

*a cura di*  
STEFANO BERTOCCI  
FEDERICO CIOLI

## **Franciscan Landscapes**

*Conservation, Protection and Use  
of Religious Cultural Heritage  
in the Digital Era*

vol. 2



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This volume collects the papers presented at the concluding conference of the European project 'F-ATLAS: Franciscan Landscapes: The Observance between Italy, Portugal and Spain' that took place in Assisi, May 11-13, 2023.

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Façade of the Basilica di Santa Maria degli Angeli, Assisi (Italy). Drawing by Stefano Bertocci.

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# INTEGRATED DIGITAL SURVEY FOR THE DOCUMENTATION OF CULTURAL LANDSCAPES. THE FRANCISCAN CONVENT OF CHELVA ON THE 'RUTA DEL AGUA'

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## **Abstract**

The paper illustrates the methodological protocols for the management and dissemination of the tangible and intangible cultural heritage of the Franciscan Observance in the framework of the European project F-ATLAS. The in-depth analysis focused on the Spanish case study of the Convento de Los Franciscanos in Chelva, near Valencia. Founded in 1388, the complex is one of the first Spanish Observant foundation convent. The building is part of an agricultural area characterized by terraced gardens and complex systems of canalization of spring waters. The case study represents many of the identifying characteristics of the Franciscan Observance sites in Italy, Spain, and Portugal. The investigation through TLS and SfM/IM methodologies aim at realise reliable drawings and analysis concerning the architecture of the Franciscan convent of Chelva, in relation with its historical evolution and the territory. The research objective is to highlight mutual transnational influences between the identified Franciscan Observance settlements.

**Keywords:** Terrestrial laser scanner (TLS), Structure from Motion/Image Matching (SfM/IM), Religious architecture.

*opposite page*  
**Fig. 1**  
Characteristic perspectives of the historic centre of Chelva.

## 1. Introduction

The research is part of the three-year European project F-ATLAS – Franciscan Landscapes: The Observance between Italy, Portugal, and Spain<sup>1</sup>. The project aims to develop methodological protocols for the management and dissemination of the tangible and intangible cultural heritage of the Franciscan Observance settlements (Bertocci et al., 2023). In particular, through the study of bibliographic and archival sources, the digital survey and the census of the individual complexes, the project aims to investigate the relationship between the Observance architecture and the surroundings, emphasizing how the places of the Franciscan presence have marked cities and countryside, forming an inseparable part of the history, of civil life and the territory (Bartolini, Paciocco, 2000, p. 124). The critical cataloguing and mapping work coordinated by the ISCTE-IUL of Lisbon and the University of Barcelona led to identifying case studies representing an essential testimony of the link between architecture and ‘Franciscan landscapes’ (Volzone, Genin, 2022).

In Spain – where the Franciscan Observance appeared at the end of the 14<sup>th</sup> century – two fascinating settlements were chosen to be explored further through integrated digital survey campaigns. The first case study, the Monastery of Sant Miquel d’Escornalbou in Tarragona (Soler et al., 2023), was surveyed in November 2021. The Convento de Los Franciscanos in Chelva, near Valencia – known as one of Spain’s first Observant Foundations – has been chosen as the second case study<sup>2</sup>. The complex is part of an agricultural area characterized by large terraced plots of land and by the presence of water canalization systems that underline the close interdependence between built and natural heritage, qualifying the case study as a cultural landscape, where man’s work is in union with nature in a system of mutual influences.

The religious complex still maintains the original hermit nucleus of the caves, located on a hill not far from the convent. Its peri-urban position in a strategic point allowed the friars to observe the town of Chelva and the surrounding valley. The agricultural environment implemented by the historical presence of rainwater collection and canalisation system, the proximity to the Chelva and Turia rivers, and the presence of caves, which over time became the home of hermits, make the convent of Chelva an essential reference for understanding Franciscan settlements.

