Gestión del paisaje. Patrimonio, territorio y ciudad
Paisaiaren kudeaketa. Ondarea, lurraldea eta hiria
Landscape management. Heritage, territory and city

TRABAJO FIN DE MÁSTER
MASTER-AMAIERAKO LANA
FINAL MASTER'S DISSERTATION

THE REMNANTS OF THE OPTICAL TELEGRAPH IN THE NORTH OF SPAIN AS A SOCIO-CULTURAL RESOURCE: THE VALUING PROCESS AND A FRAMEWORK FOR INTERVENTION

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Resumen/Laburpena/Summary

The development of the optical telegraph in the 19th century was a significant step forward in humanity's quest for fast and secure telecommunications. The optical telegraph's network was one of the first vehicles of globalization. It spread quickly over Europe and was displaced just as swiftly by the electric telegraph. Today, the optical telegraph rests in relative obscurity, but it is not trivial.

In Spain, security concerns led to the design of the optical telegraph as an infrastructure of fortified towers, connected by sight. By their nature, its sites form a complex linear landscape that spans across regional boundaries. Even after 150 years of disuse, several of the buildings remain. In many cases, they are conspicuous landmarks on the territory. They bear the memory of a distinct piece of our past. In short, the remnants of the optical telegraph have the potential to be beneficial resources for their associated landscapes, but they have often been underutilized, and they are undeniably at risk. There is an increasingly urgent need to take action before the sites degrade further, but this intervention will only be successful if it comes from a clear understanding of the stations' distinctive tangible and intangible values.

In this dissertation, I have sought to develop a systematic approach to evaluate the optical telegraph sites that considers their duality as milestones of a trans-regional network and as local heritage objects. Accordingly, I have sought to identify the methods and the criteria that can be used to form an efficient and sustainable framework for intervention. This interpretative framework could feasibly form the foundation for a solid strategy that preserves the optical telegraph sites while capitalizing on the added value they bring to their environments.

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I would like to thank my family for their constant support, for being my long-suffering sounding board at all hours of the day and for always being there.

Finally, thank you to my fellow MSc students in the 2020/2021 class, for encouraging my weird interests throughout the year and showing the value of cooperation inside and outside the classroom.

And to everyone who once saw those lonely towers in the distance, to those that have ever wondered what they were or what could be done for them I can only say: take the first step; this is a journey worth making.

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1. Introduction

1.1 The Optical Telegraph as a Linear Landscape

To label something as heritage is to make a declaration of intentions. Despite acquiring its significance in relation to the past, heritage is a concept that only exists after someone identifies a (material) thing that has potential benefits for the present (Criado-Boado & Barreiro, 2013, p. 6; Mason & Avrami, 2000, p. 18). The nature of a heritage object is continually changing purely as a by-product of people's interactions and shifting impressions (Lowenthal, 1993, p. 379).

The concept of heritage is a meta-cultural fact (Criado Boado, 1996, p. 6), deeply connected and dependant of the social groups that give it meaning, whether as a reminder of the past, a tool for generating identity in the present or something else. As Mason and Avrami (2000, p.18) concisely point out, "cultural heritage is a medium for the ever-evolving needs, beliefs and attitudes of social groups."

The concept of landscape is similarly complex. It has had many definitions over the decades, as its character, values and representation became broader and better accepted. Landscape is a dynamic, holistic phenomenon composed of multiple entities (Antrop, 2017, p. 45). On a practical note, taking the initiative to label a particular site as one of those entities and as part of the character of its landscape is accompanied by the underlying assumption that it also carries potential benefits for a group of people.

While the intervention and conservation of sites of interest cannot rest exclusively on the sensitivity of an outside agent (Blanco-Rotea, 2015, p. 73), on drawing attention to them, we acquire an obligation to consider how they should be managed and protected. Certainly, we must acknowledge that it is not possible to save everything, always; nor should we aspire to that goal to the detriment of our ability to effect lasting, positive changes on the chosen sites. However, simply assuming that a landscape can "absorb the hits" is neither sustainable nor responsible (Land Use Consultants, 2009, p. 8).

This MSc thesis considers that the remnants of the Spanish optical telegraph are valuable as an ensemble of heritage sites and as a shared linear landscape with unique characteristics. The territories in which the stations were built are made richer by their existence and would be diminished by their destruction (Kagan, 1998, p. 285), whether that destruction is done actively or by disinterest. At the same time, the telegraph towers are part of the distinctiveness of their associated landscapes; as such, they cannot be reproduced somewhere else without losing their meaning (Luginbühl, 2011, p. 49).

The optical telegraph network was a data transmission system adopted by several European nations[1] in the late 18th and early 19th centuries. Its stations did not stand alone; they extended across large parts of the territory and formed a highly recognizable linear infrastructure. Unlike other linear systems, such as the railway, there was no physical connection between the stations[2]; however, there was an immaterial thread that tied them together: vision. One of the significant attributes of the stations was their intervisibility as a prerequisite for their function.

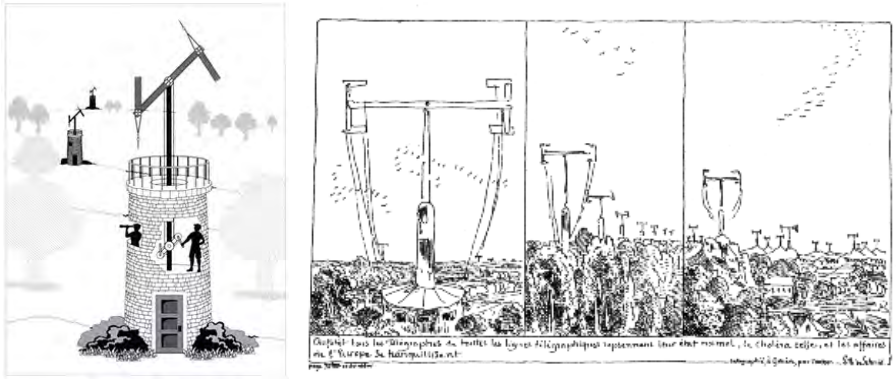

Figure 1: The stations across the territory, forming a thread of related landmarks. Right: Chappe Towers Sequence (Shectman, 2003 as cited in Gupta, 2013 [modified by the author]. Left: Comic vignette by Töpffer (Wivel, 2007).

Furthermore, each station was defined by its environment and influenced that environment in turn. Over a hundred and fifty years after their decommissioning, several of them still are or have the potential to be a resource in their respective territories. Thus, I seek to propose a framework for understanding and intervention that can be adapted to the particular conditions of each site without diminishing their reality as part of a larger ensemble, stemming from the identification and understanding of their unique characteristics.

1.2 Origin and Functional Parameters of the Optical Telegraph

The search for reliable, long-distance communication has been a constant in human societies across time and space. From post-horses to fire beacons, from Polybius' hydraulic semaphore[3] to the coastal watchtowers of the Mediterranean coast, human societies sought to expand, defend their settlements and consolidate their reach by transmitting information further and faster.

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[1] The different national networks were, for the most part, completely independent from one another. There never was a "super-structure" at a continental level; indeed, the transmission methods and encoding were incompatible from system to system. There were, however, singular instances of connection between countries, such as the possibility of courier-driven messengers between Behobie (France) and Irún (Spain), the short-lived Amsterdam-Venice line or the parallels between Brest and Deal as advanced vigilance posts due to the delicate relationship between France and the United Kingdom.

[2] However, their existence as singular points of a network was reinforced by their unified design and relay system as well as their location within their respective environments. This will be explored in detail in chapter 2.

[3] While he was not the inventor, our knowledge of the system comes from his descriptions in the 3rd century BC. See also: Figuier, 1868, p.7; Chappe, 1840, p. 3.

It is debatable whether these early attempts can be considered telecommunication systems as we understand them today. Each of them had crippling limitations: whether on the speed and distance that the information transmission could reach, the security and reliability of the message in case of ambush or, usually, a distinct lack in versatility of meaning that only allowed for pre-convened, short ideas. Indeed, though several sources refer to any attempt at long-distance information transmission as "telegraphic" (Gautier, 1893, p. 14), it is a relatively recent term that only coalesced with the development of the optical telegraph. The discourse around its etymology was relevant as late as 1844, as shown in an article by *La Estrella Balear*:

> "El telégrafo es una invencion que tiene por objeto dar á señales variadas todos los valores de los sonidos del lenguaje. Es por lo tanto una escritura aérea que se puede leer á distancia, de donde viene el nombre de dicho instrumento, léjos, escribo, porque sirve para escribir lejos. Creó que se equivocan los que derivan de telum, saeta, aludiendo á que por su medio se corresponde con la rapidez de una saeta." ("Telegrafos", 1844)

In 1684, Sir Robert Hooke established the basis for complex telecommunication in a conference to the Royal Society, *On Showing a Way How to Communicate One's Mind At Great Distances*. His approach was revolutionary, not due to the introduction of new technological advances, but because it codified the principles that have persisted from the optical to the electrical telegraph and remains valid for modern communication systems in the Internet era. Among those principles were (Holzmann & Pehrson, 1995, pp. 36-38):

- The synchronization of every node in the line, that is, the expectation that all of them will start and stop operating at the same time, previously stipulated and measured by harmonized clocks.

- That data packets ought to be transmitted through symbols different from the traditional alphabet. Similarly, encryption had to be considered in addition to the vocabulary used.

- It was not enough to account for the primary stream of information. There must be a simultaneous, secondary stream of metadata to signal the characteristics of the message, the state of the system and acknowledgement or error in the transmission. Thus, an effective communication system must have clear protocols and procedures in place, and indirectly, an administrative body capable of ensuring its correct use.

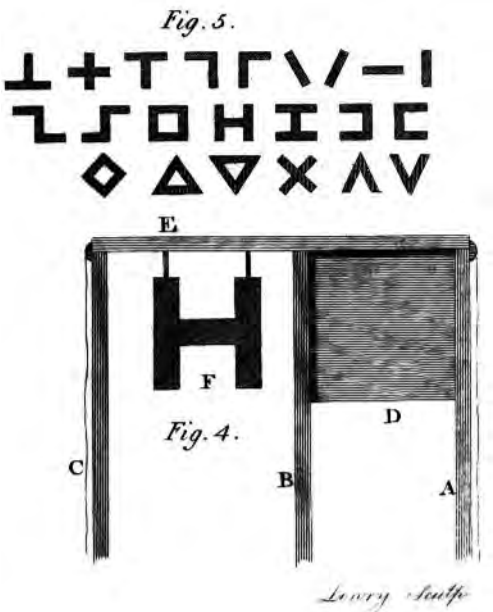

Figure 2: Representation of Hooke's telegraph and permutations. (Hooke, 1798, p. 317)

Hooke never put his model into practice; however, there is evidence that his theory was well-known in the 18th century, as it is mentioned in several sources, notably concerning the French and Swedish telegraphs (Holzmann & Pehrson, 1995, p. 39).

