

Petrifying Wealth. The Southern European Shift to Collective Investment in Masonry as Identity,

c.1050-1300

Horizon 2020 DMP (final outline)

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Grant number: ERC-ADG-2015 - ERC Advanced Grant 695515

Principal Investigator / Researcher: Ana Rodríguez

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Plan Description: Between the years 1050 and 1300 the European landscape turned to stone. It was a structural transformation that led to the birth of a new, long-lasting panorama and helped in the creation of individual, collective and regional identities: a landscape epitomising the way we see the space and territory of Europe. The project Petrifying Wealth seeks to rewrite the social history of the central Middle Ages, emphasizing the need to reassess from an untried perspective an element that has always been present in our vision of the period—the sudden ubiquity of masonry construction—but which has hardly been given the opportunity to provide in-depth explanations for complex social dynamics. The project seeks to offer novel explanations to previously unasked questions about wealth, building, and collective identity. The speed, extent, and systematization of the construction of churches, towers, castle walls, palaces, and houses within castles and cities provide evidence of an underlying, if unaddressed, issue. That is, it is precisely in the twelfth and thirteenth centuries that the structural link can most clearly be seen between both private and collective wealth, and the investment in stone structures built to last. The study of the shift involving new institutional dynamics, but also unprecedented social practices, as well as ideological concepts radically different from those that had prevailed until then, aims to break down assumptions that have naturalized this truly astonishing process while using as case studies the undervalued regions of southern Europe to explore the larger questions. By inverting the standard approach that sees the heart of the former Carolingian empire (present-day France and Germany) as the wellspring from which other “peripheral” territories drank, Dr. Ana Rodríguez and Dr. Sandro Carocci will undertake to bring new light to probe the greater meaning behind the process of masonry building as an investment in social identity in the central Middle Ages.

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1. Data summary

"Petrifying Wealth. The Southern European Shift to Masonry as Collective Investment in Identity, c. 1050-1300 ", ERC Advanced Grant, is a project that aims to analyze the structural transformations in Europe that led to the birth of a new landscape between the 11th and 13th centuries characterized by the amplitude and rapid diffusion of stone constructions and other durable materials. Within the framework of these research lines, the research team is currently working on the development of a free PostgreSQL database covering the mentioned period including areas such as architecture, archeology of architecture, documentation, art and photography, both in a wider sense and in relation to some specific case studies. This database will have its corresponding spatial extension PostGIS, which will make it possible to visualize and analyze the breadth of phenomenon, with the ultimate objective of studying in depth not only new institutional dynamics, but also the social uses and conceptions ideologies previously unpublished, until that moment, in Western Europe.

Objectives of the Project

Both religious and lay buildings will be analyzed, having in mind the following objectives:

For religious buildings,

Objective 1a: Analysis of the material evidence both on a macro scale and regionally. Census and systematization through a database of all rural and urban churches in the regions selected through a Geographic Information System (GIS). An analysis will be made of territorial concentration (number of churches, approximate dating, distance between them, distances from urban centres), noting in each case the existence of associated structures (cemeteries, hospitals, barns).

Objective 1b: Census and chronology of the foundations of family churches, paying particular attention to the endowed by women in regions where they are documented in the research period.

Objective 1c: Estimation of construction costs. Evaluation of aspects related to the production and transport of the materials used, including elements such as the distance from the quarries of origin, the use of new stone and the reuse of old materials and of elements from Roman ruins.

Objective 1d: Testing of the hypotheses concerning the functionality and use of the elements of the churches. Census and systematization of porticos or other structures used as meeting places; census of the

documentary evidence of community meetings to establish the role played by the churches in them and their public visibility: community meetings, liturgical and sacramental ceremonies, marriages outside church premises, processions. Individuation of significant examples.

Objective 1e: Analysis of the role of masonry-built religious buildings in sources of canon law, in ecclesiastical thought, in hagiography, in iconographic representations, microarchitecture, and in the memory of monasteries.

Objective 1f: Analysis of population documents and the determination of population in certain territories where the new inhabitants were obliged to build churches. Inquiry into the hypotheses of stabilization of population and the consolidation of rural communities around churches. Estimation of the relative size of some churches in relation to the surrounding communities and the number of people they could contain.

Regarding lay buildings,

Objective 2a: Analysis of the material evidence to construct the object of research both on a macro scale and regionally. Census and systematization through a database of castles and other fortified buildings in selected rural regions through a Geographic Information System (GIS)

Objective 2b: Analysis of the various forms and functions of urban noble towers, distinguishing the chronology of their distribution and the regions where they are a regular feature and where they are scarce along with the reasons for this.

Objective 2c: Census and analysis of documents of consortium management (such as the “societies of Italian towers” and the towers for groups of relatives in other places) in towers and noble palaces within the geographical areas covered by the project.

Objective 2d: Systematization of urban civilian buildings, by processing existing information relating to Rome, Padua, Pisa, and that provided for different regions of the South of France and Iberia by data from studies conducted by archaeologists of architecture. Social diffusion models will be taken into account.

Objective 2e: Analysis of available data regarding the typology of country dwellings, with particular attention to the possible survival of non-masonry remains and the social diversification of the forms of dwellings; census of the types of country dwellings suitable for defence.

Objective 2f: Identification of the earliest petrified households of the aristocratic lineages through written and material evidences.

Objective 3a: Analysis of the literature on the major buildings by public authorities.

Objective 4a: Quantitative estimation of the relative costs and value of dwellings. Assessment of data on the costs of building activity; analysis of the development of trades exchanges related to construction and associated social groups, based on existing literature.

Objective 4b: Assessment of the social value of houses by region and period, analysing the role of the masonry house as a badge of citizenship in legal and literary sources. Presence of buildings in tax regulations, fines and penalties, evaluation of cases of common property. Analysis of references to petrified assets in wills, family distributions, pacts between relatives, etc.

Objective 4c: Collection and analysis of available data on the urban market of rents of houses and parts of houses.

Objective 4d: Typological, geographical and chronological census of petrified buildings linked to productivity (mills, fulling mills, Cistercian farms, artisan workshops) based on existing literature

Final objective 1: Global interpretations, resulting from the research conducted throughout *Petrifying Wealth* by the Principal Investigator and team members, supported by external collaborators and other experts through seminars, meetings, and conferences, as well as in fieldwork.

Final objective 2: Dissemination of the results and scientific data in high-impact publications and scholarly gatherings.

Nature of the final data management plan

Data plans provide a fundamental tool to describe the information with which the project works. It analyses the structure of the system, the data schema on which the information will be stored, the data sources acquired and elaborated and their subsequent publication and external access policy.

The *Petrifying Wealth* project is committed to an open data policy (FAIR). To facilitate access, understanding and re-use of the data, three plans will be developed at different moments of the project: Initial, Intermediate and Final.



The [Initial Data Plan](#), developed in 2017, established the guidelines that the project intended to follow, the objectives to be achieved and the proposed structure of the system.

In [Intermediate Data Plan](#), we can assess the fulfilment of these initial objectives, as well as make a precise description of the structure of the system that has finally been implemented, and of the data that have been elaborated.

In the Final Data Plan, the final implementation of the structure outlined in the Intermediate Data Plan and the methods followed for its publication are described, following the guidelines of the FAIR data policy.

Objectives of the final data plan

In the final phase of the Project, we are in a position to analyse the results obtained throughout the life of the Petrifying wealth Project, as far as the data are concerned, and the methods chosen for their publication, along the lines of the [FAIR data policy](#).

As described in the intermediate data plan, from the implemented system structure, and in particular the PostgreSQL / PostGIS database, a large dataset on medieval construction has been generated, bringing together data sets already generated, with others produced within the Project, mainly secondary data from the analysis of the primary sources acquired.

These data have served as the basis for the development of multiple specialised studies, the publication of which can be consulted through the CSIC institutional repository ([DigitalCSIC](#)), as well as generating a robust dataset, which seeks the use of standards that allow its interoperability and reuse in future research projects.

In the final data plan of the project, the data set generated will be analysed quantitatively, both the data currently accessible and those that will be made accessible in the future.

In parallel, the methods used to disseminate the results of the research and access to the data will be described. The project database will be accessible, searchable and reusable, and will continue to be used after the end of the project, in order to continue incorporating all the data of interest, with the aim of becoming a basic tool for the studies on construction during the Middle Ages in the study area of the project (Spain, Portugal, Andorra, Italy and Southern France).