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<sup>1</sup> The project, granted by the JPI-CH 2019 tender and started in July 2020, is a collaboration between the University of Florence (PL Stefano Bertocci), the Instituto Universitario di Lisboa (PI Soraya Genin), the University of Barcelona (PI Maria Soler Sala) and the Portuguese Catholic University of Lisbon (PI Maria Filomena Andrade).

<sup>2</sup> One of the first data we have on the origins of the Observance in Spain is a bull of 1390 with which Clement VI authorized the foundation of observance of Chelva and Manzanera, both in the province of Valencia (García Ros, 2000; Martínez Vega, 1996; Soler et al., 2021; Soler et al., 2022).



### 1.1. The Convento de Los Franciscanos in Chelva

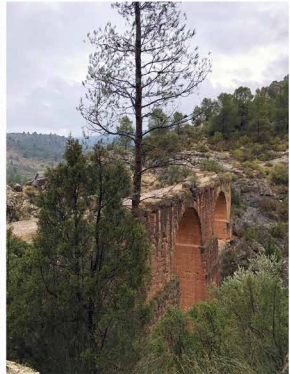
The town of Chelva in the Valencia region is an outstanding example of the overlap between Islamic and Christian urban planning (Benito et al., 2014). The presence of water characterised the territory, defining the landscape and making Chelva an important centre of agricultural production over the centuries. The great Peña Cortada aqueduct from the Roman era lost its continuity in the Middle Ages. It was used by the Arabs as an irrigation system, through diversions that circulated through the streets and vegetable gardens of the city, providing service to the numerous fountains and laundries typical of Islamic Urban Planning<sup>3</sup>. Not far from the inhabited centre, along the paths of the Ruta del Agua, which develop within the historic centre and along the course of the Chelva river, is located the convent of San Francisco, founded in 1388 at the behest of the first viscount of Chelva, Pedro Ladrón de Vilanova<sup>4</sup>. His humble primitive factory, “as if designed by the very hand of poverty”<sup>5</sup>, consisted only of nine narrow and small cells and a small church. Already fifteen years before the foundation of the convent, in 1373, three religious from the Franciscan convent of Zaragoza had settled in the caves dug into the rock on a hill overlooking the current convent. Some of these structures are still well preserved today as they served as a temporary retreat for many religious people in those years and subsequent periods.

<sup>3</sup> Among the elements considered immovable property of cultural interest according to the general inventory of the Valencian cultural heritage are the Peña Cortada aqueduct, the parish church of Nuestra Señora de los Angeles, the turret and the historic city with its terraced orchards.

<sup>4</sup> In the work *La Fénix Troyana*, Father Vicente Mares Martínez (1633-1695), rector of the parish church of Chelva, reports that the convent was founded in 1388 at the behest of the viscount after a meeting with Father San Bernardino in the city of L'Aquila, Italy. During the meeting it seems that the viscount asked to the saint to send friars to Spain in order to build a Observant convent and Bernardino agreed sending five friars to Valencia. The source is not reliable as at the time San Bernardino was only 8 years old (Catalá Gorgues, 2019).

<sup>5</sup> “como diseñada por la mano misma de la pobreza”, See Martínez Colomer, 1803, *Historia de la Provincia de Valencia* ed al regular Observancia ed San Francisco, Valencia, p. 70.

➔  
**Fig. 2**  
 Aerial view  
 highlighting the  
 close relationship  
 between the  
 convent and the  
 water system  
 that characterised  
 the surrounding  
 landscape  
 (photo by Pietro  
 Becherini).



➔  
**Fig. 3**  
 Aerial view of the  
 convent with the  
 city of Chelva in  
 the background  
 (photo by Pietro  
 Becherini).





