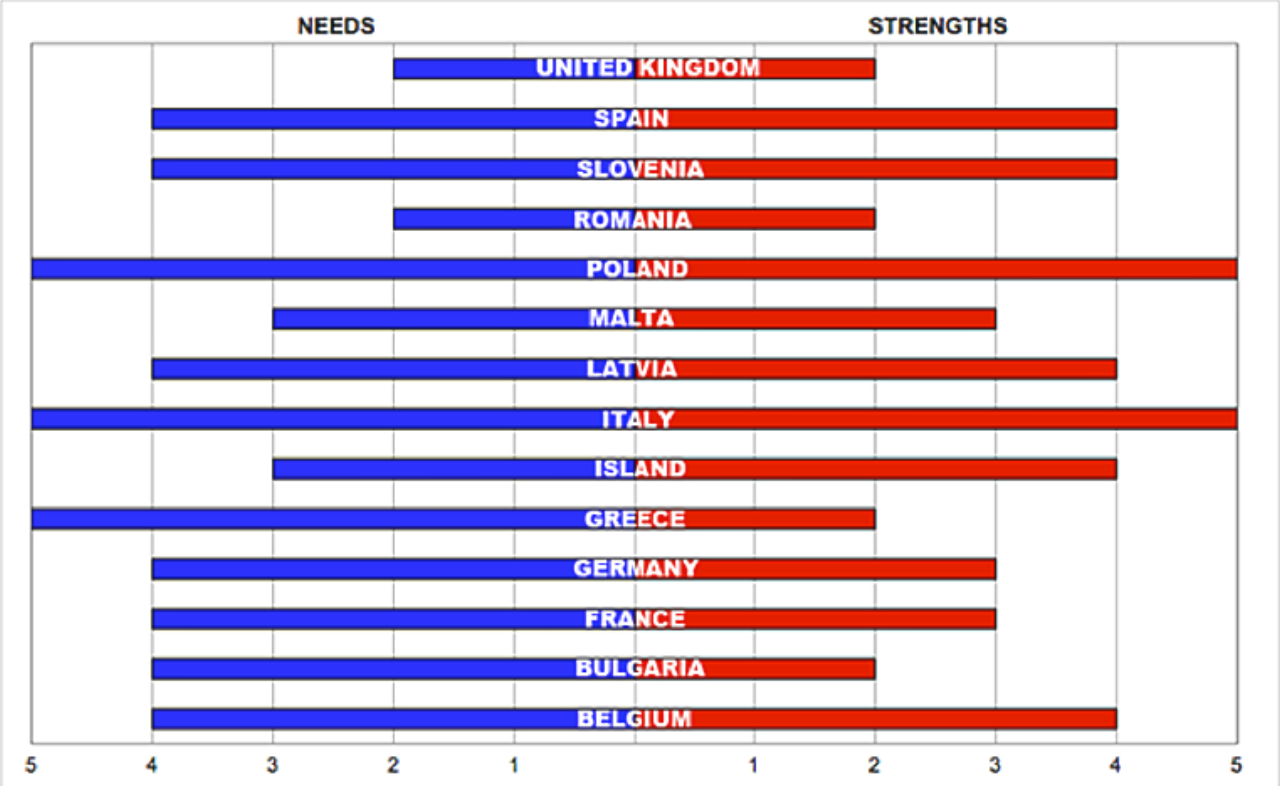
The second diagram allows an immediate identification of the requirements (needs) and the research capabilities (strengths) expressed by the different countries, through a score from 1 to 5 for each subtopic with high scientific priority.

This approach highlights possible convergence and agreement among Countries that possess complementary features.

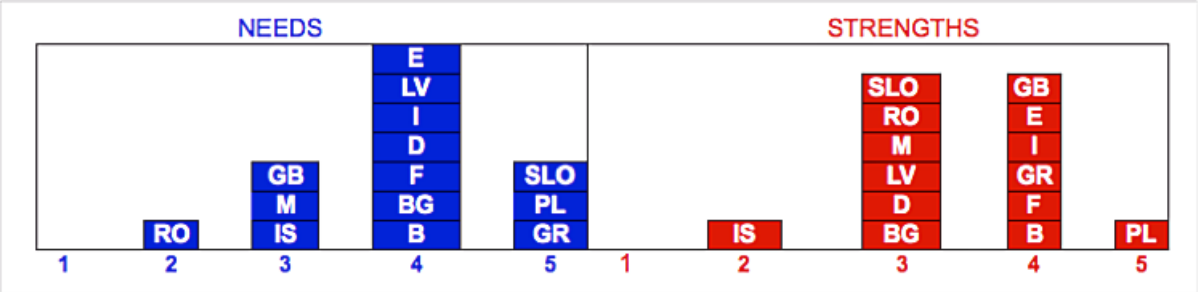
The outcome of the evaluation also provides evidence for the definition of partnerships for future common research projects at the European level, as well as the planning of a common strategic research agenda on RTD priorities in the field of conservation of tangible cultural heritage.

