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Study of the situation of traditional constructive techniques and materials in Spain

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ABSTRACT: Constructive solutions in traditional architecture are born of the materials available locally which were used to achieve the best possible technical and architectural adaptation to the local climate. Given the importance of traditional materials and systems and their effect in the conservation and restoration of traditional architectural heritage it was decided that a specific section should be dedicated to the recovery of traditional constructive techniques within the Spanish National Plan for Traditional Architecture, drawn up by the Spanish Cultural Heritage Institute (IPCE). The main objectives were to create a database on the current situation of available traditional materials, the production and use and the survival of specific trades linked to production and execution, encouraging their use in these traditional architecture restoration processes. This text aims to present the methodology and the results obtained in the study in 2013 and 2014.

1 INTRODUCTION

As is known, traditional architecture for the most part uses locally available materials, making good use of local materials in the design of suitable constructive solutions. Thus, a double symbiosis occurs between building and landscape. Buildings drawing on the surrounding landscape for construction with materials linked to local geology and agriculture, shaped by the climate and rivers, are also buildings which blend into and are an essential part of the landscape, adapted to the rivers and climate. This wealth of constructive materials and techniques linked to local diversity has progressively diminished with the introduction of industrial materials and global production. The conservation of traditional architecture calls for the understanding, valorization, and eventually the recovery and/or enhancement of traditional constructive materials and systems and their conservation in restored buildings (Dollfus 1956, Oliver 1997, VV.AA. 1990).

Given the importance of the issue and its impact on the conservation and restoration of traditional architectural heritage, it was decided that within the Spanish National Plan for Traditional Architecture a specific section should be dedicated to the recovery of traditional constructive techniques for the restoration of traditional architecture. The main objectives aimed to create a database on the traditional materials currently available, their extraction, production, and use in construction, as well as the survival of specific trades using and promoting these in the restoration processes of traditional architecture. The use of these materials and associated constructive techniques allows architecture and traditional techniques, to be conserved thanks to their current use, with major benefits for local culture and economy.

2 OBJECTIVES

The general objectives of the project "Documentation and research for the knowledge of the current situation of traditional constructive systems, as well as the extraction, use, and implementation of traditional materials in Spain" are:

- The creation of a database of the existing productive structures for the execution of different traditional techniques and any other centers experimenting with traditional constructive materials and systems.
- Geographical distribution of these processes.
- Basic characteristics of traditional constructive materials and systems reflected in fiches and graphic and audiovisual material.
- Study of basic materials of traditional architecture which are now protected and the impossibility of using these in the restoration of buildings. Assessing how to ensure that regulations allow for their use, at least in rehabilitations.
- Study of the situation of the trades of extraction, transformation, and execution relating to traditional architecture, as well as of educational centers where these trades are taught and researched.
- Knowledge of the regulation of the artisan sector in Spanish autonomous communities in relation to traditional construction trades.

- Reflection and future proposals on the adaptation of protection measures based on the results obtained, as well as a proposal for suitable promotion of the recovery of traditional constructive materials and techniques.

3 METHODOLOGY

The methodology for this project is based on qualitative research which uses several sources of information for data collection. The documentation obtained is subsequently analyzed in order to draw final conclusions.

There are many information sources: specific bibliography; official sources from all levels of the administration; professional associations related to the topic; ethnographic museums; experts and researchers in the field; citizens' associations interested in the subject; all sorts of webpages and internet resources, all duly selected.

The work consists of four major tasks: the creation and compilation of a database on the different agents of traditional construction; the geographical mapping of constructive materials and techniques and their current situation and activity; graphic and audiovisual documentation (photographs, videos and internet links) of traditional constructive materials, processes and techniques; and cross-referencing of information, regulations, analysis and reflections in order to draw conclusions on the current condition of traditional constructive materials and techniques in the different parts of Spain.