Father Àngel says that around 1400, a conservative friar “driven by zeal” destroyed the convent because its existence was a symptom of the loss of the primitive ideal (García Ros, 2000). The Chelva convent was rebuilt in 1401, reaching up to thirty cells and in 1518, it had a ruinous appearance and was subsequently renovated and enlarged. The works for the construction of the church of San Francisco – which has a late Gothic style and a Renaissance facade – began in 1551 at the expense of Don Francisco Lladró, viscounts of Chelva, and his wife, Doña Inés Manrique. The building, like the rest of the convent, fell into ruin following the expulsion of the friars in 1835 and was reconstructed starting in 1910, based on a project by the master builder and lay Franciscan Fray Maseo Company, inaugurating the church in neo-Gothic style, on October 26, 1913 (Catalá Gorgues, 2019). The complex suffered further damage after the suppression of the Second Spanish Republic (1931) and later during the Spanish Civil War of 1936-39 and is strongly altered from an architectural point of view today. After the abandonment of the last friars, the complex, a place strongly felt by the citizens of Chelva, was used as a farm and is still used for religious meetings hosted inside the guesthouse.

## **2. The integrated digital survey**

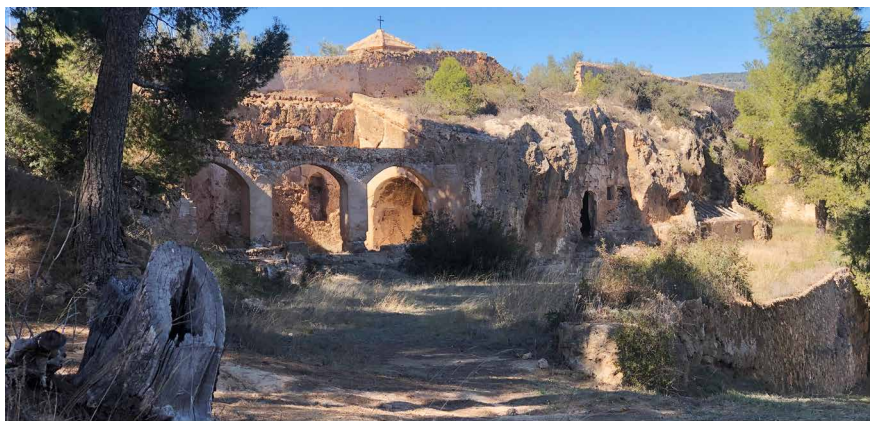
The Chelva case study provides many of the identifying characteristics of the sites of the Franciscan Observance, highlighted through a careful comparison between the Italian, Spanish and Portuguese settlements. In particular, we find the strong link with the territory, the functional structure of the complex developed around the cloister and the presence of hermit caves. From a methodological point of view, the research faced difficulties in finding historical documentation due to the losses caused by the events that followed the French occupation (1811-13), the suppressions (1822-23), the exclaustation (1835 and 1865), the confiscation (1855), the ordinance of suppression of the Second Republic (1931) and the Spanish civil war (1936-39) (Mancinelli, 2013).

The research aims to establish the necessary documentation to investigate the evolutionary phases of the Chelva Convent based on analyses of the existing building to develop future requalification and protection strategies while respecting the historical and cultural characteristics of the site.

The documentation methodology adopted envisaged the integrated use of laser-scanner survey (TLS) and close-range and UAV digital photogrammetry (SfM/IM). This documentation campaign aims to create technical drawings on a 1:50 scale, necessary to develop a framework of metric and morphological valuable knowledge for understanding the complex and for developing comparisons with other investigated case studies.



**Fig. 5**  
Digital laser-  
scanner survey  
campaign of the  
hermitical caves.



*opposite page*  
**Fig. 6**  
Texturised mesh  
model by digital  
Structure from  
Motion/Image  
Matching by UAV.