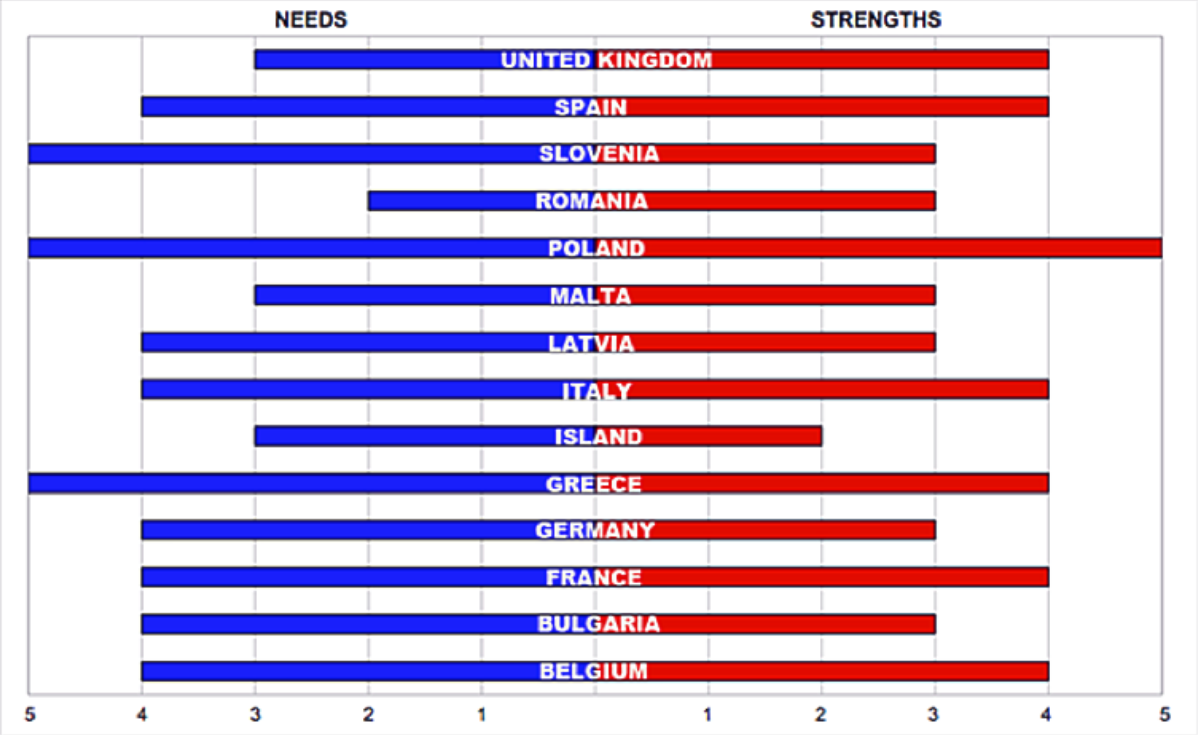
2.1 Multidisciplinary approach on the synergic interactions between environment and materials.



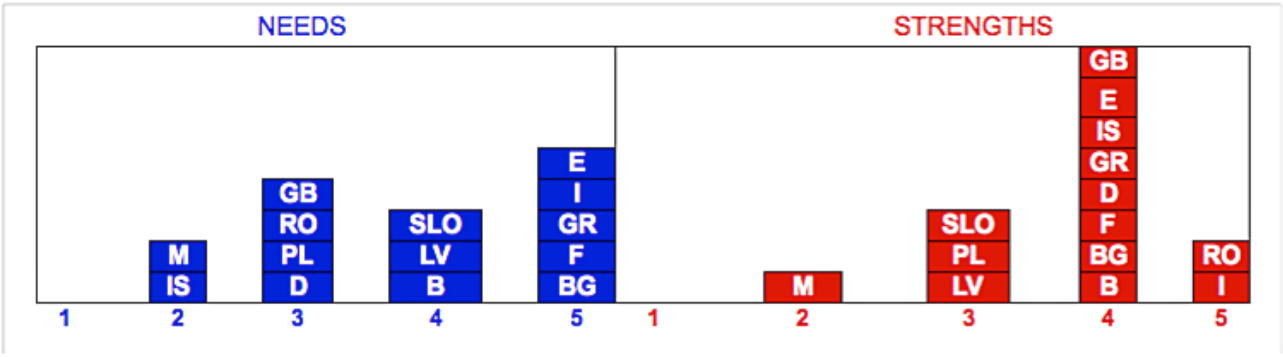


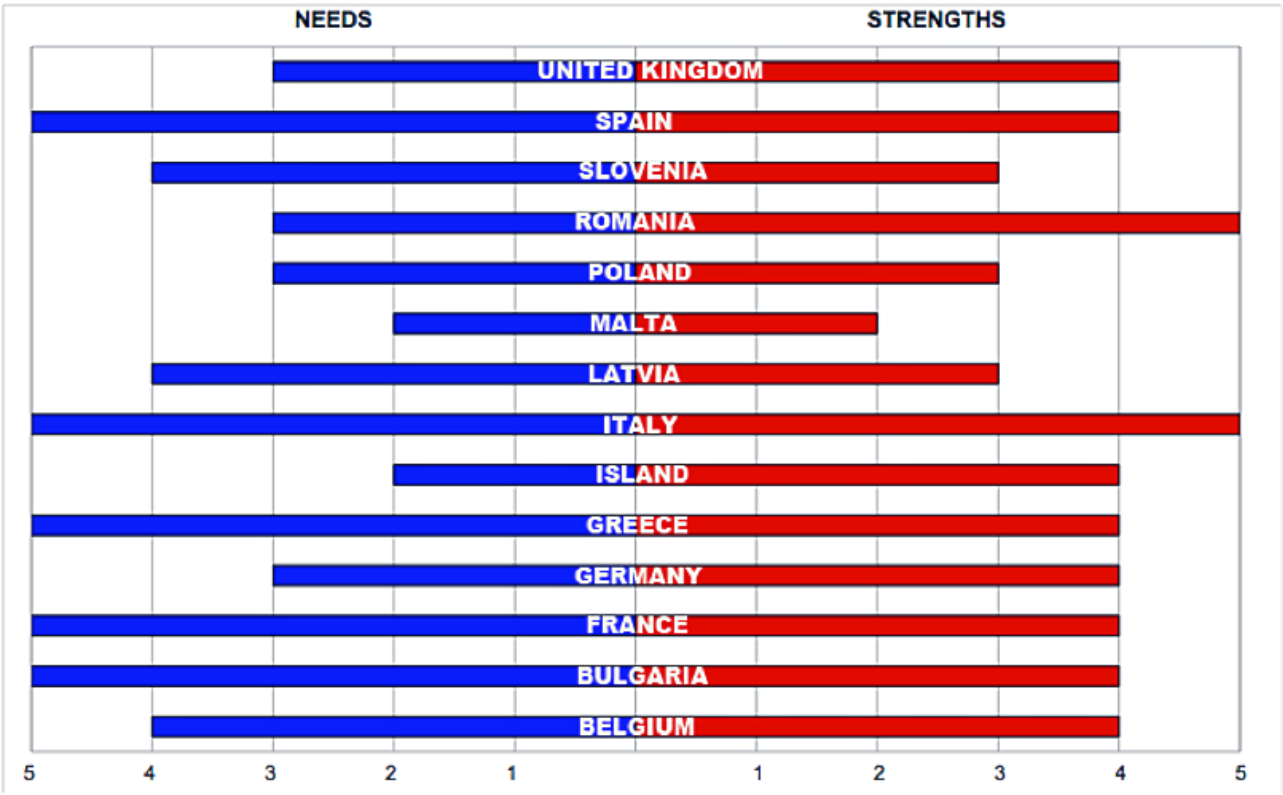
2.2 Interactions between specific environmental factors (temperature, humidity..) and complex artefacts made by different materials.