Data sources

As mentioned in the Intermediate Data Plan, the objectives of the Project require the acquisition of a large amount of data that will provide a global vision of the study area during the period analysed. The structure of the spatial database is designed to facilitate the storage of data from different sources, adjusting them to the predefined scheme. The data acquired are from different disciplines and their interrelation will open up new perspectives for study. Among the many disciplines covered, the following are worth highlighting:

Architecture:

For the analysis of the preserved architectural remains, we have collected in a systematic way the data of large reference works for the Peninsular territory (mas información en el Intermediate Data Plan):

- **Enciclopedia del Románico:** (Encyclopaedia of Romanesque) developed by the Santa María la Real Foundation (Fundación Santa María La Real del Patrimonio Histórico (FSMLRPH), a non-profit Spanish private cultural foundation.
- **Románico en los Mapas:** a particular work developed by Julián Castells, published by the Santa María la Real Foundation through its website, which provides the location of more than 16,000 buildings within the study area of the project, going beyond the territorial limits of the Romanesque Encyclopaedia. Of particular interest for the project are the locations of the buildings of France and Italy.
- **Catalunya Romànica:** Romanesque Catalonia is a digital product based on the 27-volume reference work published by Enciclopèdia Catalana over fourteen years, between 1984 and 1998, under the direction of Jordi Vigué (1985-90) and Antoni Pladevall (1990-99).
- **Consortio Camino del CID:** The Consortio Camino del Cid -Consortium of the Way of El Cid- is a Spanish non-profit public corporation legally established in 2002 and formed by the Provincial Councils of Burgos, Soria, Guadalajara, Saragossa, Teruel, Castellón, Valencia and Alicante, for the purpose of promoting and disseminating the cultural, tourist and environmental potential of the Way of El Cid and generating new resources for the inhabitants of the regions through which this route passes.
- **Asociación de Amigos de los Castillos:** This non-profit cultural Association was founded in 1952 under the Decree of 22 April 1949, which came to protect the Spanish castles and recognized them as national monuments. On 22nd December 1966 the A.E.A.C. was declared of Public Utility by the Council of Ministers and since 1976 the King and Queen of Spain have held the Honorary Presidency of the Association.



- **Institutional architectural catalogues**, such as those provided by the Autonomous Community of Aragon (<http://www.sipca.es/>) or the Government of Catalonia (<http://invarquit.cultura.gencat.cat/cerca>).
- **Field work** carried out by the *Petrifying Wealth* team during the first two years of the project, with the aim of analysing in detail specific issues of some case studies, of which the following are clear examples:
 - Merindades of Burgos: architectural analysis developed by Rocío Maira Vidal. Derived from these studies, the analysis of the **dataset of roofs and vaults** of certain buildings and their descriptive analysis are incorporated into the database.
 - Tivoli: architectural analysis of the medieval buildings of the city of Tivoli (Italy) developed by Fabio Giovannini.
 - Sepúlveda / Segovia: architectural and archaeological analysis of the cities of Segovia and Sepúlveda (Spain) by Fabio Giovannini, Rocío Maira Vidal and Enrique Capdevila Montes.
 - Zamora: architectural analysis of the religious buildings in the city of Zamora, carried out by Teresa Martínez Martínez, within the framework of her doctoral thesis on the stonework markings of some of the buildings in the city. As a result of this thesis, a set of **stonemasonry markings** of certain buildings and their detailed analysis are included in the database.

Epigraphy

Within the framework of the project, the data relating to epigraphic sources (Iberian Peninsula, Italy and southern France) contemporary to the period of study (11th-13th centuries), which cite or have a direct relationship with some type of construction, have been incorporated and analysed. The data analysed come from the following sets of information:

- **Open databases:**
 - **AETHAM:** Database of Hispanic medieval epigraphy systematised by Prof. Isabel Velázquez's team (UCM) and which has a total of 4.744 records [http://hesperia.ucm.es/consulta_aehtam/buscador.php]. Of these records, a total of 65 epigraphs have been added to the *Petrifying Wealth* database.
 - **EPIARQ:** Database of Hispanic medieval epigraphy systematised by Prof. Isabel Velázquez's team (UCM), with a total of 645 records, of which a total of 2 epigraphs have been added to the *Petrifying Wealth* database.



- **Corpus of published epigraphs**

Documentation

The written documentation with which we have worked, always dated within the period of study of the project, is limited exclusively to particular study areas. Of all the documents analysed, only those of particular relevance have been included in the database, or in certain cases, those that mention buildings whose location has been obtained, but always in response to specific research needs.

- **Datasets:**

- *Corpus Histórico del Español Norteño (CORHEN)*: is the result and source of the research work of the *Grupo de Historia del Español Norteño (GHEN)*, directed by María Jesús Torrens Álvarez (CSIC) and made up of researchers specialised in the history of the Spanish language and the edition of ancient documents.
- *Open lemmatised diplomatic corpora*: Thanks to the enormous amount of documentation available through the various open lemmatised documentary corpus projects, a new line of research is opening up that makes it possible to analyse the chronological and spatial evolution of certain terms related to construction and petrification processes:
 - **The Corpus Documentale Latinum Hispaniarum (CODOLHisp)**: was born as the result of the collaboration between Spanish teams that are carrying out research on Medieval Latin lexicography. These teams have joined their efforts to develop a new platform that provides access to four lexical databases of Medieval Hispanic Latin: CODOLGA ([Corpus Documentale Latinum Gallaeciae](#)), CODOLCAT ([Corpus Documentale Latinum Cataloniae](#)), CODOL-LEG ([Corpus Documentale Latinum Legionis](#)), CODOLVA ([Corpus Documentale Latinum Valencie](#)).
 - **CBMA, Corpus de la Bourgogne du Moyen Âge**: Database containing in its current state 29.013 diplomatic documents (including 27.094 lemmatised in 2017), mainly Latin, from the 6th to the 14th centuries, i.e. more than 6.1 million words. In total, more than 70 editions have been digitised since 2004 to obtain this set.
- *Documentary databases from individual research*: Thanks to the transfer of the documentary database of Dr. Inés Calderón Medina, 724 documents have been incorporated, of which we have proceeded to work with those of specific interest to the project. -:



- *Documents collected in the works Enciclopedia Románica and Catalunya Románica:* directly related to the buildings analysed therein. Specifically, Catalunya Románica incorporates some complete documents and all the known documentary citations for all the buildings included in the collection, resulting in more than 4.000 buildings that are only known from written documentation, as it has not yet been possible to locate their material remains.

Other datasets

- **Viator-e:** The [Viator-e project](#) is designed to analyse the social, political and economic repercussions of the construction of transport infrastructures during several periods in the Roman Empire.
- **Geographical layers:** mainly generated by public administrations, those geographical layers that are of specific interest for the research are incorporated into the project, given that they provide spatial information directly related to construction, such as Digital Terrain Models ([National Geographic Institute](#) - IGN) or Hydrography ([Confederaciones de Cuencas Hidrográficas](#) or [Generalitat de Catalunya](#)).
- **Administrative data:** Current administrative delimitations and nomenclatures will be used for the definition of the areas of research. The use of standards will allow the interoperability among the different supranational areas of study. This data will be obtained from official sources, such as the [National Geographic Institute](#) (IGN) or [L'Istituto Nazionale di Statistica](#). EU own codification will also apply: EUROSTAT ([NUTS - Nomenclature of territorial units for statistics](#)) and ISO 3166 ([country codes](#)).

Architecture of the System

As indicated in the Initial and Intermediate Data Plan of the Petrifying Wealth Project, the system architecture is based on a client-server architecture with four main interrelated axes:

- **Spatial database:** developed in PostgreSQL / PostGIS, stored on a local server, which provides a distributed network for the different entities generating information. The conceptual data model describing the structure of the database has been developed in UML and will be published openly, to facilitate consultation, understanding and reuse of the project data.



- **Bibliographic database:** Developed with specific software, such as the bibliographic managers Mendeley or Zotero, which already incorporate standards when storing and subsequently publishing the bibliographic references used in the research project. Thanks to the use of standards, it is possible to establish a connection with the spatial database and associate certain specific references with certain spatial and thematic elements.
- **Data storage:** The project's server is also used for data storage and exchange. Due to the large amount of graphic information, a server with a capacity of 4 TB, which can be doubled if necessary, is indispensable.
- **Publication of data:** Since the beginning of this year (2021) the data can already be consulted via the project website (www.petrifyingwealth.eu). A basic version of the data is currently available, which can be consulted through a cartographic viewer; the project bibliography can also be consulted.