### 2.1. Terrestrial Laser Scanner survey (TLS)

The documentation campaign took place from 21 to 28 February 2022 and involved research groups from the University of Florence, the University of Barcelona and the Polytechnic University of Valencia. For the laser-scanner survey, a Z+F 5016 was used for the convent complex and the caves, and a Leica RTC360 was used for San Francesco's church interiors<sup>6</sup>. A Pentax K-1 with a 24-70mm F2.8 lens was used for the close-range photographic survey, and a DJI Mavic Mini 2 drone was used for the UAV survey. The two surveys were integrated using morphological points with coordinates obtained from the point cloud resulting from the laser scanner and topographical targets acquired using the Leica Zeno FLX100 plus smart antenna. Collecting the marker coordinates was necessary to locate the two portions of the complex, the caves, and the convent, collected in two separate sessions.

The survey provided for the acquisition of 185 scans for the convent part, 60 scans for the cave complex and 30 scans inside the church. The acquired data were processed using the Leica Cyclone software. The individual scans were subjected to the filtering process and the registration by roto-translation and overlapping of the single acquisition and alignment through cloud constraints. The scans were acquired with the overlay of the given RGB colour through the HDR cameras equipped with the instruments, returning a highly descriptive 3D point cloud which, integrated with the photogrammetric models obtained from photogrammetry by UAV, returns an overall image and allows to develop further in-depth investigations also linked to the evolutionary aspects of architecture and landscape.

<sup>6</sup> The laser-scanner survey of the interior of the Church and the GPS acquisitions were carried out by Prof. Pablo Rodríguez Navarro and Prof. Teresa Gil Piqueras of the Polytechnic University of Valencia.

*opposite page*  
**Fig. 7**  
 Preliminary 2D  
 elaborations  
 representing a  
 cross-section of  
 the cloister and  
 the general plan.  
 A\_entrance  
 square;  
 B\_Church of St.  
 Francis;  
 C\_Cloister;  
 D\_Dormitory;  
 E\_Refectory;  
 F\_Patio;  
 G\_Rectory;  
 H\_Side Chapel.