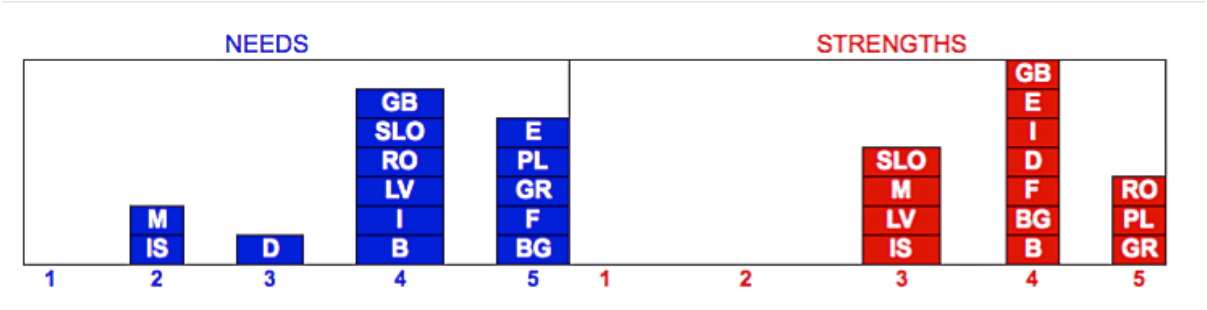


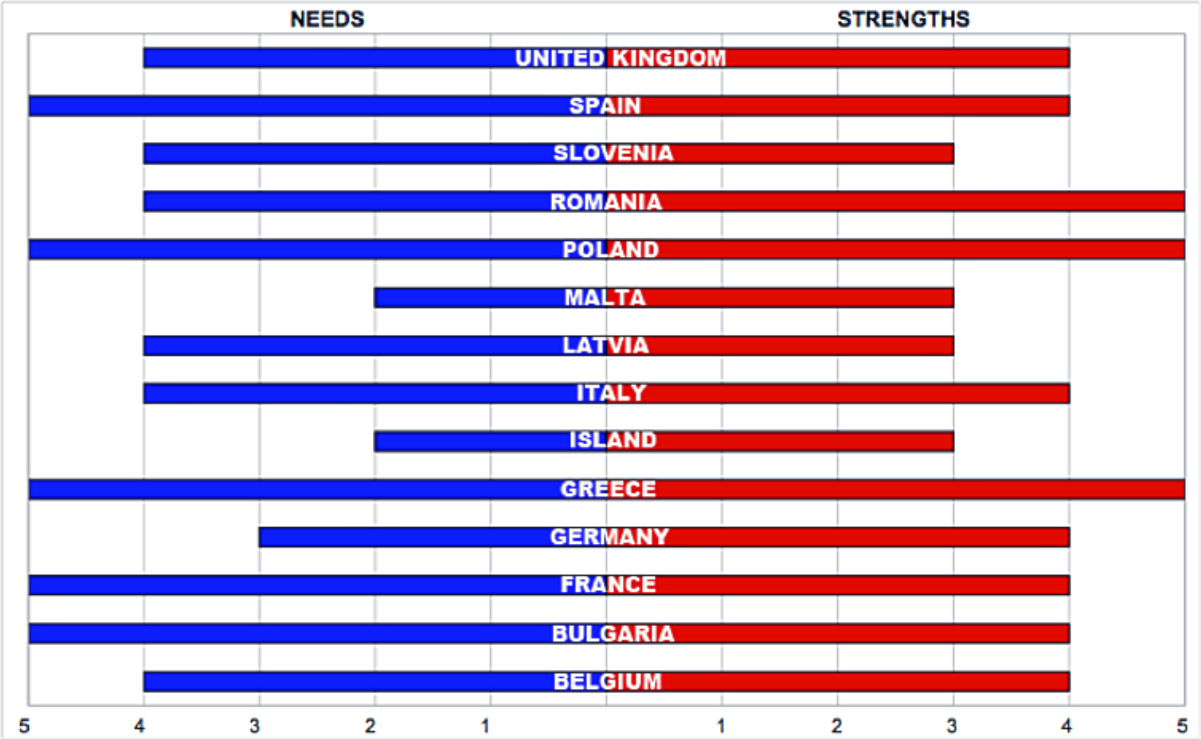
3.1 Portable instruments for in situ measurements.