Dataset description

Thanks to a solid data model, which has remained unchanged throughout the life of the project (the full description is available in the intermediate data plan of the project, so there is no need to describe it again in this data plan), it has been possible to move forward in the collection of information without having to carry out time-consuming modifications to the structure.

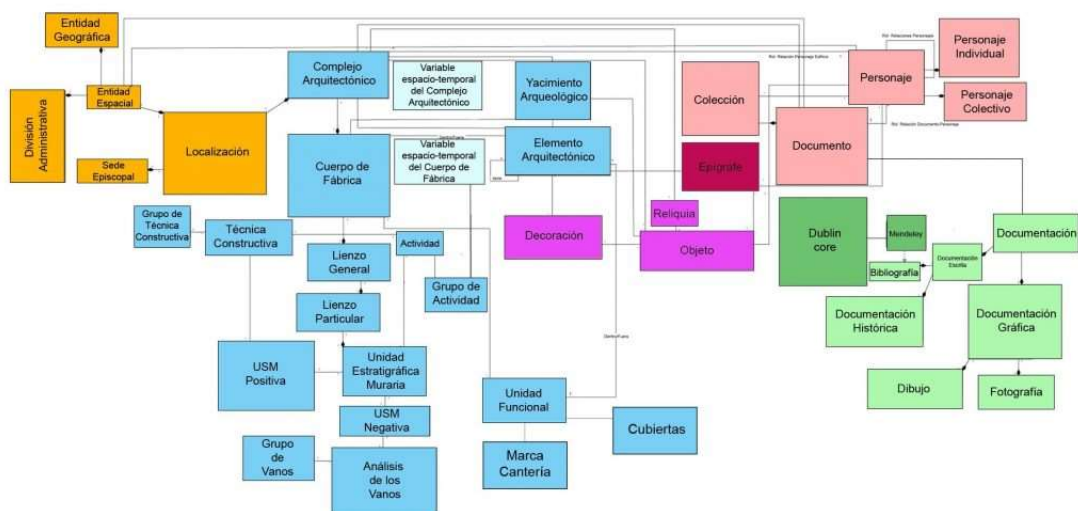


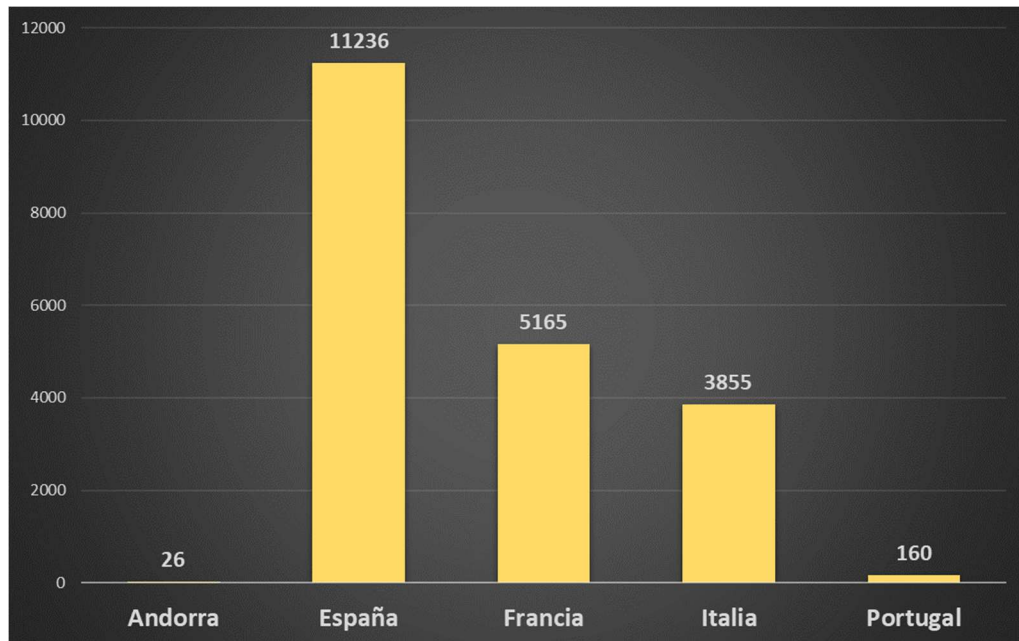
Image 1. Summary of the project data model

On the basis of the data already described, we proceed to give final figures of the data that have been collected, fulfilling the objectives committed to at the beginning of the project, mainly for Spain and Andorra:

Architecture: The formal characteristics of the buildings are collected. The structuring of the data is based on the theory of the archaeology of architecture (G. P. Brogiolo, 1988, *Archeologia dell'edilizia storica*, Como), conceiving different parts that define the architectural complexes, organised hierarchically from the general whole to the more specific parts of the buildings, defining for each of them a series of characteristics of interest for the project. To ensure the completeness of the database and the robustness of the analyses to be carried out, a mandatory data core (CORE) is specified.

1. Architectural complexes: It is the general definition of the building, encompassing all its parts and related spaces. At the end of the project, the database has 20.442 buildings registered for the entire study area. Within it, it has been in Spain (and more specifically in the northern half) and Andorra, where the collection and analysis of all the preserved buildings has been systematised, so that their over-representation in comparison with the other countries, for the moment, cannot be interpreted as a historical phenomenon:

<i>Countries</i>	<i>Buildings</i>
<i>Andorra</i>	26
<i>España</i>	11.236
<i>Francia</i>	5.165
<i>Italia</i>	3.855
<i>Portugal</i>	160
<i>Total</i>	20.442



Of this group of buildings, only 240 could not be assigned a chronology of less than a period of one century, a criterion required to be able to work with them; this small group of buildings has not been taken into account in the analyses carried out, nor in the results presented below.

Of the 20.442 buildings, 9.093 have not been analysed, of which only their name, administrative division to which they belong and geographical coordinates have been collected. Of the 11.109 buildings analysed, the vast majority of the buildings analysed belong to Spain:

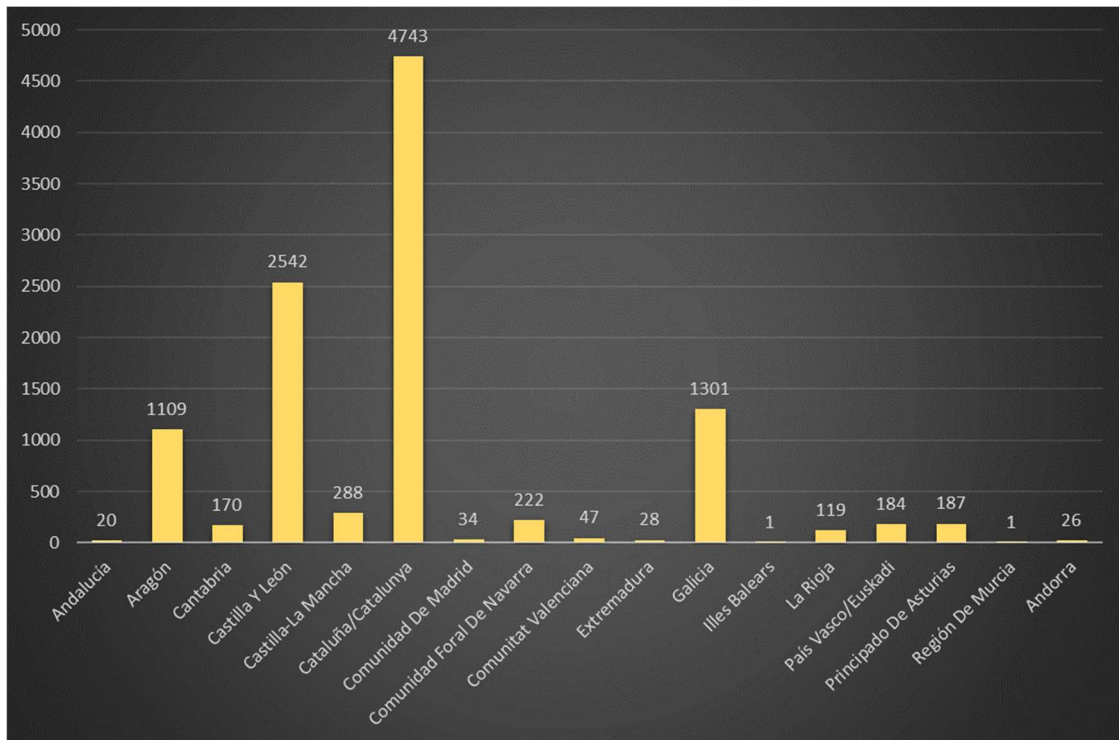
<i>Countries</i>	<i>Analyzed buildings</i>
<i>Andorra</i>	26
<i>España</i>	10.996
<i>Italia</i>	86
<i>Portugal</i>	1
<i>Total</i>	<i>11.109</i>