One intermediate technological step greatly contributed to the telegraph's viability: the achromatic telescope, patented by John Dollond[4] in 1758. Prior to this date, objects observed through a telescope often showed a multi-coloured halo along the edges that would have prevented the kind of precise observation needed for the optical telegraph. This effect was due to the process of chromatic aberration, codified by Isaac Newton in 1665. Chromatic aberration can be defined as "the fact that light of different colours is differently refracted in transparent media" (Willach, 1996, p. 196).

Between 1791 and 1793, Claude Chappe would make repeated appeals to the *Assemblée Nationale* and conduct experiments to streamline his design. In the summer of 1793, he was able to demonstrate the usefulness of the system, transmitting a complex message between Belleville, Ecouen and Saint-Martin-du Tertre that covered 26 km in 11 minutes (Gautier, 1893, p. 35).

The successful demonstration led to the construction of the first French line in 1794, which would connect Paris to Lille (190 km). The new system spread quickly throughout Europe: that same year Abraham Niclas Edelcrantz, in Sweden, would propose a variation on the mechanism and direct the construction of a telegraph line between Stockholm and Drottningholm covering 12 km (Edelcrantz, 1801, p. 115). In 1796, Lord George Murray would secure funding for the London-Deal line (109 km). Denmark, Norway, Finland, the Netherlands and Germany would follow, as well as

[4] Whether he was the inventor or falsely claimed the discovery of Chester Moor Hall remains a matter of debate (Willach, 1996).

the Atlantic coast of the United States —particularly Nova Scotia (Randall, 1947)— and a few decades later, Russia, India, Egypt and Spain, among others.

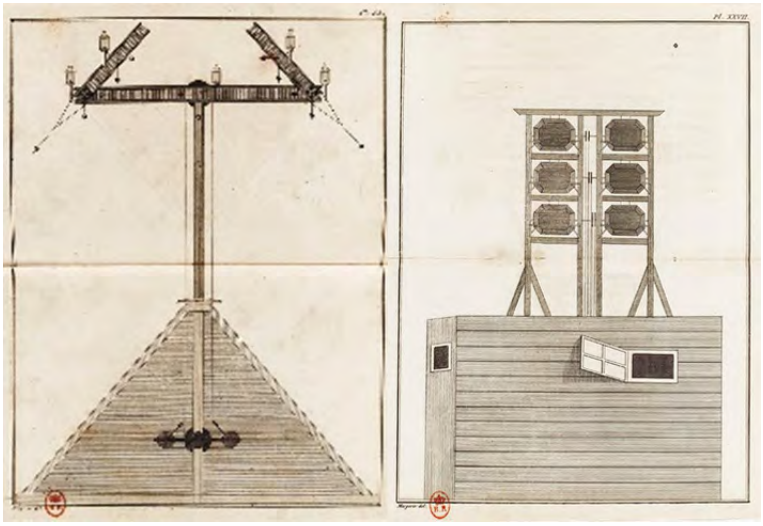

Figure 3: Representation of Chappe's and Murray's telegraphs. (Chappe, 1840, Planche XI and XXVII)

The spread of the optical telegraph network can be correlated to the shifting socio-political tides in Europe. In particular, it is possible to trace the governments' renewed interest in fast, reliable communications on raising external and internal pressures. The layout of the telegraph network grew radially from the capital towards the frontiers and ports. Its development was influenced by major international conflicts, such as the Napoleonic wars (1803-1815) or significant internal conflicts, such as the first Carlist war (1833-1840).

The optical telegraph was not, in earnest, a social construction. It was a tool in a new conception of State, a means of control of the territory (Matterlart, 1993, p. 26) and a major advancement in military tactics through the centralizing of power:

> "Un jour viendra, ajoutait-il, où le gouvernement pourra exécuter ce projet et réaliser la plus grande idée que nous puissions concevoir de la puissance en se servant des télégraphes pour répandre directement chaque jour et à chaque heure son influence sur toute la surface de la République." (Gautier, 1893, p. 32)

As such, the telegraph stations were often seen as a symbol of oppression, not only an ugly, looming servant of far-away powers but also one that, by its nature, could never be understood. From Victor Hugo to Rodolphe Töpffner, the optical telegraph was reviled or mocked during the period it remained in use:

> "Je suis monté au télégraphe qui s'agitait fort en ce moment. Le bruit courait dans l'île qu'il annonçait au loin des choses sinistres. On ne savait quoi. (J'ai su à Avranches. C'était le nouveau meurtre essayé sur le roi.) Arrivé sur la plate-forme, l'homme d'en bas qui tirait les ficelles m'a crié de ne pas me laisser toucher par les antennes de la machine, que le moindre contact me jetterait infailliblement dans la mer…" (Hugo, 1836, pág. 56)

However, the seeds for change had already been planted. The capacity of the telegraph as a channel of information, the advantages it afforded as a vehicle of globalization, were already recognized. Notably, in 1837 the French government passed a bill that fined up to 10,000 francs for illicit telegraph signals and civilian lines (Koenig, 1944, p. 436). This bill was likely a reactive answer to civilian attempts to use the telegraph for financial purposes, and particularly to François and Joseph Blanc's scam, who co-opted the Paris-Bordeaux line to receive stock market information from 1834 to 1836 to great success (Scott, 2018).

Furthermore, as the electrical telegraph replaced the optical telegraph and as long-distance communications became available to a wide range of people, the old system would eventually become an object of wistful nostalgia (Martin, 1898, p. 5):

"Que fais-tu, 'mon vieux télégraphe,
Au sommet de ton vieux clocher,
Sérieux comme une épitaphe,
Immobile comme un rocher?"[5]

1.3 State of the Art in Academia

Knowledge related to the optical telegraph exists in a curious limbo. The optical telegraph was relatively short-lived, and as a rule, it has not managed to breach the gap into widespread awareness. Even among scholars, it is not uncommon to find telecommunication treatises that either erase the optical telegraph's existence (Wheen, 2011) or severely underplay its importance, regarding it almost as a quaint foible of the past.

In contrast with this apparent obscurity, there is an undeniable fascination with the topic in certain academic circles. It is not surprising. The optical telegraph was a reflection of the socioeconomic and political climate of its time. Therefore, it is a valuable tool for understanding the societies of that time. Even though it did not herald a technological jump on par with the electric telegraph or the railway, it was an awe-inspiring show of ingenuity. If anything, its fleeting existence and the obscurity in which it lays today, shadowed by its better-known successor, have contributed to its romantic appeal. The optical telegraph is one of the scrappy underdogs of history.

There is a wealth of information related to the French optical telegraph; this is not surprising, as it was the first and the most long-lasting iteration. Several treatises date back to the 19th century, most notably by Ignace Chappe (1840) and Abraham Edelcrantz (1801)[6], which constitute invaluable sources for our current understanding of the particular challenges and realities of the telegraph in

[5] Poem by Gustave Nadaud. Full version available at: http://www.telegraphe-chappe.com/chappe/chapchan.html. Last consulted: 07/10/2021

[6] Ignace Chappe, brother of the creator of the French optical telegraph, was deeply involved in its dissemination and administration. Abraham Edelcrantz was the creator of the Swedish optical telegraph.

its time. These treatises, however, were usually more concerned with finding historical antecedents and debating the merits of the people involved with the telegraph than the study of the system from a functional (and much less constructive) perspective. In that respect, one of the best sources regarding the operational parameters of the optical telegraph is "French Optical Telegraphy, 1793-1855: Hardware, Software, Administration" (1994) by Alexander J. Field.

In Spain, there is a modest amount of primary records in several historical archives, though they are rarely from the period of operation[7]. Most mentions of the Spanish optical telegraph found on official documents date from the second half of the 19th century and early 20th century. They generally relate to deeds of sale (Cabezón de Pisuerga, Valladolid), permission to renovate or demolish (Vitoria-Gasteiz, Rúbena) or other economic considerations.

On the other hand, modern publications tend to adopt one of two approaches. They are either broad studies dedicated to the operation, administration and design of the telegraph as a network or analysis of a specific group of towers, usually restricted to those in the same province or Autonomous Regions.

The first category includes several comprehensive treatises that are indispensable for understanding the telegraph as a long-distance communication system, but do little to anchor it to its physical implementation. Among them, special consideration must be given to *Historia del telégrafo óptico en España* (1990) by Sebastián Olivé Roig and *Las comunicaciones en la construcción del Estado contemporáneo en España: 1700-1936* (1993) by Ángel Bahamonde Magro, Gaspar Martínez Llorente and Luis Enrique Otero Carvajal.

Standing at the halfway point between a system treatise and a detailed site survey is the comprehensive study directed by Mª Linarejos Cruz Pérez, *Telegrafía óptica en España* (2014), which endeavours to locate each station even in the cases where there are no physical remnants, as well as record the views, materiality and information of interest of each site.

The works in the second category tend to become detailed inventories of their chosen targets. While eminently useful from a documentation perspective, they rarely consider the idiosyncrasies of each site and associated landscape. They emphasise a restricted set of intrinsic conditions[8] over instrumental and contextual values; therefore, they are beneficial but insufficient as a tool to understanding the heritage element in its entirety, especially as a prelude for the necessary management and intervention of each particular site.

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[7] There are some exceptions; For instance, the Provincial Historical Archive of Álava has preserved a copy of the project for a telegraph strong house in Armiñón. This project is, strictly speaking, a predecessor of the optical telegraph network that would be constructed in 1844. Reference: DH-924-3 fld_79.

[8] They usually describe their location, its shape and state of conservation or the constructive techniques and material of conservation; the physical reality over the relationships and cultural implications.

As the case studies in this work are part of the Madrid-Irún line, also known as Castilla Line, in the north of Spain, the following works have been particularly relevant: "Torres fortificadas del telégrafo óptico en la comunidad de Madrid" (2005) by Pablo Q. Schnell; *Torre a torre. La línea del telégrafo de Castilla* (2012) by SERCAM; "Torres del telégrafo" (1987) by José Zufiaurre Goya and *Las torres de telegrafía óptica de la línea Madrid-Irún a través de la Comunidad Autónoma Vasca* (2014), by F. Javier Ajamil Baños.

In conclusion, although primary and secondary sources are available for study, the theoretical and academic field is disconnected from the practical applications and restoration initiatives. The interest shown by experts tends to be a step removed from the reality of the sites and their context and rarely —if ever— take into account the value of collective memory and place attachment[9] necessary for their continued survival. This lack of cooperation between local and academic stakeholders puts the remnants of the optical telegraph at risk because its resources are never fully used; that is the issue this paper intends to highlight.

The concept of value as an evolving, complex reality is not new, nor is its inclusion in conservation and intervention efforts. The literature on this topic is extensive, if not always in agreement. The theoretical base for this paper will draw particularly from sources that highlight the importance of understanding and identifying the idiosyncrasies of a place as well as the need to establish a cyclical, integral process that considers its many dimensions in an orderly, transdisciplinary manner (Criado-Boado & Barreiro, 2013, p. 8). In this regard, I have also relied on the official documents of ICOMOS' Burra Charter for Places of Cultural Significance (2013) and the Seville Charter of Industrial Heritage (2019).