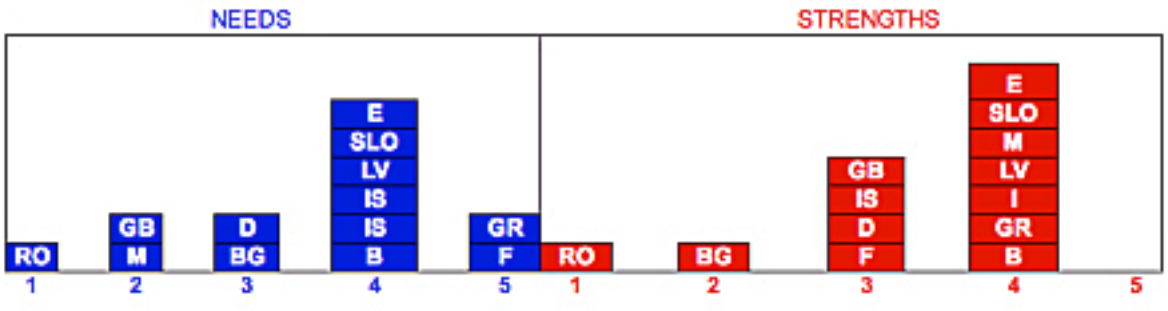


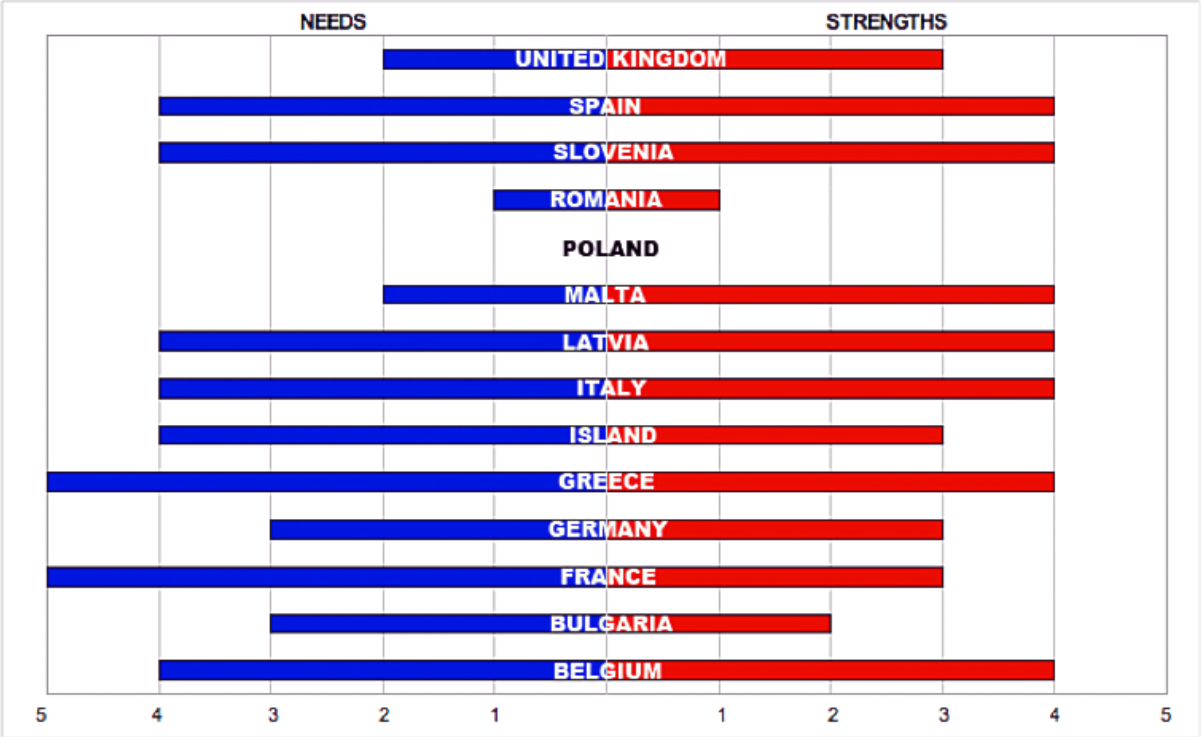
3.2 Non invasive instruments and methodologies for diagnosis and monitoring.



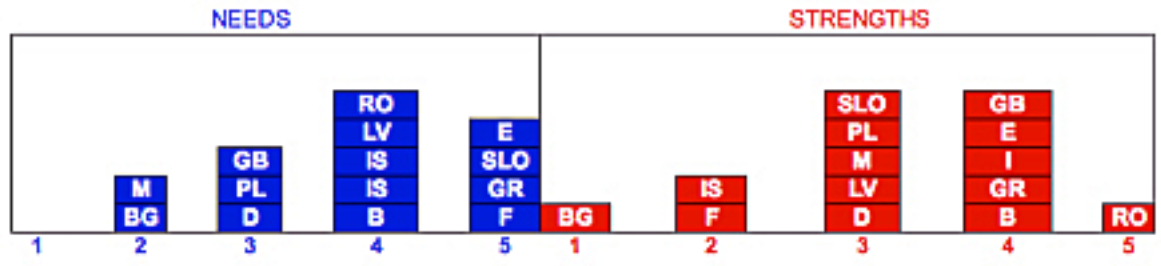


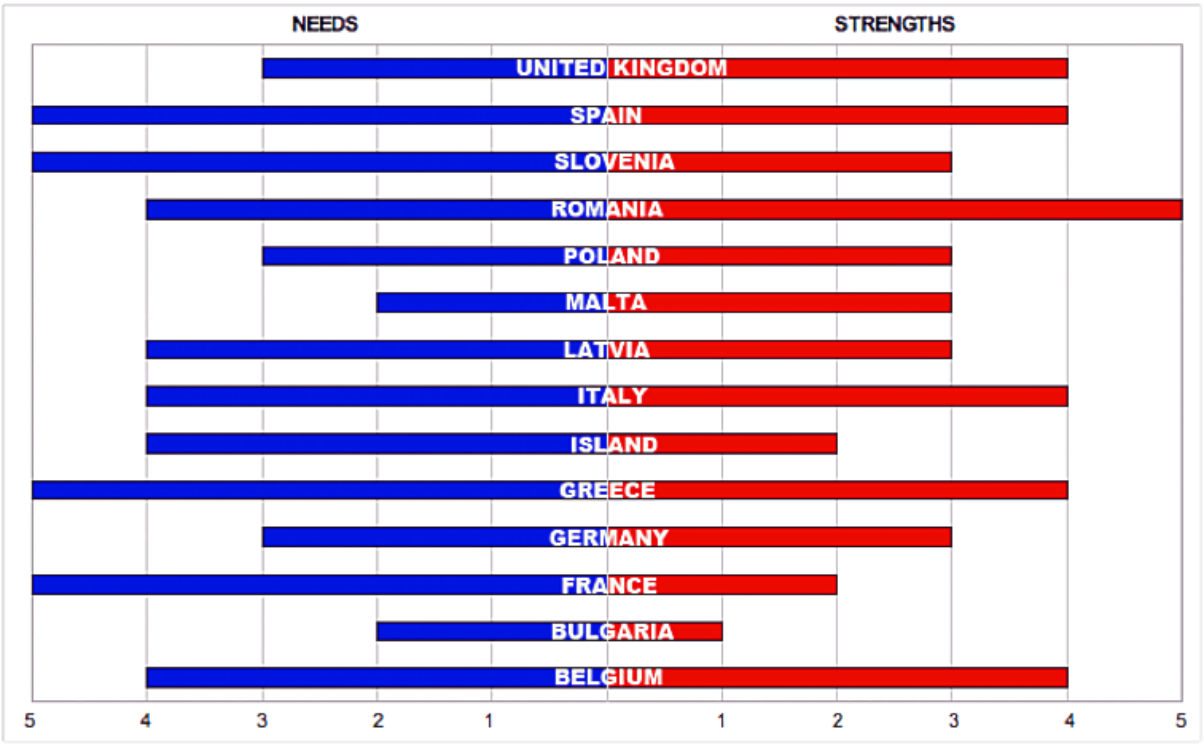
4.1 Development of new and appropriate materials and technologies for the upgrading or the construction of conservation buildings/rooms.