20.442 buildings = 9.093 buildings to be analysed + 11.109 analysed + 240 analysed without chronology



For Spain and Andorra, the analysis of the buildings collected in the database has been systematised; they are the only countries for which all the buildings collected are analysed. If we divide the data we have by the Administrative Divisions to which they belong:

<i>Autonomous Communities</i>	<i>Analyzed buildings</i>
Andalucía	20
Aragón	1.109
Cantabria	170
Castilla Y León	2.542
Castilla-La Mancha	288
Cataluña/Catalunya	4.743
Comunidad De Madrid	34
Comunidad Foral De Navarra	222
Comunitat Valenciana	47
Extremadura	28
Galicia	1.301
Illes Balears	1
La Rioja	119
País Vasco/Euskadi	184
Principado De Asturias	187
Región De Murcia	1
Andorra	26
Total	11.022



The compilation of buildings, and their subsequent analysis, has focused mainly on buildings of a religious nature, given that these are the focus of most of the bibliography analyzed (mainly the Encyclopedia of the Romanesque and Catalunya Romanica collections, as described in the Intermediate Data Plan). For the lay buildings, although we have tried to collect as many references as possible, we do not have an exhaustive inventory that gives at least a chronology of less than a century, and which would allow us to ensure that we have at least the majority of the known buildings of this type.

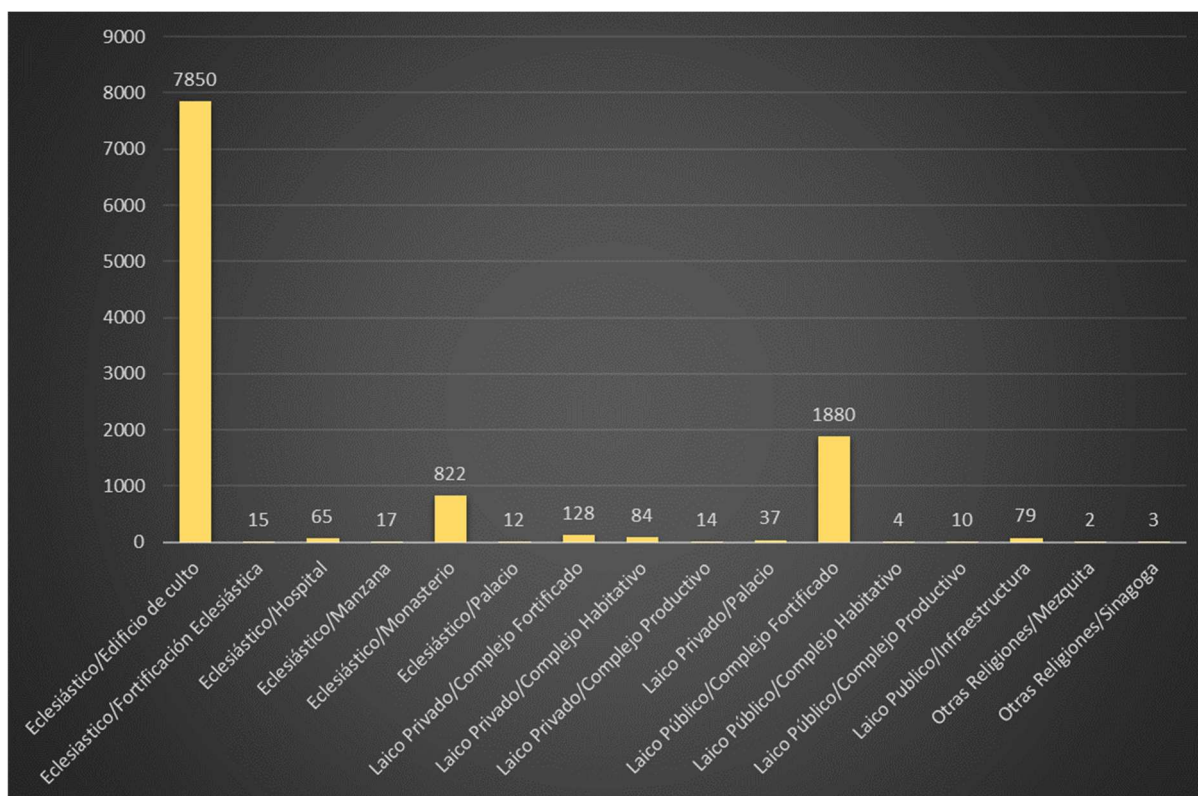
For the buildings analyzed, what has been called the core of the database, described in the Intermediate Data Plan, is studied on a mandatory basis. Among the data that make up this core, apart from the information relating to geolocation (geographic coordinates and assignment to an administrative location), the following can be mentioned:

Building typology: For each building, the typology of the building is recorded, based on the remains preserved. In some of them, it has been possible to add a double typology (currently only in 10 cases), either for ecclesiastical buildings that change function, e.g. monastic churches that become parish churches, or buildings of other religions that are converted, e.g. mosques that are converted into churches. This possibility, available in the data structure of the project, will be one of the tasks to be completed in the future.

The data available for the buildings according to their typology are:



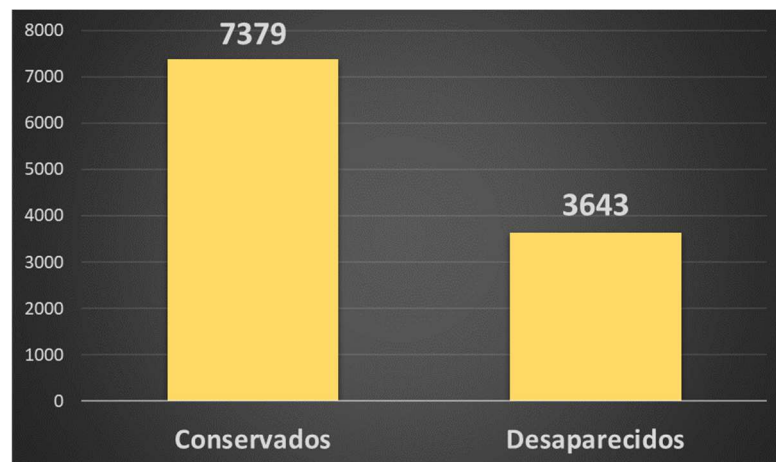
<i>Building typology</i>	<i>Analyzed buildings</i>
Eclesiástico/Edificio de culto	7.850
Eclesiástico/Fortificación Eclesiástica	15
Eclesiástico/Hospital	65
Eclesiástico/Manzana	17
Eclesiástico/Monasterio	822
Eclesiástico/Palacio	12
Laico Privado/Complejo Fortificado	128
Laico Privado/Complejo Habitativo	84
Laico Privado/Complejo Productivo	14
Laico Privado/Palacio	37
Laico Público/Complejo Fortificado	1.880
Laico Público/Complejo Habitativo	4
Laico Público/Complejo Productivo	10
Laico Publico/Infraestructura	79
Otras Religiones/Mezquita	2
Otras Religiones/Sinagoga	3
Total	11.022



Preservation of the building: This includes, in a non-systematic way, those buildings that do not preserve remains from the period under study, either because they have completely disappeared or because they have been replaced by more modern buildings, but for which we have some documentary reference, in the smallest of cases photographic documentation from the early 20th century, and mostly references from medieval documentary sources, in which case the date of the first document in which the building is mentioned is also included.

The analysis of missing buildings has been carried out systematically only in some study areas such as León or Merindades. We also have the contribution of the dataset of José Carlos Sánchez Pardo, referring to buildings mentioned in written documentation prior to the year 1000.

Even so, there are currently much more references in the database to preserved buildings than to missing ones, but it is a piece of data that can also serve as a reference in terms of knowing the total number of buildings at a given time, and how many of them are preserved or missing.