I will also reference several works regarding the valuing process throughout the paper. Of special interest are: "Hacia un modelo integrado de investigación y gestión del Patrimonio Histórico: la cadena interpretative como propuesta" (1996) and "El patrimonio era otra cosa" (2013) by Felipe Criado-Boado; "Assesing Values in Conservation Planning: Methodological Issues and Choices (2002) and "Heritages Values and Challenges in Conservation Planning" by Randall Mason.

Lastly, this MSc thesis is another step in a personal endeavour. My journey started by identifying the optical telegraph as an architectural landmark with historical value without considering any practical applications. The results appeared in my final degree project in the University of Valladolid: *La línea de Castilla del telégrafo óptico: Historia, arquitectura y patrimonio industrial.*

Upon completion, however, it became apparent that the work was far from over; in particular, I became interested in using this experience to move into a more propositive narrative. For this

[9] Understanding place attachment as "the social cohesions, community identity or other feelings of affiliation that social groups […] derive from the specific heritage and environment characteristics of their "home" territory" (Mason, 2002, p. 12).

reason, I have not developed the identification and documentation of the Spanish optical telegraph in detail within this work. However, readers can find further information in my other publications:

- "Las líneas del telégrafo óptico y la primera organización contemporánea de las comunicaciones en España", in *[TST] Transportes, Servicios y Telecomunicaciones*; published in March 2021 regarding the language, technical characteristics and evolution of the optical telegraph;

- "The Towers of the Spanish Optical Telegraph: Antecedents and Variants of the Type", currently unpublished, focused on the building, its architectural materiality and antecedents and,

- "The pertinence of perceiving the visible: the optical telegraph towers of the Castilla Line in the landscape" which will appear in the *II International Congress Architecture and landscape: historical transfer, contemporary challenges* held in Granada in January 2022.

1.4 Objectives and Structure

Proper management of the optical telegraph towers is a necessity that is growing more urgent. Several sites are slowly degrading, and the rehabilitation initiatives that have been taken regarding specific points within the network have rarely been successful, as they were primarily focused on one aspect —such as the building's materiality—, ignoring the holistic nature of the site. As a result, they have been unable to withstand the test of time. In general, there seems to be a pervasive idea that "action is equated with progress and detailed planning is perceived as time not well spent" (Demas, 2000, p. 49).

In this work, my main objective is to argue that this view is not sustainable and that intervention on the optical telegraph towers —indeed, in any cultural site and heritage object— must be done after a process of understanding, identifying and valuing their particular characteristics. Any intervention measure must not consider the site as a stand-alone entity. It must consider its environment, the wider network; in short: the visual and functional relationships.

As such, this work does not intend to develop a specific plan or strategy, as that would require far more time and resources, but rather set the basis for it. To argument my position, my secondary objectives are to:

- explore the history and characteristics of the optical telegraph network as a 19th century telecommunications system, to pinpoint the design conditions unique to this heritage element;
- develop an interpretative framework that encompasses those conditions, exploring the criteria that are essential to understand these particular sites;

- apply it in carefully selected case studies, with the intention of gathering information in a coherent and systematic fashion;
- transform the information into value quotients and compare the case studies in view of the potential risks and benefits they present, in order to test the framework's usefulness;
- reflect on the results and the overall conditions of the network to identify possible avenues of research, intervention and design.

The analysis and evaluation will necessarily involve a transdisciplinary approach, as multiple values play a part and must be examined in a coherent fashion (Criado-Boado & Barreiro, 2013, p. 2). Nonetheless, I cannot claim to have escaped professional bias as an architect. While I do not try to develop a plan for intervention and design, the discourse still sees them as goals that should be pursued. However, it is also apparent that intervention cannot be the end. Monitoring the results, maintaining the site, revising the plan and continuing to engage the community will be crucial for the longevity of the intervened object.

Chapter two is dedicated to understanding the optical telegraph as a telecommunications system from a historical perspective. Chapter three will set the paradigms, theoretical framework and methodology to identify and value points of interest. Chapter four will use this approach to study two case studies that show significant variations, challenges and opportunities, which will provide insights into the framework itself. Chapter five will conclude the process, looking at possible avenues of research and interpretation of the results.

2. The Spanish Optical Telegraph

2.1 The Spanish Network

Two main factors played a role in the design and materialisation of the optical telegraph in Europe: the language and mechanic relay[10] and the organization of the national network. The limitations imposed by these two elements had a clear impact on the design of the freestanding towers. Several constructive factors depended on each tower's relative position within the network, from their emplacement to their orientation.

The logic behind the Spanish network was similar to the European norm. Thus, it was a radial and arborescent system centring on the capital. The desire to concentrate the information in one place was so pronounced that there was a singular central hub in Madrid, situated on top of the

[10] The use of the traditional alphabet would have been slow, clunky and inefficient. Instead, there was a relay with mobile parts actioned by pulleys. The relay could adopt different positions that conveyed the information as a group of numbers that, on arrival, would be decoded using a specialized dictionary, in Spain the *Diccionario Fraseológico Nacional*. For detailed information, see: Field, A. (1994) and Lalana-Encinas & Santos y Ganges, (2021).

Postal Office in Puerta del Sol, and three additional stations, responsible for connecting each of the national lines.

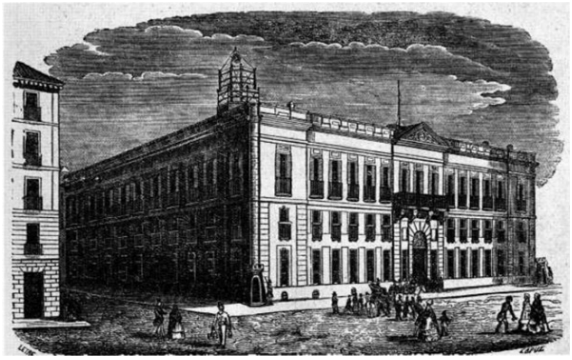

Figure 4: Representation of the optical telegraph's central hub in Puerta del Sol (Madrid). (Olivé, 1990, p. 45)

The original project planned the establishment of "three main, financed lines and ten lines planned for the future, which would reach 77% of the capitals of the Iberian Peninsula and the most important borders and ports" (Lalana-Encinas & Santos y Ganges, 2021, p. 45). This territorial strategy would not shift significantly in the following years, as the electric telegraph would follow it without significant changes a few years later. The three main lines were:

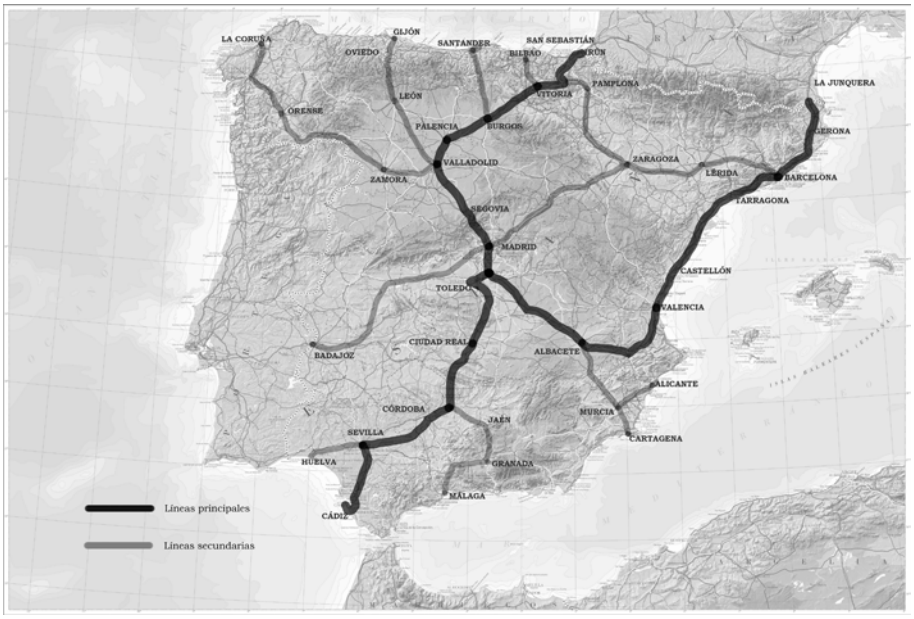

Figure 5: Built lines and projected expansions of the Spanish optical telegraph network. (Lalana-Encinas & Santos y Ganges 2021, p.105)

- The *Castilla Line*, from Madrid to Irún. Construction started in 1844, and it remained in service between 1846 and 1855. The line had 52 towers distributed in nine sections, each with a commanding officer responsible for five to seven stations. It had a branch towards the royal residence in Granja de San Ildefonso. The *comandancias* (stations that could encode or decode messages) were in Madrid, Granja de San Ildefonso, Valladolid, Burgos, Vitoria, Tolosa, San Sebastián and Irún.

- The *Barcelona Line*, from Madrid to Valencia and La Junquera. The first portion was inaugurated in 1849, though the line was never completed. It had 29 towers and

five sections, and a branch to Tarancón (Cuenca). The *comandancias* were in Madrid, Motilla del Palancar, Tarancón, Valencia, Castellón, Tarragona, Barcelona y Gerona.

- The *Andalucía Line*, from Madrid to Cádiz constructed between 1847 and 1853. It remained in service until 1857, coexisting for a few years with the electrical telegraph. It had 59 towers distributed in 11 sections. The *comandancias* were in Madrid, Toledo, Ciudad Real, Córdoba, Sevilla y Cádiz; however, Jerez de la Frontera also held this role for the first few years, as the line started operating by portions as construction concluded.

Originally, the Real Orden of March 1st, 1844, which launched the project, recommended integrating the telegraph mechanisms on pre-existing buildings, such as palaces or churches. However, this created additional challenges; for instance, the vibration caused by the bells could misalign the optical mechanism (Olivé Roig, 1990, p. 62).

In the Castilla Line, only 9% of the stations were not freestanding towers (Lalana-Encinas, 2019, p. 63), and with only two exceptions (Villazopeque and San Juan de Mezquía), they comprised most of the main stations located in urban centres. This decision likely stemmed from the added security of the urban environment. Additionally, installing the telegraph on the urban seats of power would shorten the time in transit to the relevant authorities.

2.2 Architectural Type and Variants

The original building, proposed by Mathé in 1844 and revised in 1848, was relatively simple. It was an embrasure tower with a square plan designed in the context of the first Carlist war. It drew inspiration from military field fortifications and coastal watchtowers. The Spanish telegraph was seen as a target that could be assaulted by local enemies, such as bandits or insurgents; therefore, the physical protection of the data was a crucial requirement of the design. This decision had significant repercussions on the identity and the resilience of the stations.