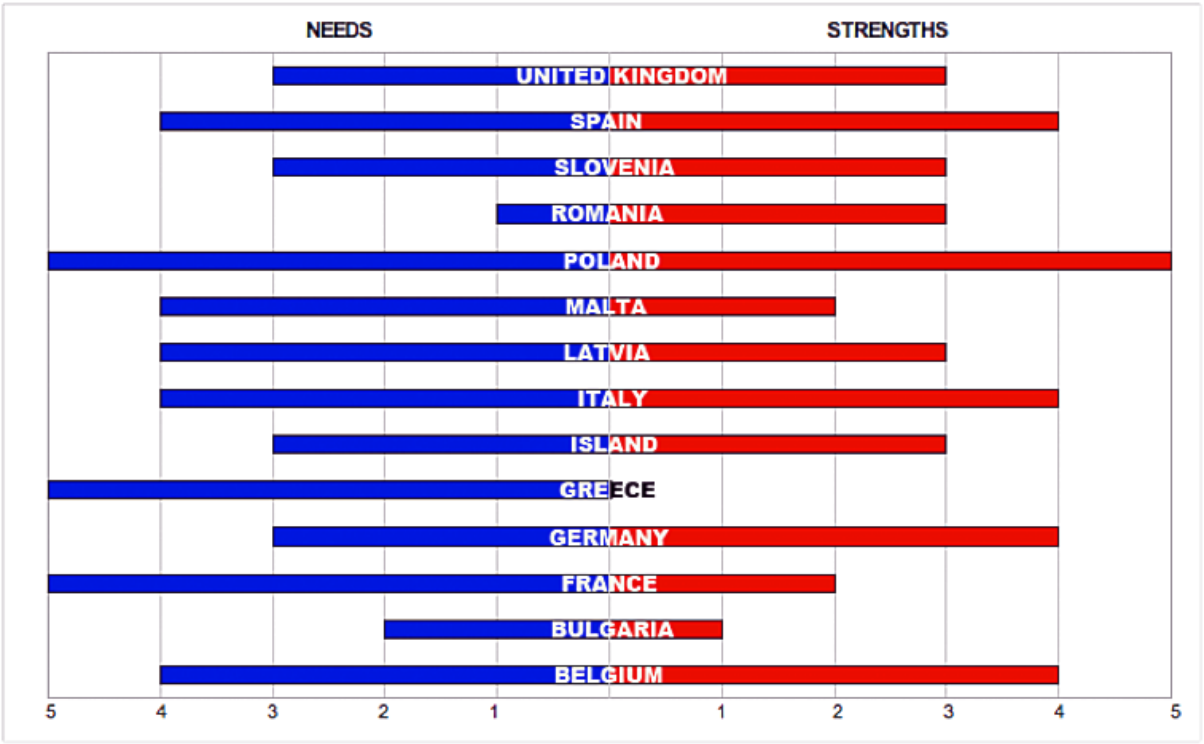


4.2 Development or improvement of products for restoration and conservation with low impact on the historical content of artefacts.