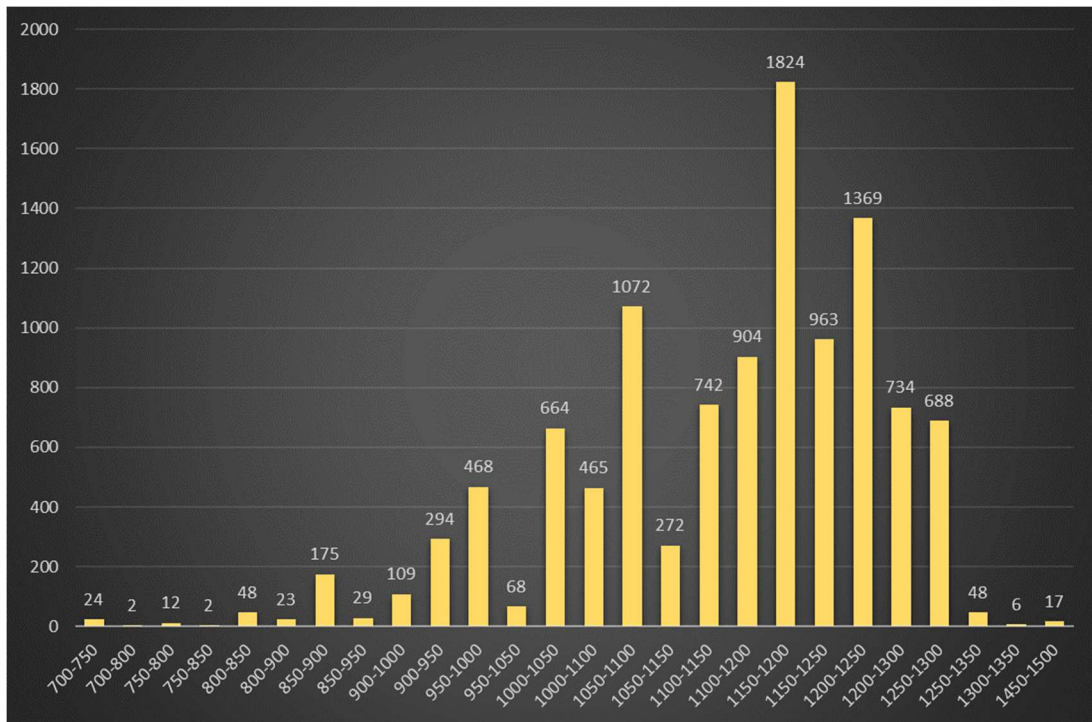


Chronology: As defined in the Intermediate Data Plan of the project, the chronological ascription of the building is composed of two forms of analysis:

- Functional Phases: the construction phases that can be identified in the buildings are collected in a non-systematic way. They refer only to the material remains. The chronology is collected in the form of a cascade or hierarchy, starting with a specific year, period and ending in a century, the only obligatory field and which encompasses the others.

- General chronology: This is compulsory for all the buildings analysed. It is made up of periods of 50 years, with the same building being able to take a maximum of two periods, i.e. a period of one century, above which, due to the high level of uncertainty it generates, the building is considered to have no chronology. This field refers to the oldest preserved remains of the building, while for missing buildings, the chronology is given with reference to the earliest known citation to the building in written documentation. In the case of buildings with preserved remains from the study period with older documentary references to the preserved remains, priority is given to the material remains, whereby the chronology of the oldest material remains is assigned, and in parallel the date of the earliest known documentary reference is stored in the database.





2. Building block: Functionally independent parts within the Architectural Complex. Collected systematically for all the buildings analysed, we currently have 8.589 building blocks, related to the 7.379 buildings conserved for Andorra and Spain. Of these, as with the architectural complexes, certain obligatory fields are analysed.

Firstly, their **typology**:

<i>Tipology</i>	<i>Building block</i>
<i>Capilla</i>	16
<i>Casa Adosada</i>	28
<i>Casa Aislada</i>	10
<i>Cementerio</i>	1
<i>Circuito Murario</i>	458
<i>Claustro</i>	117
<i>Edificio Fortificado</i>	538





<i>Edificio Genérico</i>	102
<i>Estructura Productiva</i>	4
<i>Iglesia</i>	5.995
<i>Infraestructura</i>	67
<i>Molino</i>	10
<i>Palacio</i>	26
<i>Panteón</i>	3
<i>Torre</i>	1.160
Total	8.535

Also if the building block is **preserved**, in the vast majority of cases, or has disappeared, but documentary references to this particular part of the building are preserved:

Conservation Status	Building block
<i>Conservado</i>	8.535
<i>Desaparecido</i>	54

Finally, for all the buildings analysed, the **construction materials** that make up the building blocks are collected in a general way, resulting in the following results:

Construction materials	Building block
<i>Piedra</i>	8.173
<i>Ladrillo Cocido</i>	290
<i>Cal</i>	63
<i>Madera</i>	5
Total general	8.531





It should be borne in mind that a single building block may be made of several materials, as in the case of mixed techniques that combine stone and brick. In the same way, an architectural complex can be made up of masonry built with different techniques and different materials.

It is also interesting to note that in the majority of cases there is only one building block for an architectural complex, such as churches that are composed of or conserve only the body of the nave, or fortified buildings that only have a walled enclosure. But there are also a large number of architectural complexes with two parts, such as churches with a nave and a tower/bell tower, or fortified complexes with a walled enclosure and a fortified building. If we analyse how many bodies of masonry there are per building we have:

<i>Building block count</i>	<i>Buildings</i>
1	6.364
2	878
3	98
4	28
5	9
9	2
Total	7.379

Special mention should be made of two buildings that have 9 registered bodies of masonry, with buildings of great complexity, such as the Castle of Loarre (Loarre, Huesca) and the Monastery of Santa María de Poblet (Vimbodí i Poblet, Tarragona).

3. Functional Units: This is the name given to the different elements that make up the Building / Block. For example, for the body of a church we have a series of functional units such as, for example, the naves, the transept or the chancel.

Of the functional parts that make up the building blocks, only vertical elements such as belfries, porticoes and bridges (only those that can be assigned a precise chronology of less than a century) are systematically recorded. In total we have recorded 1.203 units, always related to an Architectural Complex and a conserved and chronologically dated Body of a Factory.



They correspond to the following typologies:

Tipology	Interpretation		Functional units
almacén (depósito)			2
atrio (espacios abiertos)			4
	Cementerio	1	
cabecera (construcción religiosa)			17
	Ábside Cuadrangular	2	
	Ábside Semicircular	7	
	Testero Plano	1	
calzada			2
capilla (habitación o estructura)			11
	Capilla Funeraria	1	
cisterna			4
	Baño	1	
cripta			47
crucero (construcción religiosa)			3
escalera de husillo (simple)			16
galería (espacio de nivel superior)			2
	Tribuna	1	
habitación genérica			23
	Armarium	1	
	Calefactorium	1	
	Cocina	4	
	Dormitorio	5	
	Granero	1	
	Locutorio	1	
	Parlatorio	1	
	Refectorio	3	
	Scriptorium	1	
lienzo (muralla)			33
nártex			1
nave central			12
nave lateral			1
portal (elemento arquitectónico)			5
pórtico (espacios exteriores cubiertos)			159
	Atrio	4	
	Lonja	2	
presbiterio (construcción religiosa)			2
puente (construcción)			62
puerta			22
sacristía (construcción religiosa)			3
sala			23
	Refectorio	2	
	Salas Capitulares	16	
	Salas De Monjes	2	
torre (construcción individual)			748
	Cimborrio	95	
	Espadaña	626	
	Torres Barbacanas	2	
transepto			1
Total			1.203

Apart from the obligatory core, other data sets related to the buildings, analysed exclusively in certain cases of study, should be highlighted:

- **Architectural elements:** different elements that make up the Functional Units, from elements typical of construction to stone elements, but closer to movable art. Only the following items have been collected:

<i>Tipology</i>	<i>Architectural element</i>
<i>Arcosolio</i>	1
<i>Elemento decorativo</i>	1
<i>Pila Bautismal</i>	20
<i>sepulcros</i>	1
Total	23

- **Roofs:** a set of data derived from the specific analysis of building roofing systems, both in stone and wood, of great importance in the study of construction costs.

Exterior roof	Interior roof	Building
A Cuatro Aguas		3
	Abovedada	3
A Dos Aguas		14
	Abovedada	7
A tres aguas		4
	Abovedada	3
	Techumbre y Armaduras de C	1
A Un Agua		2
Poligonal		4
	Abovedada	4
Total		27



- **Stone masonry marks:** Derived from the methodology developed by Jennifer Alexander for the study of stone masonry marks, a set of georeferenced data is incorporated into the project's database, always in relation to the buildings. It catalogues the stone masonry marks in order to analyse from this perspective the constructive evolution of the buildings where they are found. We currently have 5.136 marks, all of them from buildings in the city of Zamora.
- **Epigraphy:** documentary sources in stone associated with entities that provide information about them.