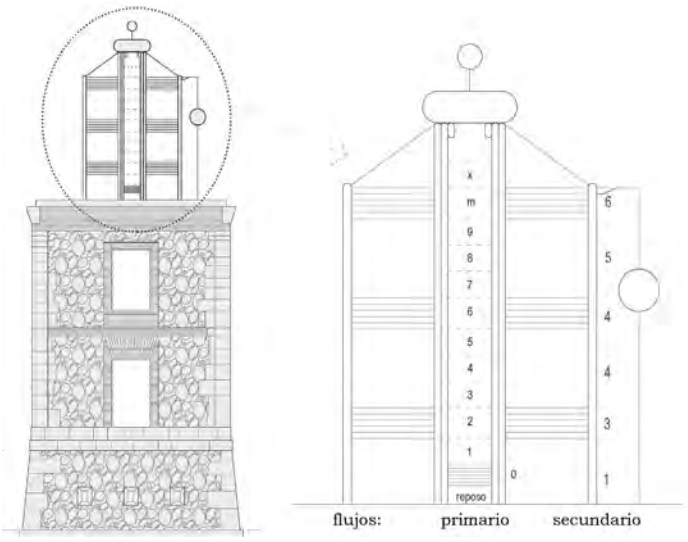

Figure 6: Optical telegraph tower and mechanism system. (Lalana-Encinas & Santos y Ganges, 2021, p. 114)

The Spanish telegraph was strictly for governmental use; therefore, the building geared towards functionality over any other aesthetic consideration. While a tool to maintain the status quo, the towers were not explicitly conceived as a visual, overt symbol of power. This approach translated in sober constructions, without ornaments or any distinguishing features that cannot be ascribed to constructive requirements or necessities for its everyday use. However, since the goal was to build a large number of stations for concurrent use as quickly and as cheaply as possible, there is a unique, distinctive typology with only a few variants. The result is that the optical telegraph towers have retained a recognizable image that gives them a unique identity and reinforces their value as parts of a greater whole.

The basic model had a square plan and three storeys. Their height was on average around 9.47 m, totalling 15.32 m when including the signalling mechanism (Santos y Ganges & Lalana-Encinas, 2021). Operators accessed the tower from the first floor using a mobile wooden staircase. The ground floor housed the residential activities[11] with a cot and a small kitchen, while the second floor housed the work area: the pulleys that actioned the mechanism and created the line of sight with the neighbouring towers.

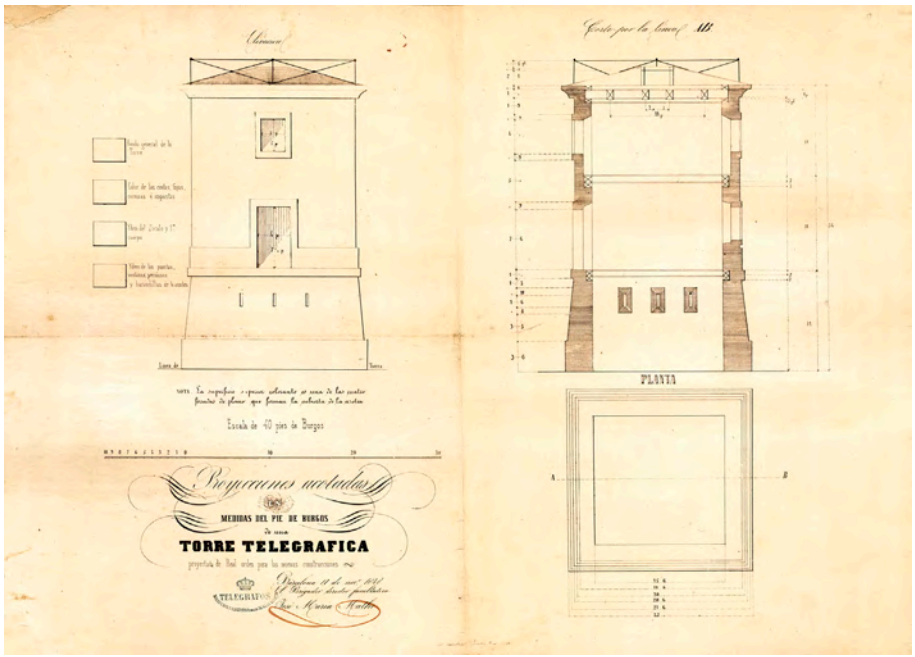

Figure 7: Project of November 17th, 1848 by the brigadier Mathé: "Proyecciones acotadas en medidas del pie de Burgos de una torre telegráfica proyectada de Real orden para las nuevas construcciones". (Santos y Ganges & Lalana-Encinas, 2021)

Despite the unified design, there were several variants. Some of these variants responded to the characteristics of the environment and included differences in shape —quadrangular, trapezoid or rectangular—, overall height[12] or materials of constructions —stone, brick or mixed— (Cruz Pérez,

[11] Not every operator resided in the tower, as families were not allowed to do likewise. It was also common for the two assigned operators to trade shifts so that each would be "on-call" for 24 hours (from midday to midday) and sleep in the building (Olivé, 1990, p. 84).

[12] Some exceptions include towers with only two (Tolocirio) or four storeys (Valladolid), but these were exceedingly

2014, pp. 38-41). Other variants were the result of experience; for instance, there is a noticeable change between the Castilla Line and the two that would follow. The former were "approximately 12% larger than those from 1848. […] The second floor had the same distribution as the first floor, with openings 2.1x1.1 m wide on each wall" (Santos y Ganges & Lalana-Encinas, 2021), while towers in the Andalucía and Barcelona lines presented two solid walls and decreased the width and height of the openings on the second floor on the façades that faced the neighbouring telegraphs[13].

2.3 Conservation Conditions

The optical telegraph coexisted for a few years with the electric telegraph but was officially closed down in 1857. Though a few stations in the Basque Country would be put back into service during the third Carlist war (Ortiz de Urbina Montoya, 2005, p. 174), for the most part the personnel was quickly folded into the electrical telegraph workforce (Olivé Roig, 1990, p. 59) and the old buildings were abandoned and mostly disregarded. This dismissal is apparent in some of the transactions that would take place over the next century. For instance, the notice of sale of the tower of Cabezón de Pisuerga (more importantly, its plot of land) had to clarify that the State:

> "…ha estado y esta en pacifica posesión de la misma por haberla construido de su cuenta, aunque no se ha encontrado titulo escrito de su propiedad, ni aparece esta inscripta en el Registro correspondiente…" (Provincial Historical Archive of Valladolid, [verbatim reproduction], exp. 1349/123)

The few actions undertaken would be almost entirely down to private stakeholders so that some of the towers would be converted to residences or pigeon-lofts, or else they were musealized by larger investors, such as Fundación Telefónica or the Government of Navarra[14].

Over half of the towers throughout the territory have disappeared (Cruz Pérez, 2014, p. 34). In the Castilla Line, only 20 out of 52 stations remain to some extent; on those that still stand, several fundamental changes have occurred over the years of abandonment. The original whitewash is almost completely gone. The elements made of wood, such as the roofs, floors and stairs, have disappeared, leaving only indents in the walls to inform us of their presence. The metal pieces, including the mechanism and pulleys, did not survive long, as they were often sold or plundered to melt them down.

Likewise, the structure of the towers has suffered. Stone towers were dismantled to reuse the material. Brick towers were less stable, and without the floors bracing the walls, they have begun

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rare.

[13] This particular change was likely related to the fact that optical towers did not use glass panes to protect the interior, but only wood shutters that were only affixed when the station was not in operation; that is, at night. During the day, operators were unprotected from wind drafts or rain. (Garces Desmaison, 2014, p. 125)

[14] These investors have sponsored integral restorations, respectively, in Adanero (Ávila) and Basalen (Navarra).

to sag and crumble.

2.4 Environment Conditions

Emplacement and environment were key factors in the design of the optical telegraph. In his *Histoire de la télégraphie*, Ignace Chappe (1840, p.132) warned that «le choix des positions exige spécialement de l'habileté, une grande attention, et assez de temps pour s'assurer, par l'expérience, de celles qui paroissent douteuses.»

The location of each station had to answer a series of technical concerns while remaining cost-effective. Primarily, "it was necessary to ensure a visual correlation between neighbouring stations, and protect the integrity of the message by protecting the operators within the station. Though the operators rarely inhabited the tower, it seems that accessibility or quality of life were not significant factors of design" (Lalana-Encinas, 2021, p. 4). This characteristic will be an essential consideration for its management.

On the matter of visual correlation, that is, intervisibility, Mathé's relay system had an advantage over its contemporaries, as it did not need to be at a perpendicular angle to the line of vision. However, that orientation was preferred to reduce the margin of error and prevent blinding by the sun (Schnell Quiertant, 2005, p. 68). Hence, almost every trio of towers in the Castilla Line forms an obtuse angle; the only exception is Altsasu, in the Basque Country.

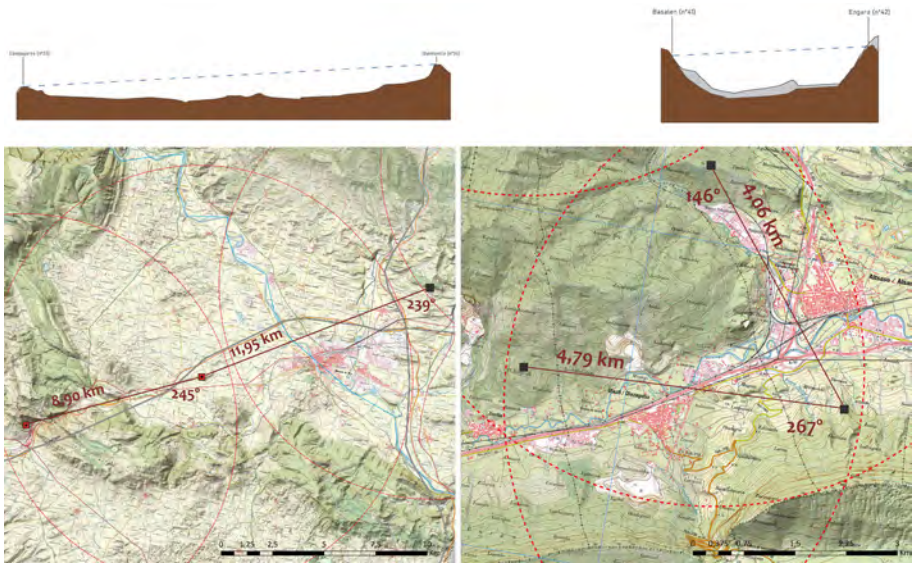

Figure 8: Alineations and distances in the towers of Campajares (Burgos) and Basalen (Altsasu). (Lalana-Encinas, 2021)

Distance between stations was also a powerful constraint. The Real Orden of 1844 had proposed an average distance of 11,2 to 16,7 km (Olivé Roig, 1990, p. 62) however that was rarely followed in practice. On the Castilla Line, average distances ranged between 4 and 17 km. It is also possible to establish a clear correlation between the associated landscape, its geomorphological and climatic conditions and the variations in the average distance between stations.