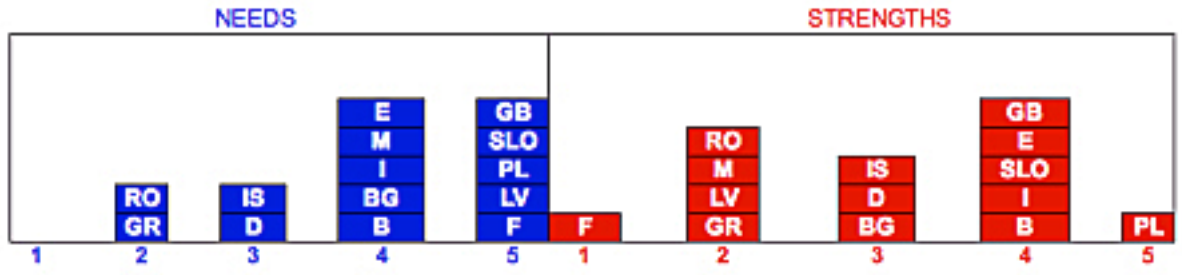


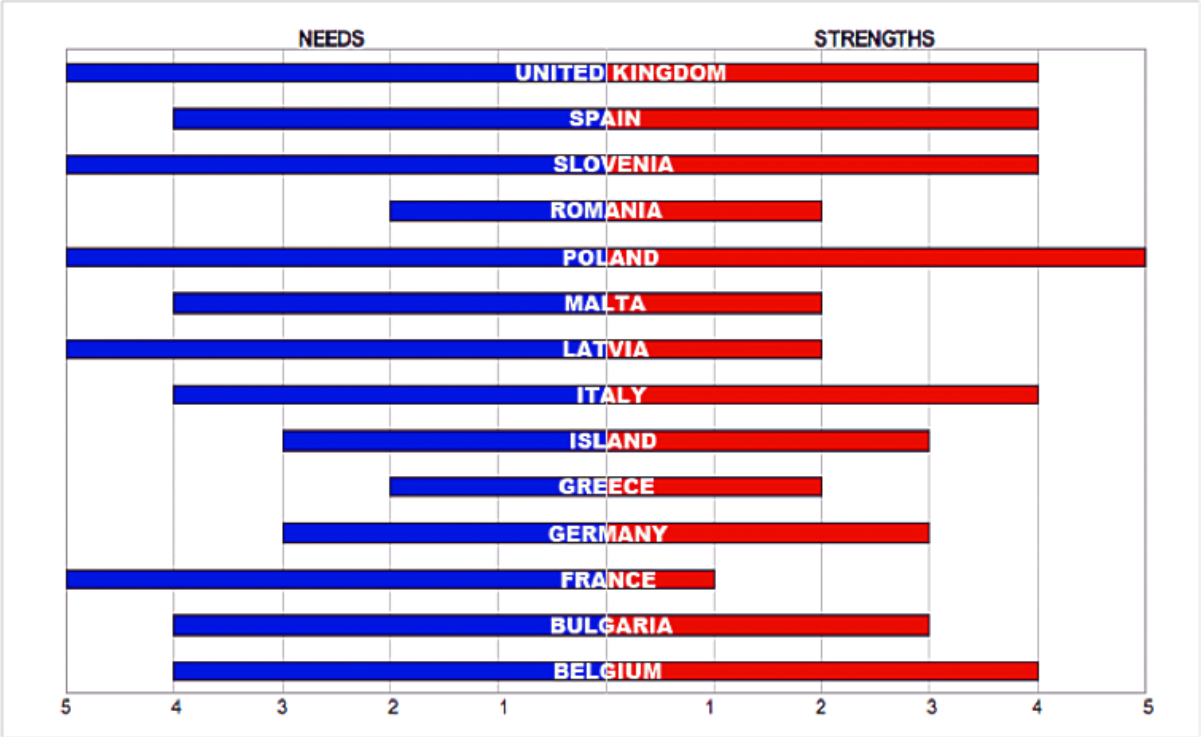


5.2 Innovative solutions for compatibility, durability and reversibility of new materials and treatments.



6.1 Development of strategies and procedures for storage and preservation of multi media supports and readability of the stored content.





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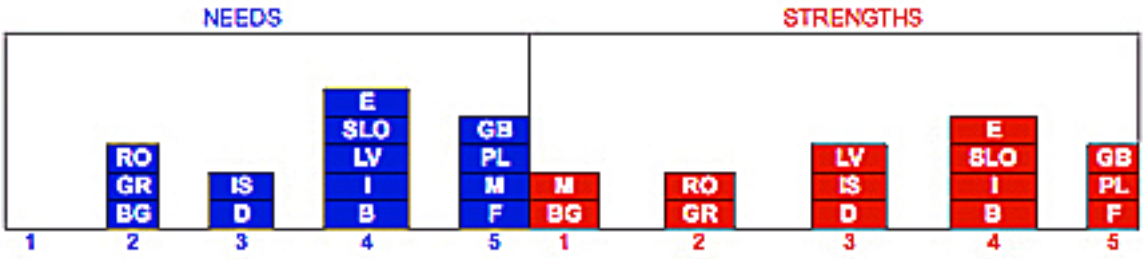
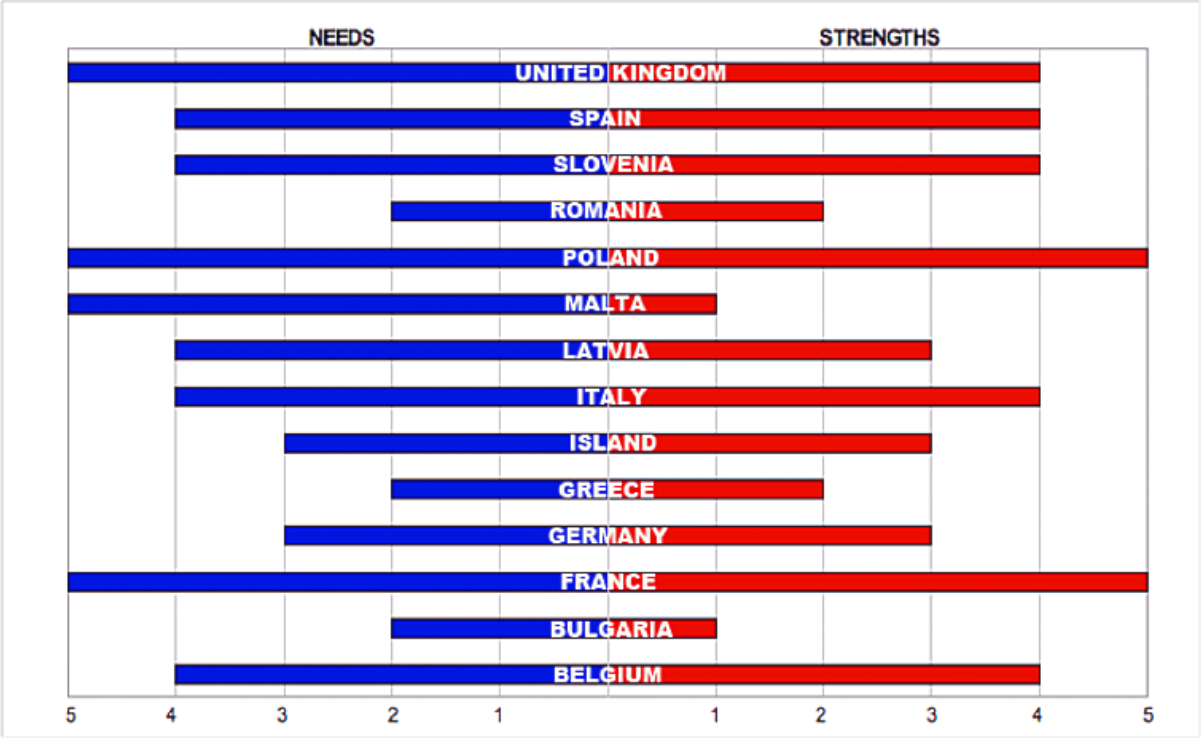
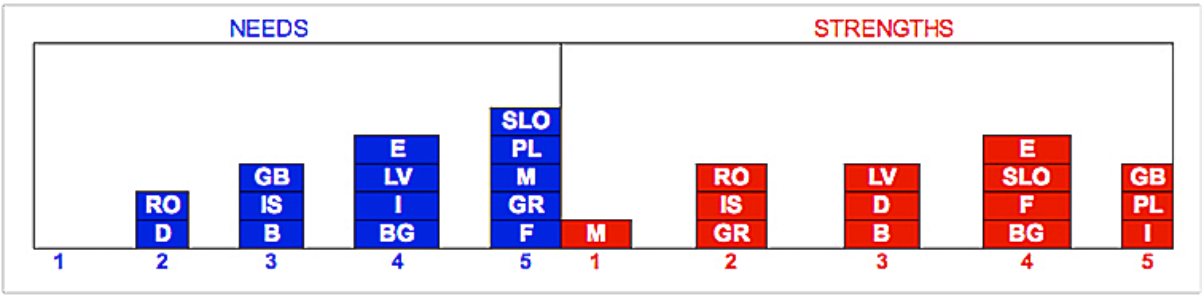
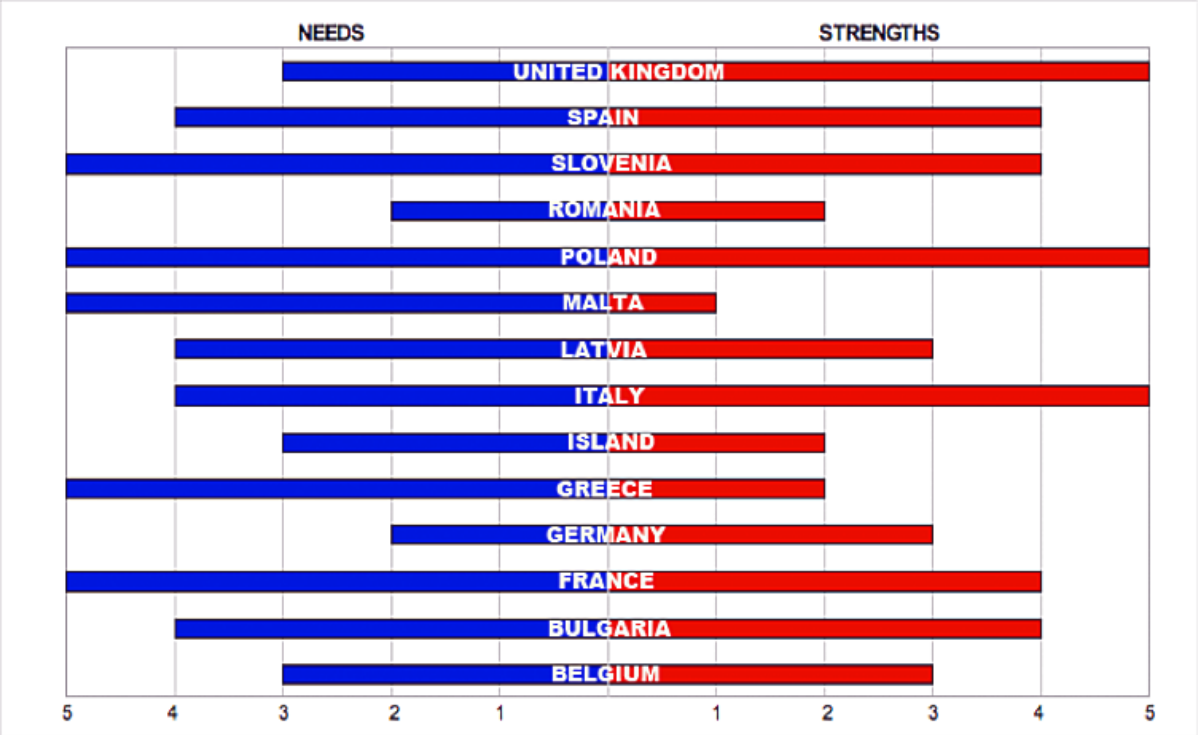