4 WORK PROCESS

4.1 *Creation of the database*

Research is firstly tackled through the creation of a database for the different agents linked to the study and located through the sources mentioned.

Information is classified based on the type of activity developed, establishing four categories:

- Extraction: agents dedicated to obtaining raw materials used in traditional architecture (250 recorded).
- Transformation of raw material: activities that involve transforming raw material into products of traditional construction (657 recorded).
- Execution: any activities which involve building using traditional systems and techniques (136 recorded).
- Research/Teaching/Dissemination: all sorts of institutions and associations dedicated to the study and research of traditional constructive techniques, as well as those dedicated to promoting knowledge on the subject through courses and practical workshops, publications, etc. (147 recorded).

The information required is different for each category, and adapts to specific individual characteristics.

It should be noted that the "transformation" database does not include trades such as carpenter, nor does the "execution" database include trades such as general building, as it is understood that with the right instructions practically any carpenter or builder can carry out traditional jobs. This aims to identify trades requiring more specific training, and adding them to the list.

The greatest amount of data possible is collected through the numerous sources of information, so that the comprehensive study presented aims to be homogeneous throughout Spain. However, from the start it became clear that given the scope of the work it was impossible to consider this database as a closed tool, no matter how extensive. It should therefore be seen as a dynamic tool which can and must continue to grow in the subsequent revisions of the National Plan for Traditional Architecture.

The aim of compiling this information, apart from providing the number of agents who still keep traditional constructive forms alive, is that access should be freely available to teachers and specialists.

4.2 *Geographical distribution of processes*

The different mappings are created from the information collected from different mediums and compiled in the database, and from other specific sources of information including the Geological and Mining Institute of Spain, European Forensic Genetics Network of Excellence, specific bibliography, expert opinions, etc.

Thus the areas with different types of raw materials (up to fifteen in this case) are mapped, and the information relating to the places with active extraction, featured in the database, are superimposed. In addition, the localized agents dedicated to the different trades for the transformation of raw materials and use in traditional construction work, research, teaching, and dissemination are added. The aim is to be able to study and cross-reference data from the different mappings to analyze the situation of the geographical distribution of the different activities.

Mapping is also proposed for traditional constructive systems, equally drawn up by consulting extensive bibliography and experts in the field. This part of the study focuses particularly on some specific traditional techniques, partly at greater risk of disappearance, and sixteen different systems were selected. It is considered important to know the field of application of a traditional constructive solution both to study the relation-

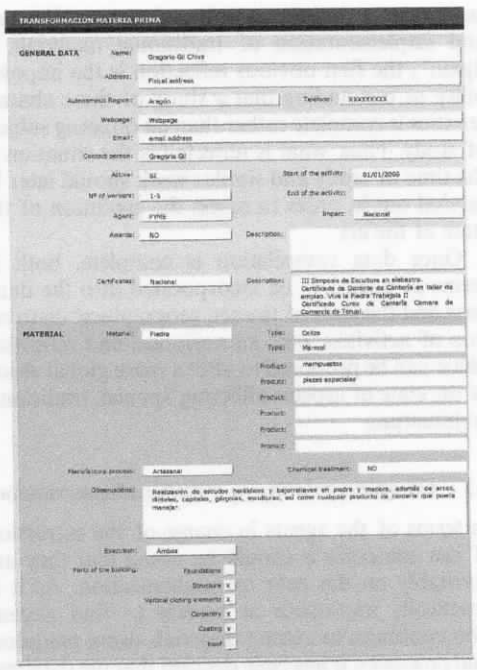

Figure 1. Example of fiche for agent for the transformation of prime material.

ship with its environment in terms of the materials used and its response to the bioclimatic setting, and to recognize the field of action in which the use of a specific technique is truly traditional. Thus, the area of work is recognized in instances where action is needed to recover a technique at risk of disappearing. The techniques suited to use in the rehabilitation of traditional constructions in each area are also documented.