There are currently 783 inscriptions, broken down as follows:

<i>Countries</i>	<i>Epigraphy</i>
<i>España</i>	162
<i>Francia</i>	107
<i>Italia</i>	491
<i>Portugal</i>	23
Total	783

If we look at the typologies of the epigraphs, bearing in mind that an epigraph can assume several types:

<i>Tipology</i>	<i>Epigraphy</i>
<i>Celebrativa</i>	23
<i>conmemorativa</i>	61
<i>Consagración</i>	154
<i>Construcción, reconstrucción</i>	451
<i>Datatio</i>	9
<i>Decicatoria</i>	87
<i>Diplomática</i>	10





<i>Donación, transacción</i>	69
<i>Esortativa</i>	10
<i>Fundacional</i>	71
<i>Funeraria</i>	90
<i>Monumental</i>	2
<i>Onoraria</i>	2
<i>Señalética</i>	3
<i>Firma, monograma</i>	16
<i>Otros</i>	1

- **Quarry:** A set of data referring to stone exploitation systems, whether 26en-cast quarries or underground mines, but always referring to systems of extraction of materials destined for construction within our period of study. These quarries should be related to the buildings constructed with materials extracted from them, or to the written documents where they are mentioned. There are currently 26 elements in the project's database.

- **Written documentation:** A systematic search is made of all written sources of specific interest for the project, within the aforementioned areas of study. The database currently contains 3.217 documents, of which 2.513 are of specific interest to the project.

The 3.217 documents are grouped into 210 collections, of which 97 belong to Spain and 113 to Italy. Among these collections, for Spain the Corpus Historico Nortefño (Corhen - <https://corhen.es/>) with 252 documents, medieval documents from the Kingdom of Galicia of Fernando II with 199 documents or the documentary collection of the archive of the cathedral of León with 114 documents stand out. For Italy, the collections of the Regesto di Camaldoli with 47 documents, Statuto del commune with 46 or the Codice diplomatico del monastero di Santo Stefano di Genova with 45.

- **Thesaurus:** An ontology is a formal representation of the terminology and concepts of a scientific domain, which is used to clarify the relationships between terms and concepts (Madin et al., 2008). An ontology includes a vocabulary of terms (belonging to a disciplinary field) with their definitions and the relationships between the concepts.



The great challenge of the semantic web at the technological-scientific level is to improve the levels of description of the contents of the pages. It is in this context where ontologies play a central role, by representing knowledge through the assignment of meaning to concepts, meaning that can be transcribed into formal languages, which generates an "intelligent" communication bridge between user and system.

For the purpose of the project, the art and architecture thesaurus created and maintained by the Getty Research Institute (<https://www.getty.edu/research/tools/vocabularies/aat/> o <https://www.aatespanol.cl/>) has been selected as most appropriate.

They will provide, among other advantages:

- Standardisation of the terms used. Through the connection with the project's web page, it will allow the understanding of the terms used, as well as their translation into different languages. It will allow the implementation of concepts associated with the Semantic Web.
- Increase the interoperability of the dataset with other models that also use the Getty thesaurus as a reference.
- Use of controlled and standardised terminology, avoiding the use of redundant or imprecise terms.
- Streamline access to the database by replacing terms with a numerical code. In this way, as well as speeding up the speed of consultation, terminological corrections can be made, working exclusively on the table containing the thesaurus, maintaining the integrity of the rest of the database.
- Use of the thesaurus to tag various elements. The thesaurus therefore acts transversally throughout the database, since all the sets can be tagged independently, but always in reference to the same thesaurus. In this way, it is possible to extract all those elements, regardless of their nature, that contain a certain label. This system, inserted within the PostgreSQL database, would work similarly to a NoSQL key-value system.

Based on the Getty thesaurus, other concepts included in the thesaurus of the Encyclopaedia of the Romanesque, as well as those concepts generated specifically for the *Petrifying Wealth* project, will be added. As a result, a thesaurus will be published openly with these three sources, indicating the origin of each term.



Tesauri Datasets

Terms

<i>Getty</i>	1034
<i>Petrifying Wealth</i>	409
<i>Enciclopedia Románico</i>	360
<i>Total</i>	1803

- **Bibliographic data:**

The bibliography developed through the Mendeley platform (reference manager, document manager and social network), can be consulted from the beginning of 2021 through the project website (<https://www.petrifyingwealth.eu/bibliography/>). In the future, the data can be acquired in parallel using standard formats such as Bib TeX (bib), Research information system (ris) or xml, or work directly on the online platform Zotero.

The bibliographic managers Mendeley and Zotero are based on standards that facilitate their full interoperability. To comply with these standards, they predefine a data model for recording bibliographic references. In the *Petrifying Wealth* project, based entirely on these data models, we have only imposed minimum standards to guarantee the completeness of the information.

- Author / Authors
- Title
- Colection / Journal / Conference
- Date
- Place
- Access to the publication, in the case of open access.

The bibliography of the project currently has 1.494 bibliographic references, distributed between general or specific works of the different datasets, such as documentary sources, architecture or archaeology. In certain cases, specific elements have been associated through the database with the bibliographic references from which the information originates.



- **Graphic data:**

The project's graphic information consists of images, planimetries and three-dimensional models, all of which are stored on the project's server.

Basically, the graphic information comes from the collaboration agreement developed with the **Santa María la Real Foundation**, which has made it possible to acquire its photographic database consisting of more than 160,000 elements, mainly divided between photographs and planimetries.

The *Petrifying Wealth* project has produced graphic documentation of several case studies, such as the Merindades region and the cities of Zamora, Segovia and Sepúlveda. We have photographs of the buildings and three-dimensional models that allow the generation of orthophotographs of the most representative ones, mainly of Sepúlveda and Merindades.

We also have the collaboration of the **Consorcio Camino del CID**, which has provided us with information and images of more than 250 elements related to CID landmarks.

To complete the graphic information on all the buildings referenced in the database, we have finally resorted to photographic collections in open access on the Internet, with Creative Commons licence, which allow their use with the corresponding mention of their origin, such as the graphic information of the Generalitat de Catalunya in its [inventory of Architecture](#), or the information contained in Wikipedia itself.

2. FAIR data

On 15 March 2016 the article: "FAIR Principles for scientific data management and stewardship" was published in Nature's Scientific Data journal. The FAIR Principles provide a set of precise and measurable qualities that a data publication should follow to make data Findable, Accessible, Interoperable, and Reusable (FAIR).

Making data findable

The project's data can be consulted in two ways, both of which are openly available on the Internet.

On the one hand, the project has its own website (<https://www.petrifyingwealth.eu/>) which provides information on the development of the project, its members, events and publications. It also provides access



to the open data sets: the core database on buildings and the bibliography of the project. The website is referenced in DigitalCSIC (<https://digital.csic.es/handle/10261/182365>), to facilitate its location, as well as appearing in Internet search engines. It has also been disseminated through conferences, publications and social networks:

CSIC El CSIC Investigación Innovación y Transferencia Internacional Ciencia y Sociedad Formación y Empleo

Internacional Patrimonio Historia CULTURA CIENTÍFICA

El proyecto 'Petrifying Wealth' publica en abierto un visor cartográfico con más de 17.000 construcciones medievales

La herramienta permite geolocalizar edificios de la península ibérica, Italia y el sur de Francia erigidos entre los siglos XI y XIII

Fecha de noticia: Jueves, 4 febrero, 2021

Entre los siglos XI y XIII, el paisaje arquitectónico europeo se transformó bruscamente. La rápida difusión de la construcción con materiales duraderos sembró el continente de iglesias, torres, muros de castillos, palacios y casas hechos fundamentalmente de piedra, pero también ladrillo en ciertas regiones. Muchas de estas construcciones, o sus restos, han perdurado hasta la actualidad y, ahora, acaban de ser incluídas en el visor cartográfico de *Petrifying Wealth*, un proyecto de investigación financiado por el Consejo Europeo de Investigación (ERC, por sus siglas en inglés) y dirigido por la investigadora del CSIC Ana Rodríguez. El objetivo del estudio es analizar las complejas dinámicas sociales que explican

Material de descarga
Imagen (jpeg)

HISTORIA

CREAN UN MAPA INTERACTIVO DE CONSTRUCCIONES MEDIEVALES DEL SUR DE EUROPA

El CSIC ha presentado una primera versión del proyecto Petrifying Wealth, un atlas interactivo de las construcciones medievales construidas en la península Ibérica, Italia y el sur de Francia entre los siglos XI y XIII.