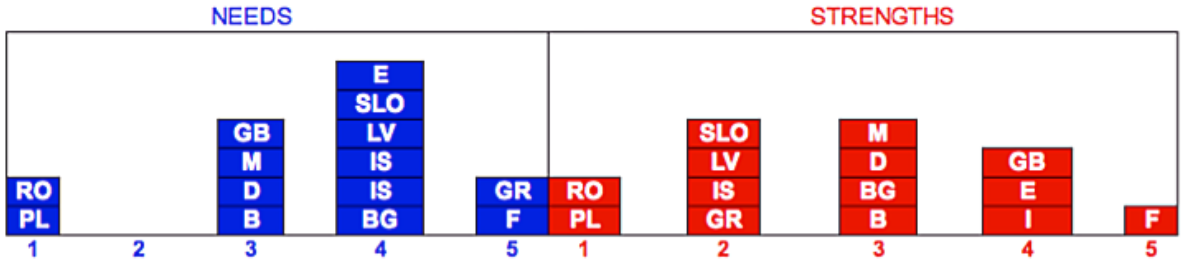


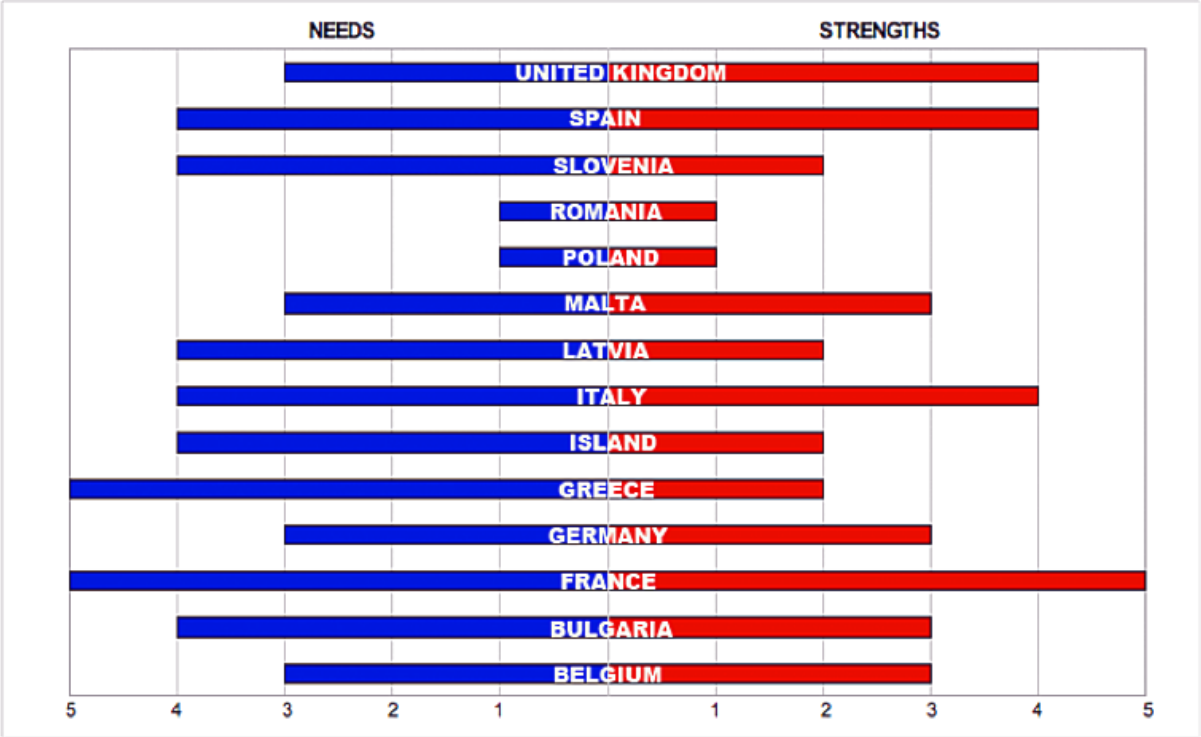
7.1 Development of management systems on quality and sustainability of indoor/outdoor cultural heritage environments.