Telegraph tower	Associated landscape	Average altitude (m)	Average distance (km)
01 - 04	Cuenca del Tajo	756	7,2
04 - 10	Sistema Central	1201	10,8
10 - 30	Cuenca del Duero	871	12,1
30 - 40	Cuenca del Ebro	693	10,3
40 - 46	Montes Vascos	606	5,0
46 - 49	Montes Vascos	408	6,6
49 - 52	Montes Vascos	133	9,0

Figure 9: Average distance of optical telegraph towers according to their general location. (Lalana-Encinas, 2019, p.54)

There were several other considerations related to the environment to consider:

- The bearing capacity of the ground, as the towers had relatively shallow foundations;

- The presence of vegetation, whether high vegetation that interrupted the line of sight or low vegetation that could compromise the operators against unexpected attacks;

- The relative altitude as "too low altitudes would affect intervisibility by increasing the number of obstacles […]; too high altitudes carried a greater risk of adverse weather, and the presence of steep terrain increased the risk of accidents" (Lalana-Encinas, 2021);

- The presence of infrastructure in the vicinity as traffic was an efficient security measure in itself (Schnell Quiertant, 2005, p. 68).

3. Paradigms and Methodology

3.1 The "I" in Heritage Management

The previous chapter has explored the historical and physical context of the stations of the Spanish optical telegraph. While that is, as already established, an important step to understand their needs, it is not sufficient on its own. Just as there is a need to articulate "why" and "how" heritage and cultural landscapes should be interpreted and managed, it is even more important to consider "who", or rather, "for whom" this would be advantageous (Mason & Avrami, 2000, p. 23).

We may appreciate cultural sites for their own sake or by virtue of their history; however, this intrinsic value is neither the only nor the best measure for its importance. Regardless of academic considerations, a site may be valued because it inspires a reaction, because someone, an individual or a group, has come to associate it with their well-being (Luginbühl, 2011, p. 56). Instrumental value is just as significant as the intrinsic characteristics of the heritage site and must be given the same level of attention when drafting a management strategy or plan.

Furthermore, while instrumental value does not entirely depend on the internal characteristics of the heritage object and often will not be unique to it, that does not mean that possessing instrumental value reduces the significance of the site. Ultimately, "to be valuable *for the sake of* something else does not entail that this object is valuable *as a means to* something else" (Dorsey, 2012, p. 139). If a site contributes to the identity of the place, if it acts as a point of attraction for visitants, if it adds aesthetic appeal—if, in short, people stand to gain by interacting with it on their own terms, those aspects must be considered.

Accordingly, an unavoidable question is whether there is a collective memory related to the site. As the optical telegraph was closed in the late 19th century, some of the more habitual subjects of memory in industrial heritage are not present. There are not former workers that can relate to the optical telegraph as an element of their everyday life, and it seems unlikely that many stories of that kind have been passed down the generations[15]. However, the population may still possess emotional ties to the tower. We must ask ourselves: is it a recognised landmark? Do people visit it still? Did they play there as children? In one of the case studies, the tower is depicted in the heraldic shield and remains a familiar sight during leisure walks. In others, there is a more distant awareness of its existence. In any case, that relationship between the station and the village keeps the former an active entity in the landscape, adding considerable diversity and character.

Even in cases without a direct, active connection between the inhabitants and the site, it does not follow that devising a management framework is meaningless. The sites can still generate benefits, whether social, cultural or even economic benefits; as Dorsey (2012, p. 139) indicates, "something can possess instrumental value without being valued as such". After all, the potential of the optical telegraph sites as storytellers of the past and creators of identity remains.

This fact is best exemplified in the case of Tolosa, where the tower[16] was abandoned for decades after its decommission. Vegetation grew, rendering it inaccessible and divorcing the site from the inhabitants' awareness of the landscape. Yet, it did not remain forgotten. Starting in the summer of 2006, Kutxa and the Environment Department of the City Council spearheaded the *Auzolandegiak* program, which called for young volunteers to clean and rehabilitate[17] the site (Goikoetxea, 2006; Arandia, 2011). The program ran every summer for several years and expanded to include the route of Santa Lutzia-Uzturre. In addition to the rehabilitation efforts, unified signage was designed and

[15] A demography that can usually relate is composed of people who worked or had parents or grandparents employed on the electrical telegraph. That was the case, for instance, of Sebastian Olivé Roig, who expressed that his interest in optical telegraphy came, in part, from his years in the telecommunications workforce.

[16] As well as other heritage elements in the Uzturre area, like an old watermill and the Hospicio de la Misericordia

[17] An anonymous volunteer during the first year remarked that among the tasks were "many things, such as muchas cosas, como clearing undergrowth, removing many stones, erecting and dismantling scaffolding, cutting trees, brooming..." (Goikoetxea, 2006. Translated by the author.)

implemented, strengthening the ties between the entities of this particular landscape, both cultural and natural.

Nowadays, the site is very well known and frequently traversed by the inhabitants of Tolosa; despite having lost a great deal of material and structural integrity, it has been fully reclaimed as a valuable part of their cultural identity.

Figure 10: Left: Volunteers performing conservation tasks in the tower of Tolosa. (Arandia, 2011). Right: Current signage in the Santa Lutzia-Uzturre route. (Photographs by the author, 2021)

This experience shows that the overall value of heritage elements without readily apparent benefits to their landscapes can be improved by the process of reclaiming them or, at the very least, by rediscovering them; that is, by finding a way to engage a group of people into taking an active interest in their continued existence. In some cases, this successful recovery after the initial degradation process may even be considered a point of added value. By turning the heritage object's survival into a success story, we may find that:

> "As with memories, relics that were once abandoned and forgotten may come to be more treasured than those that are in continuous use; discontinuity in their history draws attention to them, especially if scarcity or fragility threatens their imminent extinction." (Lowenthal, 1993, p. 349. Translated by the author.)

In short, experts (archaeologists, architects, historians) must avoid the trap of considering intrinsic value as an incontestable point of interest. Doing so will ultimately encumber intervention and socialisation efforts, as that mindset moves the heritage object to a different plane of discussion. It is vital to keep the debate away from rhetoric that won't interest most agents and stakeholders. While there is a place for academic, historical or scientific significance in heritage management, and indeed exploring these avenues is non-negotiable for restoration efforts (Azkarate Garai-Olaun, 2002, p. 59), removing the "I" —or "we"— from the subject of intervention is unacceptable.

In the end, preserving heritage sites has to do with public appreciation (Criado-Boado & Barreiro, 2013, p. 11) rather than official recognition. Without public awareness and support, the result may be a perfect intervention[18] from a technical point of view; but it will, at best, go nowhere and serve no one.

3.2 From Value to the Valuing Process

If the survival and sustainability of a cultural site are contingent on the subjective interpretation of a group of people, it stands to reason that the process of maintaining its significance cannot be approached as a rigid, linear set of regulations. The management framework must remain flexible and, while it should be transferable between similar entities —such as the stations of the same network— it must still consider the particular circumstances of each site (Mason, 2002, p. 16). Thus, heritage management benefits from using value as dynamic, evolving potential. That is not a new concept, though it is not a widespread practice.

Identifying values and instigating the valuing process by setting internally coherent guidelines allows experts, not to find an objective, scientific truth, but rather to set all stakeholders on the same level and speaking the same language. Value becomes useful in heritage management when it becomes a lingua franca that enables open discussion regarding fair and acceptable intervention results (Mason & Avrami, 2000, p. 23). In this sense, whether value is intrinsic, instrumental or contextual to the site, it is better to consider it a tool that must be fostered rather than simply a characteristic to be found.

By interpreting value as an action rather than a static condition (Criado-Boado & Barreiro, 2013, p. 9), we are better equipped to understand the variables at play, from the historical and geographical patterns to the social processes (Mason, 2002, p. 14). By understanding and assessing the heritage sites and their context(s), we are more prepared to craft an effective management framework that can be proactive, not merely reactive. The valuing process likewise becomes more sustainable and efficient, as planners are less likely to be blindsided by unexpected issues and have a stable ground so that they can adapt to the unexpected by following a pre-established logic. Subsequently, this renders the intervention more manageable and contributes to its longevity, as it also protects its resilience in the face the inevitable changes in perception, interests and objectives of the various stakeholders.

When value is interpreted as an evolving by-product of the relationship between stakeholder perception and the condition of the object and its landscape, inseparable from the "character and spirit of the place" (Luginbühl, 2011, p. 56), the management framework must work to introduce internal order, hierarchising and setting priorities for intervention.

[18] That isn't to say that it should be avoided. Rather, though punctual intervention in the constructive fabric will almost be always necessary, it will rarely, if ever, be sufficient if it is done in isolation.

Analysing the circumstances of each site through this established framework is extremely relevant, as they will inform the future strategies and policies that will prove most effective. In the case of the optical telegraph towers, that is reinforced because the question of the site's significance leads back to the paradigm established in the first chapter: that each of them is not an isolated building but belongs to a linear infrastructure. Through this fact, evidenced in the design, emplacement and intervisibility, the sites acquire additional meaning. Even those stations in considerably more vulnerable positions (i.e. inaccessible, unknown) can extract benefits from acknowledging that they belong to a larger ensemble.

The duality between station and network is an important distinction to consider. The more an optical telegraph site can rely on its immediate environment, architectural stability and socio-economic context, the more ties it can sustain with its inhabitants, and it will be stronger for it. While this state of affairs does not render its position within the network irrelevant, it does reduce its dependence on it. In contrast, sites that have not been able to maintain this relationship are now much more dependent on the network's existence. The weaker elements can only survive by relying on their reality as part of an ensemble. In those cases, intrinsic value is significantly weaker. Instrumental value and the valorisation and socialisation processes represent their best chance for survival.

3.3. A Systematic Approach to Intervention

3.3.1 Methods for understanding, identifying and valuing the sites

Heritage management as a continuous, cyclical process is not a new concept, but neither is it generalized. In practical terms, it seeks to establish an understanding of the idiosyncrasies of the object of study, moving the focus away from the end result to ensure the heritage object's significance will be respected:

> "Too frequently, importance is attached to a specific outcome or destination (a "plan"), while the process for achieving that end (the "journey") is undervalued or overlooked. The process in and of itself always yields benefits that go beyond any specific outcome" (Demas, 2000, p. 28).

To undertake that journey, I have drawn from three complementary approaches that have informed the evaluation. In the first place, Felipe Criado Boado's heritage value chain. Originally based on Porter's value chain model for economic analysis, it sets a standard for evaluation made up of interconnected links that feed from each other and from stakeholder input. While not all of the steps must be developed at any given project—this paper will focus on identification and valorization— they should all be considered during the process (De la Fuente Arana, 2014, p. 24). Social perception is one of the main values of heritage. The focus is not to educate people so that they desire conservation. Rather, what should be sought is to establish methods for a discourse (Criado-Boado & Barreiro, 2013, p. 12).