← Hilo

Petrifying Wealth ERC
@PetrifyingW

Tenemos el enorme placer de anunciar que ya está disponible la nueva versión de la web del proyecto @PetrifyingW. Como grandes novedades la versión definitiva del visor cartográfico, formulario de consulta y acceso a la bibliografía petrifyingwealth.eu/2022/01/31/nue...

Camino del Cid y 7 más

11:59 a. m. · 3 feb. 2022

Ver estadísticas del Tweet

44 Retweets 7 Citas 119 Me gusta 14 Elementos guardados

← Tweet

CSIC
@CSIC

Un proyecto del CSIC publica un visor cartográfico con más de 17.000 construcciones medievales. La herramienta permite geolocalizar edificios de la península ibérica, Italia y el sur de Francia levantados entre los siglos XI y XIII. [#PetrifyingWealth](https://petrifyingwealth.eu) bit.ly/3oOrXdq

Tú y Ciencias Humanas y Sociales (CCHS - CSIC)

11:27 a. m. · 4 feb. 2021

99 Retweets 9 Citas 216 Me gusta 8 Elementos guardados





The project website is hosted on an institutional server and has a domain acquired indefinitely, so we can ensure that we have a persistent identifier. In parallel, in [DigitalCSIC](#), CSIC's institutional repository, we have a specific [profile of the project](#), through which it can be located:

- All open publications developed by the project, which at the end of the project amount to 111.
- Members of the project, giving access to their personal profiles with their own publications, both within and outside the Petrifying Wealth project.

In [DigitalCSIC](#), associated with the project profile, the datasets that are served in open access have also been uploaded. They have metadata files that allow their description and location, as well as a Digital Object Identifier (DOI), an alphanumeric code that uniquely identifies electronic content. Specifically, it is possible to access:

- [Petrifying wealth project core dataset](#), with DOI <https://doi.org/10.20350/digitalCSIC/15292>
- [Project bibliography](#) with DOI <https://doi.org/10.20350/digitalCSIC/15308>

In both cases, the Dublin Core standards on metadata is used, intended to facilitate interoperability and the development of specialised metadata vocabularies for the description of resources, so that the user can search and retrieve information quickly and efficiently. It defines only fifteen very basic elements to describe any type of resource, being able to document a file, service, publication, programme, web page, author, source, organisation, etc.

Making data openly accessible

As defined in the Intermediate Data Management Plan, the data entered into the project database consists of a mandatory core and several related sets of information. The core project data is accessible through two ways:





1. **Project website**: it allows access to the data through three ways:

Map viewer:

On 21 January 2021, the first version of the cartographic viewer was published, allowing access to the location of the buildings in the Petrifying Wealth project database at that time. One year later, on 31 January 2022, the final version of the application was published and is currently available, and provides access, among other things, to the 20442 buildings that make up the buildings dataset.

The cartographic viewer is based on the geolocation of the datasets served in open access on reference cartography, in particular:

- Cartographic Information, Satelital image and Labels.
 - CartoDB Development Team (2020), CARTO Basemap styles for web and mobile, raster and vector , [url](#)
 - OSM Open Street Map community, [url](#)
 - Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, [url](#)
- Topography.
 - Terrestris DIGITAL ELEVATION MODEL SRTM30 WMS, [url](#)

The regional boundaries are served directly from the Project database, downloaded from official repositories of Spain (<https://datos.gob.es/es/catalogo/a05003423-unidades-territoriales-estadisticas-de-la-ue-nuts-2003>) and the European Union (<https://ec.europa.eu/eurostat/web/gisco/geodata/reference-data/administrative-units-statistical-units/nuts>).

- We can also consider as base cartography the reference to historical roads, in particular:
 - Medieval Roads: by now, the Camino de Santiago (www.ign.es) and the Vía Francigena (www.viefrancigene.org)
 - Roman Roads: we have the dataset developed by Pau de Soto (<https://viatore.icac.cat/>), which shows main and secondary Roman roads for the Peninsula. To complete this information, we show for the rest of the study area the Roman roads, both main and secondary, compiled by [Harvard University](#) and available in open access.

With regard to the thematic information that can be consulted through the map viewer:





Buildings: main part of the viewer. The initial layer of information reflects the 20.442 buildings that make up the Project dataset. They are represented grouped in clusters and graded by colour to facilitate their visualisation, indicating the number of cases that make up each one. This information is used for the 5 countries that make up the study area.

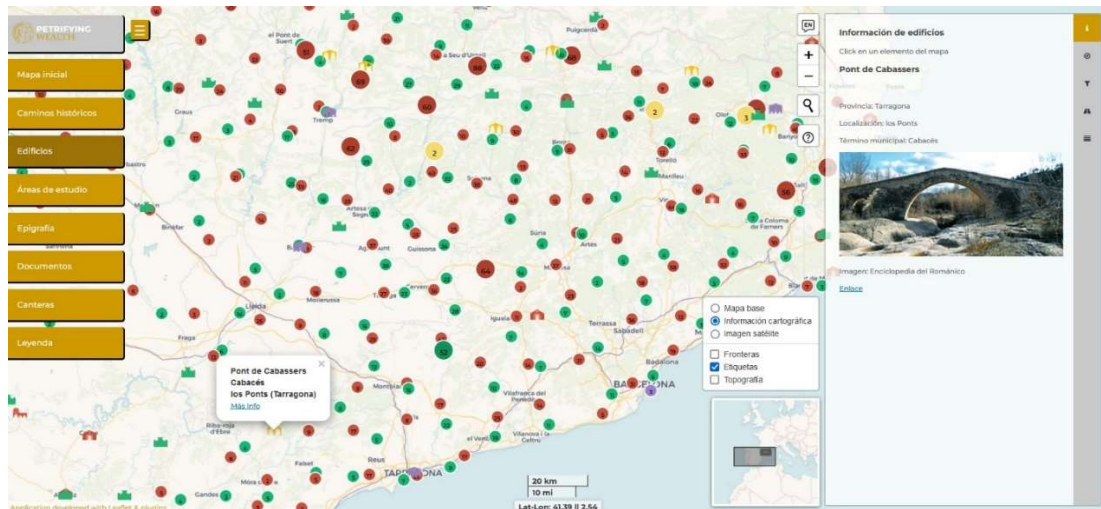
From this layer, when selecting any element, at least information on its name and administrative location is provided. In the cases being analysed, mainly concentrated in Spain and Andorra, a photograph of the element and a link to the source of information used are shown. In most cases, both the photograph and the link come from the Encyclopaedia of the Romanesque, but in those cases where this information is lacking, photographs are acquired from the aforementioned collections (Petrifying Wealth, Consorcio Camino del CID, Generalitat de Catalunya, Wikipedia or personal contributions), while the information links are completed with the work Catalunya Románica or official information sources such as the [Aragonese Cultural Heritage Information System - SIPCA](#) or [Turismo de la Xunta de Galicia](#). It is also worth mentioning reference sites that provide a huge amount of information, such as the [Asociación de Amigos de los Castillos](#), [Castillos del Olvido](#), [Asociación de Amigos del Románico](#) or the Guía de Monasterios y Conventos [Monestir](#).

The new version of the viewer, currently available, also provides access to more detailed information on the buildings analysed, mainly concentrated in Spain, Andorra and the town of Tivoli (Rome). In the building's file (located on the right-hand side of the screen), in addition to the image and the reference source consulted for its analysis, information is provided on its chronology, typology and construction materials.

This information is also implemented in the form of filters to facilitate access to the data:

1. Thematic filter that allows to select the different buildings depending on their typology. This filter has different levels:
 - a. A general level which takes into account the ecclesiastical (religious buildings, monasteries, palaces) or secular (fortifications, palaces) nature of the buildings. Other singular constructions such as hospitals, mills and bridges are also added.
 - b. Within the ecclesiastical and secular buildings, an option has been added that allows the buildings to be filtered by their constituent parts. For example, for ecclesiastical buildings, towers, porticoes, crenellations, spires or spindles, always built within the period of study of the project.





2. Chronological filter, with which the buildings can be discriminated by their date of construction, in intervals of 50 years.
3. Filter by the construction materials with which the buildings are made, generically stone, brick or a mixed technique.

The data that can be visualised correspond to the buildings that conserve dated remains within the chronology of the project (conserved buildings) and also those buildings that have disappeared or been completely rebuilt in a later chronology, but of which there is evidence of their existence through a documentary reference contemporary to the period under study.

Epigraphy: The location of the epigraphs analysed, directly related to the medieval construction process, associated with the building where they are found, is provided. On the right-hand side panel, more information is given on the related building, specifically its photo and link to the reference source.