## 2.2. The Structure from Motion/Image Matching survey (SfM/IM)

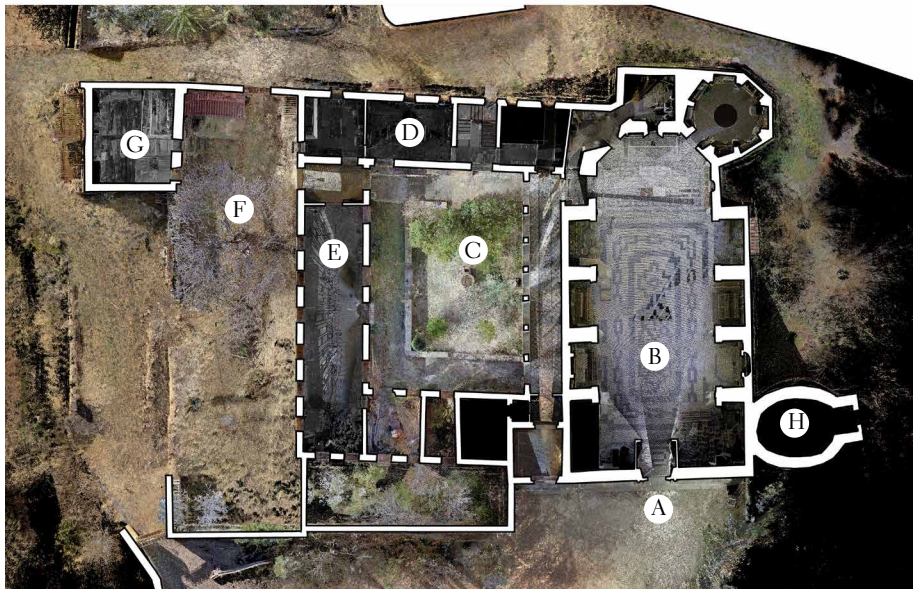
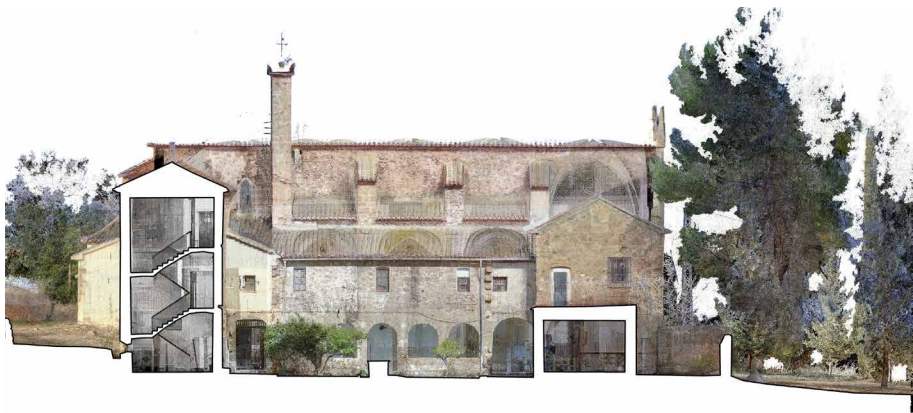
In addition to the laser-scanner acquisitions, a series of SfM photogrammetric survey campaigns were also carried out in parallel, both close-range and at high-altitudes, which allowed us to obtain the global image of the monastic complex in its architectural and environmental spaces. The models obtained allow us to integrate the TLS metric surveys by compensating for the grey areas that can only be acquired at high-altitudes and documenting the information relating to the appearance and state of conservation of the materials, particularly the roofs. The photographic survey campaign was consequently organized according to different levels of scale and detail. An initial mapping of the entire complex and the surrounding environment was initially carried out using UAVs. Subsequently, the external surfaces of the structures and the most relevant internal environments were acquired in more detail using close-range acquisition. As regards the drone photos, although each of them was equipped with geographic coordinates provided by the integrated GPS, the recognition of the targets used for acquisitions on the ground and those via laser scanners was used to integrate the methodologies and obtain a survey with a higher level of reliability.

The photographic data was processed using the photo-modelling software Agisoft Metashape Pro, obtaining a mesh model to which the texture from the photographic data was applied, thus obtaining a mapped 3D model of the external surfaces. The development of this model, integrated with the data from the laser-scanner surveys, allows the extraction of multiple graphic drawings to compare and analyse both the architectural work and the natural environment.

## 3. Architectural analysis

The drawings realised based on the survey campaign allow us to develop preliminary considerations on the architecture of the Franciscan convent of Chelva concerning its historical evolution and relationship with the territory. The convent is surrounded by a border wall, which delimits and marks the division between the rural environment and the sacred space. Access to the convent complex is via a dirt road that deviates from the Ruta del Agua and reaches a large square (Fig.7A). The external elevation is characterised by the Renaissance facade of the church of San Francisco, with the big round-arched portal flanked by two small columns that support a tympanum. On the left, a door allows access to the partially collapsed cloister, which forms the central point of the complex (Fig.7C). Only the one on the north elevation remains of the perimeter porticoes, built along the south elevation of the church.

The building on the west side of the cloister (Fig.7D), where the friars' cells must once have been, is probably due to the twentieth-century reconstructions and houses on the ground floor service areas, a kitchen, toilets, and an ample space used as a refectory (Fig.7E). A central staircase leads to the two upper floors, consisting of six bedrooms each. The first floor is connected to the choir through a corridor above the cloister porch. A large room is located along the south side of the cloister and is used as storage. Continuing the path, there is a second patio with a three-story rectory, where the reuse of masonry from the original construction is still visible in the retaining walls (Fig.7F-G).



The church of San Francisco is divided into four cross-vaulted bays, three of which are flanked by chapels on both sides, which are also cross-vaulted and framed by pointed arches (Fig.7B). The entrance hall, dominated by the deep choir on the first level, initially gave access to the side chapel on the north front, elliptical in shape, currently inaccessible due to the deterioration of the structure (Fig.7H).