The vital importance of correctly identifying the factors that affect a heritage object, assessing cultural significance and keeping the process relevant for the stakeholders at all levels of the management project is also a key consideration in the Burra Charter. The Burra Charter process dedicates half of its length towards fostering understanding in experts before even beginning to develop policies and strategies for resource management and monitoring and calls for open communication with local communities at all times, before and after direct intervention.

Finally, attention should be drawn to Randall Mason's planning process methodology. It is more detailed than the other two since it is directed towards intervention; however, it touches on many of the same milestones. Assessment of the place —whether it is of its physical condition, cultural significance or management issues— becomes the core of the process, as it is the foundation of every policy to come. Public perception must be considered in every step of the process as "stakeholders do the valuing" (Mason, 2002, p. 17).

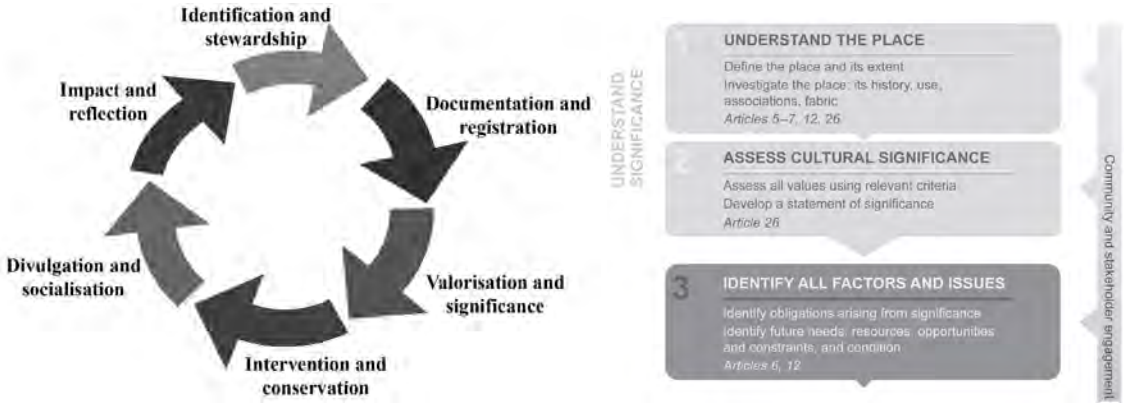

Figure 11: Left: The heritage value chain. Translation by the author. (Azkarate Garai-Olaun (Coord.), 2014, p. 607). Right: The first part of the Burra Charter process. (Burra Charter, 2013, p. 10).

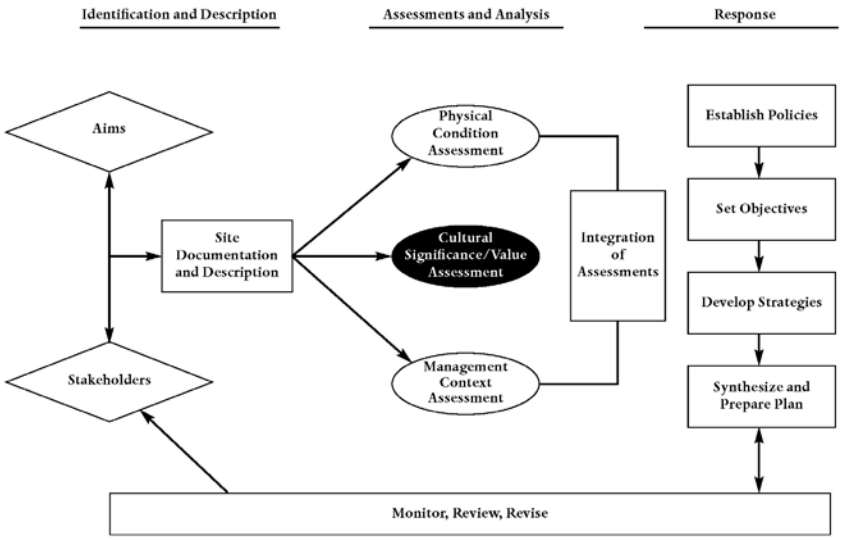

Figure 12: Mason's planning process methodology. (Mason, 2002, p. 6).

To centre the narrative, this paper will not focus on every station in the network. Rather, an effort was made to choose relevant sites within the Castilla Line, whose results could provide a valid

point of comparison. The logic for the selection of these cases, in Navarra and Palencia, will be explained in chapter 4.

Since the goal was to understand these sites within their current cultural and physical context, I could not gather information exclusively through deskwork; an important part of the assessment was done through direct observation. At this point, data gathering and further interpretation were inevitably influenced by my education. I explored the sites with a view towards design and potential intervention. The stations interact with their environments; reaching them is always an active choice. As such, a crucial aspect of their value rests in visitor perception[19]. What do people see as they reach the tower? What do they feel as they leave?

Intervention on optical telegraph sites should not only consider the tower and its environment. It should also study the process of arrival and discovery. That is because, as will be seen in chapter 4, each of the site's characteristics impacts the experience at several points during the travel—what Gordon Cullen typified as Serial Vision. While Cullen specialized in urban design, serial vision is a concept that can be extrapolated to cultural landscape management by analysing the elements that are already present and their potential to be arranged into a stronger, more dramatic narrative. In that sense, what experts should seek is the basis "to manipulate the elements […] so that an impact on the emotions is achieved" (Cullen, 1961, p. 11).

The first step, then, is the identification and analysis of the foundation for intervention. Experts must identify the physical and cultural conditions of the sites that will set the basis for a transferable and flexible management framework.

3.3.2 Identification of variables for assessments of value

The process of choosing and identifying the variables relevant to the valuing process is not purely objective. If the object is to understand the site then heritage management is an interpretative practice from the beginning (Criado Boado, 1996, p. 75). However, it is helpful to refrain from performing a values survey at this stage. Instead, the assessment should focus on establishing which elements could potentially influence the overall image (De la Fuente Arana, 2014, p. 107).

Cultural landscapes are a complex, holistic being; so are the entities that compose them. Therefore, the assessment variables must encompass very different aspects of the object of study. It is not enough to investigate from a single discipline, with one strict set of priorities.

19 This concept has been illustrated in the photographs included in the 'access and environment' sections on pages 31-32 and 42...

> "4. The object must be characterized by its multidimensional (history, morphology, phenomenology, sociability and symbology through a decidedly transversal and multiscale approach avoiding the predominance of one single disciplinary focus." (Seville Charter, 2019, p. 25)

> "5.1 Conservation of a place should identify and take into consideration all aspects of cultural and natural significance without unwarranted emphasis on any one value at the expense of others." (Burra Charter, p. 4)

On all levels of heritage management, we must use a multidimensional, transdisciplinary approach, which must be clearly reflected in the aspects that will be the subject of close examination. These aspects lay at the basis of the valuing process and, in turn, the framework for management, intervention and maintenance.

Over the development of this paper, I considered a wide variety of indicators with several levels of specificity and redundancy. Some of the conditions that had to be studied during the process were self-evident, such as the state of conservation; they have remained consistent during the study. Other indicators were considered and discarded because they were either redundant or had little bearing on the overall evaluation; this was the case of the visual catchment area, which was eventually folded into the aspect of internal and external visibility. Yet other indicators were originally dispersed and were fused to form a more cohesive narrative. For instance, the degree of social and scientific recognition was integrated into the broader category of public perception, which would include the values most relevant for future socialization and divulgation efforts.

To summarize, the indicators eventually coalesced in five aspects that covered the physical, cultural and social characteristics of the site and were significant enough to stand on their own and be relatable with the others; in this way, it is possible to create a useful narrative. The aspects are context, access and environment, internal and external visibility, materiality and conservation and public perception.

Context

A site cannot be assessed in isolation; it must be examined within a larger context (Demas, 2000, p. 38). This aspect will study the social and physical characteristics of the area —particularly the municipality and associated population centre— as they affect several management related issues. Memory and cultural significance depend on the existence of people that remember now and in the future. They are affected by the physical conditions that create a specific scenario where memory and significance will unfold. Finally, municipal and regional context gives experts information regarding the legislation and large-scale stakeholders that may support future intervention measures.

Thus, the valorisation will assign a higher quotient to highly populated municipalities with a large proportion of people in the young and adult age brackets, as they provide better services and may be able to attract more visitors to the sites.

Access and environment

The job of a telegraph operator was a thankless one. It involved considerable privations, long working hours and low quality of life[20]. Furthermore, access to the stations was hampered by the steep terrain, the distance to the populated centre and the low light, as working shifts started half an hour before sunset and often ended after dusk (Olivé Roig, 1990, p. 82). Accessibility and image were not a factor in the original design; indeed, they took a decided second place after ensuring transmission security by making the towers unassailable.

That is not the case today. The more unassuming a site is, the more challenges it will face to remain relevant and impact its landscape in a meaningful way. While this section will only analyse the material conditions of access (i.e. signage or paths), we must acknowledge the critical role played by the visitor as the subject. The experience of reaching the tower, how that changing (serial) vision is perceived, which emotions are encouraged[21], will be crucial for a successful intervention.

Likewise, a site that is out of the trodden path may still generate a valuable narrative. For instance, it could be reinterpreted as something that the observer has to discover and thus engage them in an exciting and more active role.

The value quotient considers ease of access and visitor engagement, accounting for physical and visual barriers that may hinder or discourage visitors. Other factors taken into account include the distance from the nearest population centre; the slope and width of paths and whether they reach the foot of the tower; the presence of vegetation and the presence of signage.

Internal and external[22] visibility

Ensuring intervisibility between towers was the main challenge for the optical telegraph towers. Several physical factors affected it, such as the climate and the topography. These factors, in turn, determined the distance, alignment and relative altitude of the sites, which were selected to ensure that there was an uninterrupted line of sight.

Nonetheless, while the stations were visually connected during the period they remained in use,

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[20] According to Olivé (1990, p. 82), between thirty and forty operators and other staff died in the decade the optical telegraph remained in use due to illnesses, accidents and adverse weather conditions.

[21] The changing experience while arriving at the tower will be complemented by the conditions of visibility, as in some cases the sites will be a lookout point for the territory.

[22] Internal visibility refers to the direct line of sight between stations that was the key component of their design and, consequently, their legibility today. External visibility refers to the views from the site towards the landscape and vice-versa, which impacts the approach, relevance and public perception of the sites today.

that is no longer assured today. The deterioration of the buildings and the growth of vegetation have changed the characteristics of their environments. Furthermore, while this is a change that must be acknowledged and must always be present in the management process, it cannot be simply reversed.

Chapter 2 briefly touched upon the functional issue of distance regarding visibility between sites. Cost efficiency called for reducing as much as possible the number of stations. Since the operators used a telescope to keep the towers within sight, distance was a variable that depended on the terrain —homogenous reliefs permitted longer uninterrupted visual connections— and the climate —rain, sleet, mist and other atmospheric effects that reduced the amount of sunlight.