Documentary sources: The documentary collections that have been worked on in the project are represented, giving them a geographical location in relation to the place where the collection was issued. The points of the collections are graded by colour depending on the number of documents related to them and stored in the database. In the right-hand side panel, information is given about the title of the documentary collection and a link to the bibliography of the project where data relating to the edition consulted is collected.

Quarries: Historical quarries with activity within the chronology of the study, and with a direct relationship with the petrification process, are located. The information comes from multiple specific studies, collected in the [bibliography of the project](#).

Study areas: Areas of special interest to the Petrifying Wealth project are represented.



Enquiry Form:

Published at the same time as the final version of the cartographic viewer, i.e. on 31 January 2022, it allows the thematic consultation of the core of the dataset relating to the project's buildings.

Access is free via the project's website. The first page provides detailed information on the information contained in the query form, to facilitate the work and increase the interoperability and reusability of the data.

It implements filters on the typology, chronology and location of the buildings. The results obtained can be viewed on the same website and include for each of the server records a link to the location of the building in the cartographic viewer. The filtered information, resulting from the query, is downloadable in text format (csv).

Bibliography of the project:

At the same time as the latest version of the cartographic viewer and the consultation form, access to the bibliography consulted during the development of the project and which has given rise to the different lines of research published in open access in Digital CSIC was also published in open access. The bibliography can be accessed in two ways:

- a. [Bibliography in the website](#), where reference is made to the entire bibliography ordered alphabetically by the surname of the first author. A filter is implemented so that only books or journals can be consulted. In addition, a free search field is enabled, which dynamically filters all the references that contain the term in question in any field.
- b. [Zotero](#) (): a button is implemented through which access is given to the bibliography of the Project collected in Zotero, through a private group that allows open consultation.

Zotero is a free (free and open source) bibliographic reference manager developed by the Center for History and New Media at George Mason University. It is a cross-platform programme, compatible with Windows, Mac OS X and GNU/Linux operating systems and with Chrome, Safari, Firefox and Edge browsers. It allows, among many other things, the storage and management of references, tags, notes and attachments (<https://www.zotero.org/>, <https://es.wikipedia.org/wiki/Zotero>).

Through Zotero you can extract the bibliography in different standard formats (BibTeX, RIS or CSV among others) without having to be registered, or insert the desired references in the personal bibliography of Zotero if you are registered (free registration).

2. Digital CSIC: Two datasets have been added to the CSIC institutional repository.

Project dataset. As shown in the metadata file attached to the three tables that make up the dataset, the free access files are a summary of the various tables that make up the database (thematic query) and are made up of the following fields:

o Architectural Complex: represents the main part of each building. Unique identifier ID_CA. Fields:

1. ID_CA: Unique identifier of the building.
2. Architectural Complex: name of the building.
3. Location_id: unique identifier of the nearest population centre to the building.
4. Location: Population nucleus
5. Municipal District: Administrative Division, identifiable with NUTS-4.
6. Province: Administrative Division, identifiable with [NUT-3](#).
7. Geographical Area: Geographical division developed by the [Spanish Ministry of Agriculture](#).
8. Area: description of the location of the building.
9. Typology: general typology of the building depending on who has made it.
10. SubtypeCA: Specific typology of each building, generated from the general typology.
11. Interpretative date: For preserved buildings, date of the earliest material remains; for unpreserved buildings, date of the earliest documentary mention.
12. Latitude: geographical dimension (ETS89 – EPGS: 4259).
13. Longitude: geographical dimension (ETS89 – EPGS: 4259).
14. Approximate Location: conservation of the building.

o Building Block: represents the main parts of the preserved buildings. An Architectural Complex is composed of one or several Factory Bodies. Therefore, in the CuerpoFabrica table: unique value ID_CF, foreign key ID_CA, which relates it to the ComplejoArquitectonico table.

1. ID_CF: Unique identifier of the Building Block.
2. ID_CA: Unique identifier of the building (foreign key).
3. Building Block: Name of the Factory Body.
4. Type CF: Typology of the Body of the Building.
5. Missing: Conservation of the Factory Body (1=missing).
6. Degree of Reliability: Level of analysis carried out on the Building Block.
7. Constructive Material: Constructive material with which the building was made.



o Functional Unit: represents specific parts of the building, which constitute the Building Bodies. A Building Block can contain one or several Functional Units. Therefore, in the FunctionalUnit table: unique value ID_UF, foreign key ID_CF, which relates it to the CuerpoFabrica table.

1. ID_UF: Unique identifier of the Functional Unit.
2. ID_CF: Unique identifier of the Building Block (foreign key).
3. Functional Unit: Name of the Functional Unit.
4. Typology: Typology of the Functional Unit.
5. Interpretation: Interpretation of the typology of the Functional Unit.

[Bibliography of the Project Petrifying Wealth](#): access is given to the direct download of the bibliography consulted throughout the life of the project. It is the result of exporting it from the Zotero bibliographic manager.

Making data interoperable:

Interoperability is defined as the ability of two or more systems to exchange and use information. In his doctoral thesis Manso-Callejo (2009) defines 15 levels of interoperability, of which we analyse three (Bernave-Poveda and Lopez-Vazquez 2012):

Syntactic interoperability: ensures the existence of technical connectivity, i.e. that data can be transferred between different systems (Hasselbring, 2000). This will be sought through the use of standard languages in the exchange of information.

For the core of the project dataset, the following standard formats are used:xls:

- Excel File (Microsoft Excel file format)
- csv: Text File (*comma-separated values*)
- json: Text File (JavaScript Object Notation)
- shp: Software Standard Format ArcGIS (Shape File)

For the bibliography of the project we refer to:

- BibTeX: Software Standard Format BibTeX.





- RIS: Excel File (Microsoft Excel file format)
- csv: Text File (*comma-separated values*)
- XML: *eXtensible Markup Language*

Semantic interoperability: ensures that the content of the information exchanged (its meaning) is understood in the same way by any system. The main objective of semantic interoperability is to reduce the ambiguity of criteria, so that information content can be shared and interpreted efficiently in the specific contexts in which it is used.

In order to facilitate semantic interoperability, recourse is made to:

- Geographic information standard: the official EU datum is used to represent geographic coordinates (ETRS89).
- [NUTS](#): for administrative locations, both the identifiers (for internal database use) and the official names of all administrative divisions used within the study area are.
- Thesauri: to facilitate the understanding of the terms used in the thematic description of the information, thesauri of general use in the field of humanities are used, mainly the thesaurus created and maintained by the Getty Research Institute (<https://www.getty.edu/research/tools/vocabularies/aat/> or <https://www.aatespanol.cl/>).

In the bibliography, bibliographic managers (Zotero and Mendeley) are used, which use a standard structure and implement a standard classification in the type field.

Making data reusable:

Thanks to their easy location, access and interoperability, the data from the Petrifying Wealth project are reusable, and can be a source of information for studies on medieval history in Spain, mainly related to construction.

To facilitate their reuse, they have been licensed Creative Commons By (CC By) whereby the licensee has the right to copy, distribute, display and perform the work and to make derivative works as long as they acknowledge and cite the work in the manner specified by the author or licensor.

The data can be used as a basis for the development of other research projects, assuming the basic structure proposed. Or also, from the location itself (both geographical coordinates and administrative locations), one can relate one's own data to sets generated from other research projects. Based on the





description of the data acquired, the aim is to ensure that the thematic and temporal data on these locations are also reusable.

In addition to the specific field of this dataset, such as research in medieval history, these data can be reused in many other disciplines, such as tourism, heritage protection, etc... In order to protect what has already been built, it is interesting to disseminate its existence, promoting social awareness.



Conclusions

The Final Data Plan is the last stage in the data plan developed by the Petrifying Wealth Project. It includes both the final description of the data obtained and its publication in accordance with the FAIR principles.

Looking back at the previous data plans, it can be concluded that the objectives initially set have been met. Even so, there are still questions to be addressed in direct relation to the objectives of the study, such as extending the exhaustive analyses carried out for Spain and Andorra to the rest of the countries in the study area, establishing direct relations between documentation, archaeology and construction, or from a technical point of view, implementing a service infrastructure that increases the interoperability of the shared data (WMS, WFS).

In relation to the FAIR principles, the Project's data correctly ascribe to these principles. Thanks to a tool implemented by Digital CSIC (FAIR EVA - <https://fair.csic.es/es>), we can extract the degree of adequacy of the data to the FAIR principles, with 87.04% of the objectives achieved.

Principios FAIR