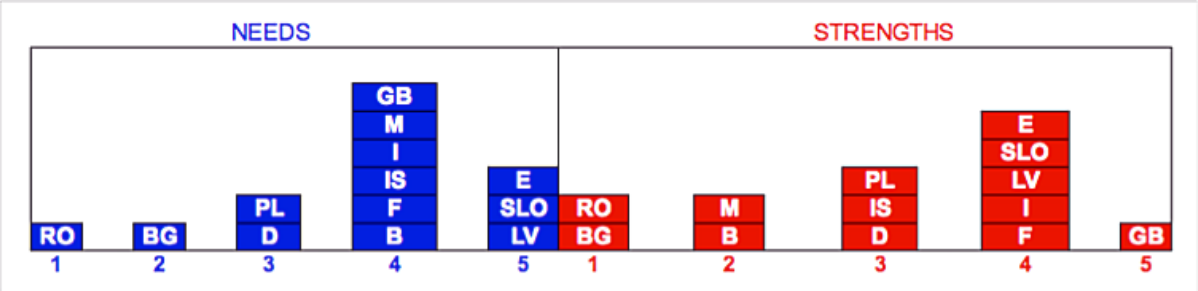


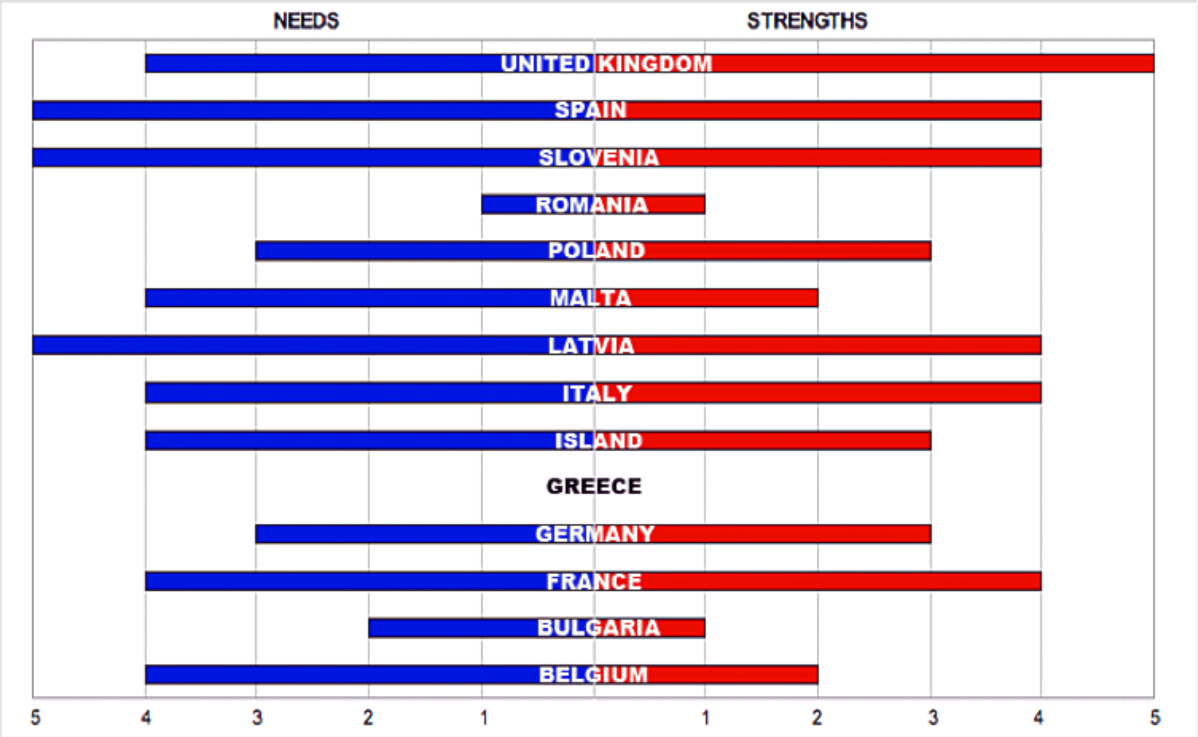
7.3 Development of scientific criteria and tools to measure and regulate tourist impact on cultural heritage sites.





10.1 Preservation of industrial heritage: objects, buildings and landscape.





5. RECOMMENDATIONS

The process for defining a common strategic research agenda must be based on a detailed and thorough consultation within each European Country, an approach never previously implemented in the specific field of conservation of tangible cultural heritage.

For the first time since the EU Framework Programmes on Research, such an approach was adopted within the NET HERITAGE Project, through the involvement of national expert panels, leading to agreement on 12 research issues of high scientific priorities.

The innovation of this approach consists in the networking of research Ministries, Councils and Foundations in the field of research and cultural heritage

- European Countries have common priorities and should look for common solutions in the research field of cultural heritage.
- The list of high research priorities must be used to develop common programmes.
- Cultural heritage research needs to be included on the National research agenda.
- The presented survey can be used as a tool for an *a la carte* approach, on which to base Joint Programming Initiatives (JPI).
- The list of common high priorities should be taken in due account for the definition of the 8th Framework Programme.
- The survey shows the strength of European research in the field of cultural heritage. It is recommended that this research capability, which is assumed as a world reference point, be exploited to reinforce European competitiveness.

The approach on which this consultation was based may be adopted for other research areas.

Finally, the priorities identified within the NET HERITAGE Project should be integrated within the research policies of other sectors, such as energy, construction, ICT, nanotechnologies, and smart cities .