Towers that still maintain a line of sight with at least one neighbour are in the higher value tier. Below them are sites where there is no direct line of sight but where it is possible to understand its existence due to uninterrupted views of the landscape or visibility of the site in the distance. Sites that are neither visible nor maintain visibility with the landscape or other towers are the least exploitable category.

Materiality and conservation

The project designs of the optical telegraph towers in 1844 and 1848 specified the general constructive characteristics, such as the width, height and number of openings. They did not determine other aspects, chief among them the material of construction. Local constructors made the final decision, so it was influenced by their experience and the availability of the materials. Thus, though all the stations had elements built with wood —such as the floors and stairs—, the bearing walls could employ stone, brick or mixed materials (Santos y Ganges & Lalana-Encinas, 2021, p. 11).

The quotient is determined by the integrity of the remnants of the tower. Restoration works are evaluated on their respect for the legibility and authenticity of the place[23]. Significant structural remains are valued but lay at risk of further degradation. Visible and recognizable ruins are next. While none of the case studies belongs to this category, sites with archaeological evidence would still score above the minimum, as there is a material trace of the telegraph's existence.

Public perception and stakeholders

The previous sections in this chapter have assessed the sites' physical condition and territorial context. While this is required information for the development of an intervention framework, before trying to extrapolate results, it is necessary to consider cultural and collective values. What is the local discourse and memory regarding the sites?

[23] The evaluation has followed the principle in article 15.1 of the Burra Charter (2013): "The amount of change to a place and its use should be guided by the cultural significance of the place and its appropriate interpretation."

Formulating a proper strategy for heritage management would need a far more exhaustive approach than the object of this paper. Valorisation and socialization efforts would have to be carefully drafted, tested and redrafted. Citizen participation would have to be explicitly sought out, preferably following different non-exclusive formats (interviews, workshops, etc.), as "the core team is often the most knowledgeable about the site, while stakeholders can provide a broad understanding of the varied meanings associated with a place" (Demas, 2000, p. 39).

However, we can perform a first superficial analysis of the sites that can give the broad strokes of the challenges and allies present in each case and can serve as a foothold for further studies. In all cases, it seems like the old adage applies, and only those that are visually enticing have also remained in the public consciousness. That may also explain the difference between the French model surviving in memory and literature, despite their physical disappearance, and the Spanish model struggling to leave a mark even when its buildings endured, as the French mechanism was more visually striking than the Spanish model (Olivé Roig, 1990, p. 94).

The valuing process considers the degree of social and academic recognition at several scales, both individual and institutional. Local interest and initiatives are the most desirable factor. The interest of regional or national groups has been considered as well. Lastly, the interest of punctual agents such as tourists and hikers has been used as a gauge for current and potential engagement.

3.3.2 Integration of assessments and valorisation

After identifying the context and the characteristics of the sites, the next logical step to integrate value assessments into the planning process is to create statements of significance. In this step, what the expert seeks is "[to synthesize] the reasons behind all the actions one might propose for the site" (Mason, 2002, pp. 23-24).

In other words, to translate the existing conditions and identified values into the basis of an intervention and management framework, they should be evaluated as a coherent unit that allows for a general overview of the site's characteristics. In short, the aim is to generate an alternative view that "enables the socio-cultural profitability of the [heritage] element" (Criado Boado, 1996, p. 77).

For that reason, the five aspects previously identified (context, access, visibility, conservation and public perception) have been tabulated on a 1-10 scale. This scale simplifies the comparison between sites and between values within a site because it sets them on a similar level. In this way, it is possible to draw attention to their comparative strengths and weaknesses. That, in turn, will assist with setting realistic objectives and developing policies that are relevant to each site and can be transferred —with minor modifications— to other points in the network.

MEANING OF THE ASSIGNED VALUE QUOTIENT	
1	The conditions are extremely poor. On initial consideration, there are no positive qualities regarding the studied aspect. Intervention will have to address this aspect as a disadvantage and search for palliative solutions, if possible.
2	The conditions are very poor. There is some potential to ground the basis of an intervention strategy, but there are no active strengths. Legibility is not possible without aid; integrity and significance are very compromised.
3	The conditions are poor. There are one or two redeeming features, but the studied aspect has a clear negative impact on the site's resilience.
4	The conditions are poor. There are a few significant strengths, but they may not be significant enough to counteract the risk factors. There are clear weaknesses and deficiencies that hinder the legibility of the site or reduce its significance.
5	The conditions are good. There are strengths and weaknesses that are roughly equivalent. There is potential that can be capitalized on at several points during the management process.
6	The conditions are good. There are clear strengths and the aspect has a definite positive impact on the site. There are several weaknesses or compelling risk factors that must be addressed urgently during the management process. Legibility and significance are reduced, but can be improved relatively easily.
7	The conditions are very good. However, there are significant risk-factors or a major weakness that is threatening the integrity of the site. Corrective measures should be taken, but are likely not urgent. Legibility and significance are preserved nearly intact.
8	The conditions are very good. There are one or two significant risk factors. Alternatively, there are aspects that are inadequately addressed or may be very difficult to integrate in the intervention framework. Legibility and significance are preserved nearly intact.
9	The conditions are very good. The site has several strengths and only minor or unavoidable weaknesses that restrict potential intervention measures, such as the possibility of universal accessibility or lack of visibility without magnifying lenses.
10	The conditions are exemplary. There are no major weakness and clear strengths that should be harnessed during intervention. Legibility, significance and integrity are clear, and the evaluated asset has a positive impact on the other aspects on site.

Figure 13: Correlation of value quotients (Elaborated by the author). Note: It is not possible to make a universally applicable formula. This overview needs to be adapted to the nature of each aspect;. As a result, the correlation will be easier in material aspects, while perceptual ones require further interpretation.

To better interpret these quotients, I have incorporated them into a Kiviat diagram specific to each of the five sites. These diagrams are particularly suited for multivariate statistics, as they allow for several variables —in our case, the selected five assets— to be displayed simultaneously.

On analysing the diagrams, the ideal situation would be a) a large footprint, as higher quotients are associated with site strengths, and b) a balanced one where all axis are comparatively equal, as that means that the site's management will have more resources to establish a multidimensional approach. As section 4.4 will explore, that has not always been the case.

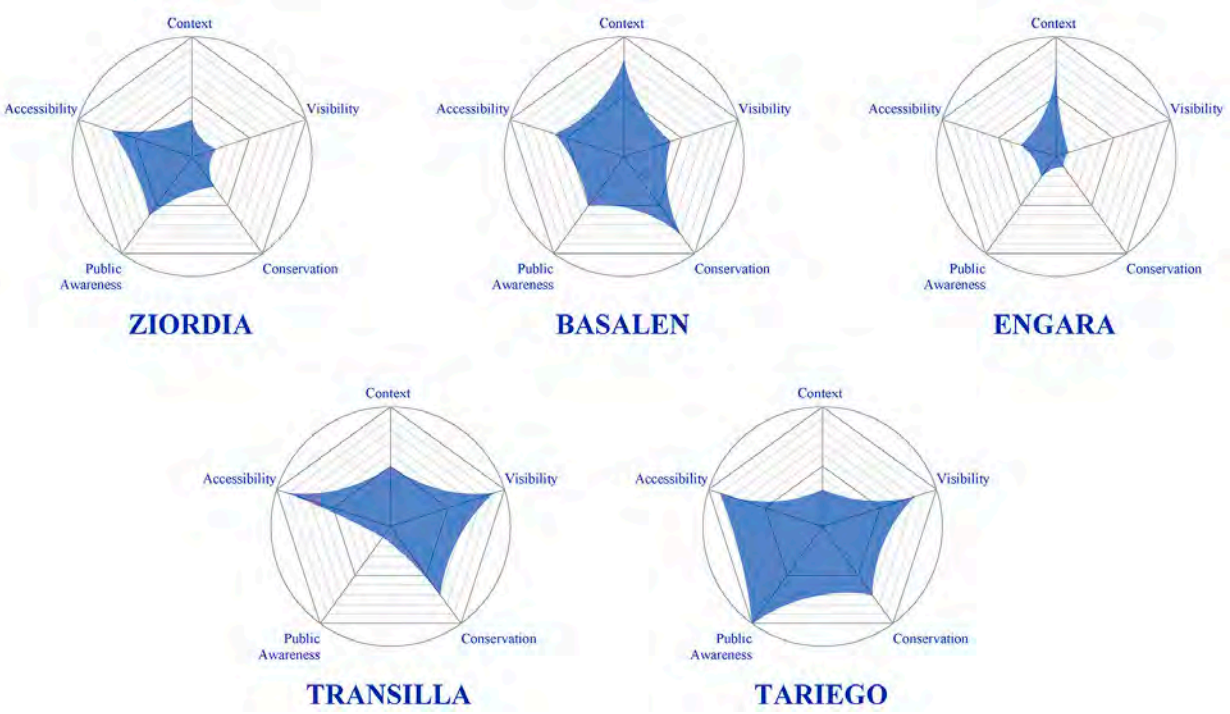


Figure 14: Kiviat diagrams of the five sites within the case studies. (Elaborated by the author).

4. Characteristics of the Case Studies

4.1 Logic of the Selection

Nowadays, the sites that still host the remnants of an optical telegraph tower as a visible presence —and therefore where the stations can more easily impact their landscapes— are in rural areas. The unique characteristics and dynamics of these areas affect them. These sites cannot be understood without understanding their context, both as part of a communication network and as an element of their associated landscape.

This underlying premise is at the base of the selection and analysis of the cases. As indicated in section 3.3, these sites were chosen with the intent to extrapolate conclusions from the resulting data. Therefore, the chosen sites present considerable variations that nonetheless are within the range that can be found in the network. They range from well-preserved structures to entities that have almost completely disappeared; from sites widely recognised by the population to largely forgotten ones; from accessible to non-accessible towers; more or less distant from the population centre; from highly visible to completely hidden.

As intervisibility is a key factor of design, another condition in the selection was that not only the chosen sites but also their neighbouring stations should contain recognizable elements; hence, the sites are categorized in two groups according to their location. While that connection between stations is not always visible today, the ruins in each group still coexist in a relatively small area and fall under similar jurisdiction so that they can potentially interact with each other.

The first case refers to the group of towers of Ziordia (No. 40)[24] , Basalen (No. 41) and Engara (No.42), located in Ziordia and Altsasu (Navarra). The second case refers to the towers of Transilla (No. 20) and Tariego (No. 21), located in Dueñas and Tariego de Cerrato (Palencia).