4.3 *Graphic and audiovisual material*

In addition to the mappings, fiches explain the different extraction, production, and construction processes linked to traditional architecture and document these visually, selecting nineteen cases. These are simple documents explaining the manufacturing process of the constructive element or solution primarily for teaching and dissemination purposes.

Following the same line of documentation for teaching and dissemination of knowledge associated to the construction of traditional architecture a search was carried out for videographic documentary information on matters relating to traditional construction processes, confirming the value of tools such as YouTube in the diffusion of knowledge. In terms of tasks documenting traditional activities the great work and effort of Eugenio Monesma, who has produced a series of videos on traditional construction, is laudable.

Figure 2. Mapping for points of extraction of slate superimposed on areas where this is found.

Figure 3. Areas where stone roof tiles are used in traditional architecture.

Both fiches and videos are an efficient form of documenting traditional construction systems, as well as a way of conserving and transmitting this cultural heritage.

4.4 *Study of materials of traditional architecture*

Following the study of the current situation of the most used materials in traditional architecture, an analysis of use and regulations is proposed, providing a brief synthesis of each situation. The materials studied are:

- Wood: protected species or species at risk of extinction, forest management (Wood shortage, PEFC certification, due diligence system) and proposals.
- Stonework and metals (grouped together as they are both extracted through mining): mining in Spain, commercialization of the product and conclusions.
- Earth: compressed earth blocks (CEBs), adobe and rammed earth, and proposal.
- Reed: production of reed, use and regularization of the material and proposal.

Figure 4. Example of fiche explaining slate roofing.

- Plant covers: Spartina Patens (Salt marsh hay), Rye
- Seagrass: situation and protection.

4.5 *State of regulations*

The study of regulations affecting the extraction of traditional materials is examined in the previous section. There are no specific national regulations for traditional architecture. In terms of the current regulations applicable to architecture it is worth noting the rigidity of some of these, designed mostly for new constructions using contemporary materials and techniques conflicting with many aspects of traditional architecture.

The Spanish Technical Building Code (Código Técnico de la Edificacion or CTE) modified in Law 8/2013, of 26 June 2013, for urban rehabilitation, regeneration and renovation has facilitated building rehabilitation by permitting interventions on vernacular architecture that are respectful with the original construction, without the obligation to reach current standards. This is very difficult with traditional construction systems and should always be done with the agreement of owners and/or users, clearly indicating any possible limitations of use deriving from non compliance with regulations. However, this is not simple and requires complex arguments and calculations for this type of solution, as insufficient research has been done on quantitative values in issues such as insulation, and even occasionally, resistance.

Given that at present many of the buildings linked to traditional construction are regarded as part of traditional crafts, a study of the relevant regulations, with variations in each autonomous community, is proposed, undertaking a comparative study of regional regulations.

5 REFLECTIONS

Following the work of "documentation and research for knowledge of the situation of traditional constructive systems, as well as the extraction, use, and implementation of traditional materials in Spain", the first obvious reflection is the impossibility of concluding that a study of these characteristics is complete rather than an ongoing subject of study. Thus, what is reflected is the situation at the time of study and similar work should later be carried out in order to assess the evolution of the state of the art.

Once data compilation is complete, both in terms of agents to be incorporated into the database and the state of the art, geographical distribution of activities, etc., an analytical and reflection phase can be proposed to offer a more global vision of the state of aspects affecting Spanish traditional architecture.

5.1 *On agents relating to traditional construction*

In terms of the agents in charge of the extraction of raw materials it should be noted that they are inevitably on the path to mechanization. As it is practically impossible at present to find anyone who continues to extract materials using preindustrial processes, it has been decided that the database should include companies dedicated to the extraction of raw materials used in traditional construction, specifying on the fiche whether the actual material extraction task is traditional, industrial or semi-industrial. This was considered the best option given that otherwise an important information item for the study would be lost, that of the extraction of the material subsequently used in traditional architecture with traditional constructive techniques. In any case, these details are considered to be less important as access to most of the materials used in traditional architecture is simple and direct.