A ribbed star vault covers the polygonal apse, and on the sides of the altar, two doors lead to the sacristy, also polygonal, and to the small bell tower. On the external front, the church walls are reinforced by masonry buttresses arranged in shear, which define the division of the side chapels inside. On the back of the convent, an uphill path leads westwards to a rocky massif characterised by numerous caves and recesses. Some of these hermitages still retain the boundary walls that served as a filter and as a living place for the hermits. In the highest part of the perimeter is the original nucleus of the convent, a small chapel dug into the rock as an apse, later integrated by a three-arched portico structure. Continuing along the path is a large cistern, which allows irrigation of the terraced gardens of the Franciscan complex through complex canalisation and management of the locks.

#### **4. Conclusions**

The sanctuary, as well as the numerous Franciscan monasteries documented during the F-ATLAS project, are comparable in terms of assets to the concept of 'cultural landscape', as they represent a union between the work of man and nature, where culture acts using natural elements to define a place configured as a well-balanced synthesis of these two elements. This link between the religious complex and the surrounding landscape is one of the main characteristics of the Chelva convent. Although its architectural structure has come to this day strongly conditioned by historical events, its distribution and link with the territory remain unchanged and allow us to make comparison with other settlements, such as the one today in a state of ruin of Manzanera, built in the same period based on the design of Chelva convent.

We can also compare the structure of the Franciscan convent of Chelva with other settlements investigated during the F-ATLAS project, such as the convent of San Bartolomeo in Foligno (Perugia, Italy), one of the first sites of the Observance, which represents an emblematic case study given its peripheral location and the structural and conservation problems caused by the 2016 and 2017 Central Italy Earthquake (Bertocci et al., 2023; Bertocci, Cioli, 2023). In both the case studies we can find some typical features of the Franciscan Observance architecture.

The first is the peri-urban location in an elevated area that allowed control of the surrounding territory. Both churches are characterized by small dimensions and a central nave structure, well integrated and not emerging from the volumes of the convent, unlike those typical of the Conventual Franciscan complexes. The Observant architecture usually aims to house small local communities and give hospitality to pilgrims along the paths. Both convent complexes are accessible through entrances flanking the church portal. In the case of San Bartolomeo, this entrance is sheltered under the portico of the baroque facade built in the 18<sup>th</sup> century. The layout of the refectory and dormitory also corresponds planimetrically, located on two sides of the cloister characterized by the presence of the well and the underground cistern.

On a compositional level, it is worth highlighting in the Chelva church the presence of a centrally planned chapel located at 45° concerning the apse, dating back to the first construction phase of the church. There is also a baroque chapel with an elliptical plan, currently partially collapsed, accessed from the right side of the central nave under the choir. Similarly, we find in the complex of San Bartolomeo in Foligno a side chapel which houses a reproduction of the Holy Sepulcher dating back to the 17<sup>th</sup> century.

These considerations on the architectural conformation of the sites of the Franciscan Observance allow us to understand better styles and trends closely connected to how the friars lived the conventual space. In particular, it is possible to interpret and evaluate historical sources such as *La Fénix Troyana* by Father Vicente Mares Martínez, which traced the construction of the convent of Chelva to five Italian friars sent to Spain by Fra Bernardino, who may have imported the architectural characteristics of Central Italy to the Iberian Peninsula. What has been highlighted by the European project F-ATLAS is that there are peculiar characteristics that link these places from an architectural, cultural and landscape point of view. These connections are the key to establishing Cultural Routes that can increase awareness about the role of the Franciscan Observance over time.

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Integrating historical research with technological progress opens exciting possibilities to create comprehensive digital archives, virtual reconstructions, and immersive experiences that can bridge the gap between the past and the present.

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