The difficulty in locating master artisans whose trades are directly connected to the use of materials for traditional constructive techniques shows how far many of these trades are currently at risk of disappearing. The aging population and the progressive depopulation of rural areas are not determining factors, but do have direct bearing in the matter. Some of the master artisans contacted are no longer active, and with the shortage of apprentices willing to continue the trade, they find no young people with interested in keeping the tradition alive. In addition, while agents from other categories show an interest in making themselves known, many of the master artisans are reluctant to figure in any sort of database, partly because they work locally and assume that their possible clients are already aware of their existence and know how to locate them easily. As a source of information, the internet greatly simplifies the task of locating medium-sized and large companies, but this is not usually the case with local artisans, often older or completely unaware of this means of promotion.

There are also companies which offer this type of artisan service but actually subcontract local artisans for the job. In addition, it is not uncommon for these local artisans to do this on the side.

As regards the contacts of the section on teaching and research, companies that have R&D departments as well as other research structures have been identified. However, at the time the work was carried out it was observed that research on materials in traditional architecture is limited. There are more records of teaching, and promotion to be found in associations, provincial and local ethnographic museums, workshops, vocational schools, etc.

At this point it is important to note that while there are associations dedicated to the knowledge and diffusion of traditional architecture, much of the information provided in this respect comes from associations or companies with greater links to bio-construction or sustainable architecture than to traditional architecture in itself. This type of agent was incorporated into the study as it is true that all their paths cross at certain times. However, it should be clarified that at no point can they be considered synonymous. In many cases, bio-construction and sustainable architecture derive knowledge from traditional architecture, although almost always filtered through the academic knowledge of professional architects, quantity surveyors, or engineers, with an interest in exploring new applications for traditional constructive materials and techniques. This is a path in which some elements of traditional construction coexist, albeit with an interest in using them in ways which are non-localized and different from the original ones, causing the loss of the direct connection between place and architecture, a basic characteristic of traditional architecture.

5.2 *On geographical distribution*

The superimposition of places of extraction and points for the transformation of raw materials over places where these materials are available, as well as the comparison of mappings of constructive systems, highlight a well-known fact of traditional architecture processes: proximity between the source of material and the construction. This study confirms that the constructive techniques used traditionally in different parts of Spain employ materials available locally and do not constantly resort to other more distant sources (Figs. 2–3).

5.3 *On access to traditional materials*

The general conclusion is that access to materials used in traditional architecture in Spain does not present problems, although as mentioned above, traditional methods are no longer used for extraction. The various necessary materials are readily available to the different professionals to a greater or lesser degree. In the case of materials requiring special permits for extraction, it is proposed that warehouses should be set up where these materials can be stored and accessed directly for use in traditional construction, simplifying the process for artisans or builders.

5.4 *On regulations*

The obligation to comply with current requirements in structural stability, safety, and comfort in buildings is undeniable, as both the current standard of living and the expectations for the future require it. However, a path should be opened which contemplates the specific case of traditional architecture. This would ensure that traditional techniques and systems were covered by the current legal framework, not just for restoration but perhaps also for small-scale new constructions. Otherwise, traditional constructions will be built using "modern" materials, tarnishing the image of this architecture and causing the loss of a highly valuable heritage commodity.

The path opened by the CTE not to completely attain regulatory requirements only applies to cases of rehabilitation so that it is almost impossible to build new traditional constructions using completely traditional constructive materials and systems as in most cases these solutions do not comply with current regulations. Thus, the construction of this type of traditional buildings is practically limited to its use as a museum element.

The regulatory efforts of the different craft laws are very laudable, but these actions are unequal throughout the national territory, fragmented efforts, so that while in some cases the management achieved in terms of craft is excellent, in others it is not useful enough. It is important to note that the laws relating to craftsmanship include all sorts of craftwork, and it has been observed that in actual fact the number of artisans relating to traditional construction work included in these laws, especially in available databases, is much lower than that of artisans from other types of crafts. In this regard, it is also very important to successfully incorporate more artisans into this system for recognition, protection and dissemination.

6 CONCLUSIONS AND PROPOSALS

After the work carried out it can be stated that the current condition of Spanish traditional architecture is delicate. This is not so much due to problems in accessing materials for construction, mostly readily available, but rather to the survival of trades linked to them. The aging population who still live in, and therefore maintain, this type of architecture is linked to the progressive disappearance of traditional construction trades. In addition, the

mistaken perception of this architecture and materials as "old" or incapable of meeting current comfort standards has led to their replacement by modern solutions and materials. Constructions like contention walls, enclosing walls, yards, lavoirs, as well as obviously homes. etc., are still necessary to the population and when built with "modern" materials lose much of their original interest and value, as well as entailing the loss of local cultural identity.

The conservation of traditional architecture should incorporate the understanding, valorization and ultimately the recovery and/or enhancement of traditional materials and techniques and their conservation in the restored building.

Given the above, all the studies aimed at in-depth research of traditional construction are considered crucial, both in ethnological and constructive terms, and also in terms of technical knowledge of these solutions and materials to make it easier and more feasible for all specialists to justify the adoption of these solutions. Initiatives aimed at improving the technical characteristics of these traditional solutions and materials are also extremely important. Thus, it is possible for this form of construction to continue to evolve, adapting to current times and requirements as much as possible without losing their character.

It is also vital to promote training at all levels, from childhood to university and from a general education aimed at promoting knowledge, and therefore respect and appreciation, to specific teaching aimed at agents of construction or the specific disciplines involved in this field. Thus, it is necessary to encourage the vocational schools so that construction trades conserving traditional skills may transmit them to future generations.

However, it is not enough for training on traditional architecture, materials, and techniques to be carried out in workshops, specific training courses or specialized masters, but it should be made compulsory for the curricula of any professions which finally interact with this architectural heritage.

Moreover, the diffusion for the general public and general education, guarantee greater awareness of particular aspects in society. The production of materials of interest for the general public (documentaries, television series, radio programs, newspaper articles, social networks, awards ...) can reach wide sectors of the population creating a cultural base conducive to the conservation and restoration of traditional architecture thanks to increasing awareness. In this regard, the use of new technologies, social networks and communication tools could be a simple and efficient way to reach the public.

It is also necessary to carry out carefully considered promotion aimed at technicians or specially involved public in the process through specific manuals for the knowledge of traditional architecture, its materials, constructive techniques and objectives, and restoration and rehabilitation processes and techniques.

Another field of action of great importance for the conservation of traditional heritage is protective regulation. At a general legal level there is greater or lesser coverage through the Law on Spanish National Heritage and the individual heritage laws of the Autonomous Communities. At a more specific level, catalogs and inventories of protected goods are particularly important. The danger of these instruments is that they may prioritize protected buildings over many similar ones without protection, so a wide berth is advised in catalogs and inventories to allow general control of urban and rural traditional heritage. It is important to carry out complete and appropriate studies with sufficient specific knowledge prior to drafting the catalogs and regulations for local protection.

At a local level, municipal regulations establish the rules to be followed at a local level both in new construction and in conservation or restoration. These regulations should specifically recommend the use of traditional constructive materials and techniques in restorations of traditional heritage and extend these to entire buildings, not just facades.

At present this work can be consulted on the IPCE webpage (http://www.mecd.gob.es/planes-nacionales/planes/arquitectura-tradicional.html), and is being expanded and transferred to a webpage titled *Red Nacional de Maestros de la Construcción Tradicional* in collaboration with Alejandro García Hermida, organized by INTBAU with the support of The Richard H. Driehaus Architecture Competition and the Rafael Manzano Prize for New Traditional Architecture.

NOTE

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