4.2. Case 1: Ziordia, Basalen and Engara (Navarra)

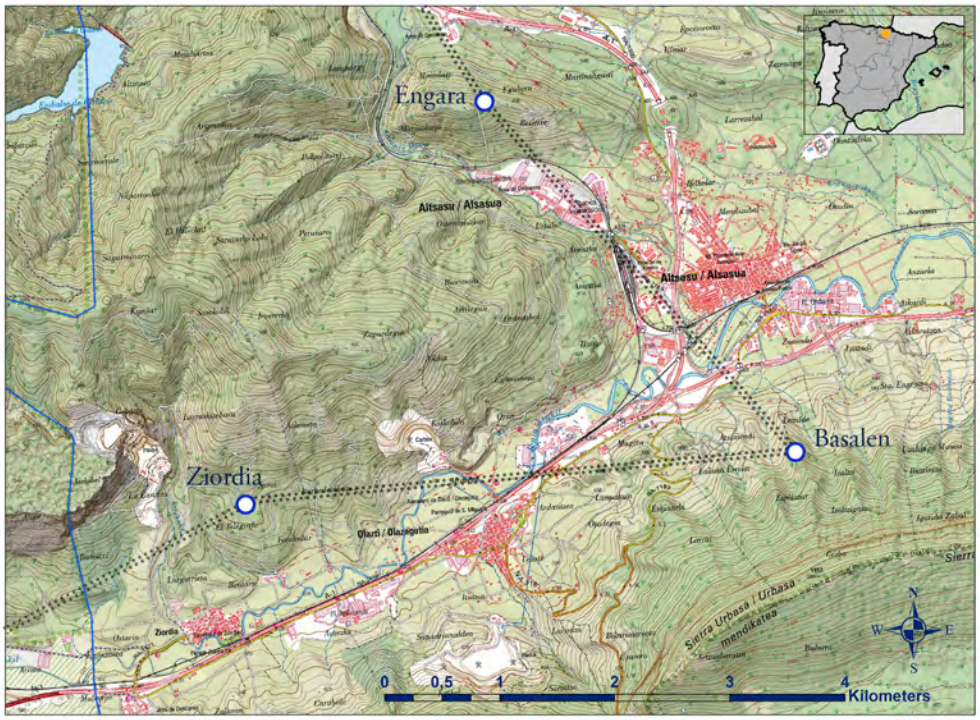


Figure 15: Emplacement and disposition of the stations in the first case study (Elaborated by the author). Note: the base map uses the MTN-25 of the Centro Nacional de Información Geográfica (CNIG).

4.2.1 Socio-political and physical context

The three towers in the case study are the only ones located in the Comunidad Foral of Navarra. Both Basalen and Engara are in the municipality of Altsasu, while Ziordia is in the eponymous municipality.

In 2020, Altsasu had a population of 7645 and showed only a mild decline over the last decade. This case is an outlier in the present study[25], as most remnants of the optical telegraph are located in areas with small, aged populations. Ziordia conforms to this pattern, as it has a population of 350 that has been rapidly diminishing in the last few years.

[24] The numbers ascribed to the towers throughout the work are part of their official designation. They are used in a variety of sources, including Olivé (1990), Cruz (2014) and Ajamil (2014).

[25] It is not, however, the most populated settlement. The figures for all the sites with visible remains in the Castilla Line are included in section 5.2; refer to page 56..

Regarding population ageing, less than one in five inhabitants (19.05%) in Altsasu is over 65 years old, while the largest group is the 40 to 64 years-old bracket (39.18%). The percentage of inhabitants over 65 is slightly below Navarra's average and very similar to the number of inhabitants below 16 years old (19.61%). In contrast, Ziordia's eldest age bracket is well above the province's average: over one in four residents (27.97 %) are over 65. While the percentage of adults between 40 and 64 is higher (34.75%), it nearly doubles the group of inhabitants younger than 16 years old (14.41 %).

Municipality	Population over 65	Municipal Average	Provincial Average
Alsasua	1423	19,05	19,96
Ziordia	75	27,97	

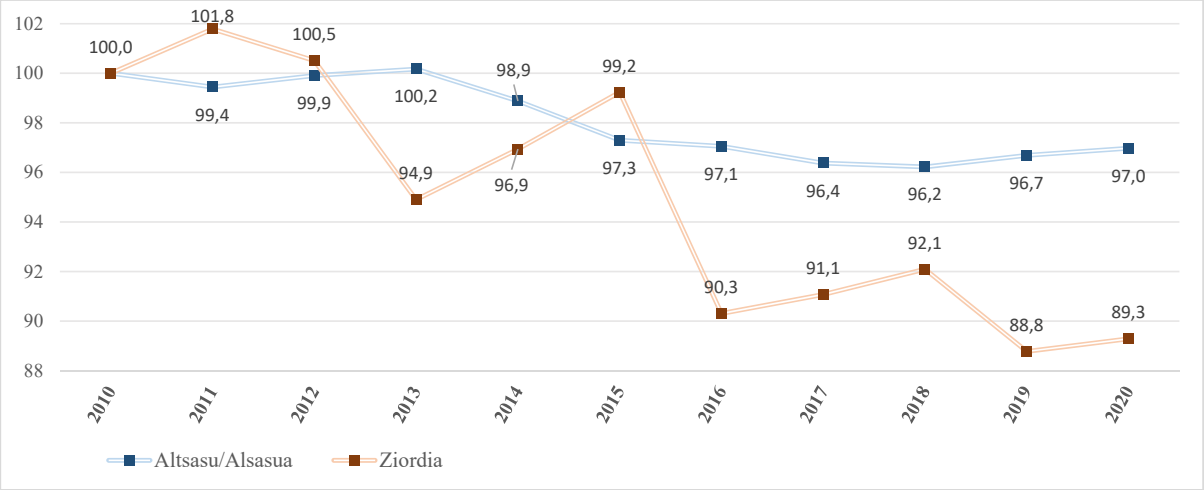


Figure 16: Population over 65 years old related to the provintial average in 2020 and evolution of the overall population figures during the last decade. (Elaborated by the author with data by the National Statistics Institute). Note: The comparison has been made using index numbers.

Other contextual factors that will repeatedly appear in the following sections are climate, vegetation and terrain. They affect several of the conditions on the sites, particularly intervisibility, access and perception; but also their materiality.

In the area of Altsasu and Ziordia, the terrain is steep, with large variations in altitude. They are located between the mountain ranges of Aralar and Urbasa, in the Arakil river valley. Thus, limestone was a common constructive material. The average annual precipitation[26] in the area is between 1226 and 1350 mm. On average, more than 120 days will have over 1 mm of rainfall, and more than 40 days will have over 10 mm. The average annual temperature is 10.5 ºC, and the average sunlight between 1800 and 2000 hours. As a result, visibility over long distances would often have been difficult and may have resulted in frequent interruptions on the network.

The land cover outside of urban centres is majorly deciduous forests. The principal tree species in the area[27] are the Cantabrian gall oak (Pulmonario Longifoliae-Quercus faginea S.) around Basalen and pedunculate oaks (Crataego laevigatae-Quercus roboris S.) in the opposite hillside,

[26] Data obtained from AEMet (Agencia Estatal de Meteorología).

[27] Data obtained from IDENA (Infraestructura de Datos Espaciales de Navarra).

encompassing Engara and Ziordia.

4.2.2 Access and immediate environment

Ziordia (No. 40)

The site is approximately 2.5 km away from the town centre, at 660 m over sea level (100 m above Ziordia). The climb is relatively easy, as the visitor can follow the wide dirt path that connects Ziordia and Altsasu for most of the way. The last stretch has a much steeper incline, and it is easy to miss without previous knowledge of the tower's existence.

The environment has changed drastically in recent years due to the mass logging of oak trees in the area, which stretches nearly to the foot of the remnants of the tower itself.

While there is no official signage related to the tower, the path to Altsasu already has signs and prepared routes to the Batueko and Belén fountains[28] nearby. While those depend on the municipality of Olazagutía and are not associated with the telegraph, they share similar cultural values. Accordingly, creating a unified approach for these sites, which are currently connected by sheer proximity and shared infrastructure, can benefit their continued survival and enrich the associated landscape.

Figure 17: Above: The Batueko and Belén fountains and their signage. Below: Approaching the tower of Ziordia from Altsasu (1), passing the Batueko fountain (2), reaching the site (3,4), abandoning the main road (5) and leaving towards Ziordia (6). (Photographs by the author, 2021).

[28] For more information, the Olazagutía City Hall has information on its webpage available at http://www.olazti.com/fuentes-de-batueko-y-belen/. Last consulted: 10/07/2021

Basalen (No. 41)

The presence of the A-1 highway limits the connection between Altsasu and the site. While it can be crossed at several points —including an underground passage near the gasoline station— it is a clear limit between the population centre and the Urbasa mountain range. However, there is no obvious trail; in some segments, only the tracking marks in the grass indicate the way.

The site is approximately 3 km away from Altsasu, at 670 m over sea level (150 m above Altsasu). The first part of the ascent is difficult. The incline is very pronounced, there are no clear markers or paths, and vegetation often impedes the wide. The second part is much easier; a wide dirt path leads to the foot of the tower and continues towards Labargain. The only signage is an information panel at the site and a sign indicating a regional trail of moderate difficulty immediately after crossing the highway.

The restoration project did not include a strategy for accessibility, leaving that responsibility to Altsasu's City Hall (navarra.es, 2020) after the works concluded in 2020.

Figure 18: Above: Regional trail sign and related post on the site. Below: Approach from Altsasu through a field (1), passage under the highway (2), path hidden by vegetation (3) or supplemented with boards on the ascent (4) and on the final segment near the tower (5). (Photographs by the author, 2021).

Engara (No. 42)

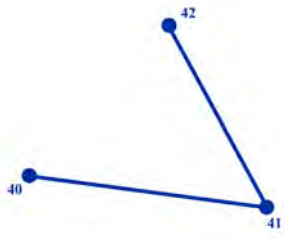
The site is approximately 2.5 km away from Altsasu, at 710 m over sea level (200 m above the population centre). The very steep incline and abundant vegetation significantly hinder access. While there is a path for the first stretch, the rest must be done off-road, without markers until nearly the location of the tower's remnants.

Though its present condition is challenging, there is also opportunity from a design perspective. With no visibility and a deteriorated state, the remnants of the tower becomes a mystery hidden in the forest. Intervention on the site should capitalize on that feeling of surprise and accomplishment on the part of the visitor.

Figure 19: Sign near the Engara site (joseimaz, 2019).

4.2.3 Internal and external intervisibility

Navarra's trio of towers is between 660 and 710 metres of altitude, in a location prone to rain and with many changes in the topography. This fact, coupled with the network's necessity to enter the valley at an angle[29], resulted in the shortest distances between stations in the Castilla Line.



Pair of towers	Distance (km)	Average distance in section(km)	Azimuth (º)[29]
39 - 40	4,00	10,30	258
40 - 41	4,79	5,00	267
41 - 42	4,06		146
42 - 43	5,28		138

Figure 20: Relation of orientation, angle and distance to determine the conditions of intervisibility between towers (Elabored by the author).

Ziordia (No. 40)

There has been a significant change in the Telegrafo hill since 2018. Due to the recent logging in its surroundings, the remnants of the tower are currently visible from the main path leading from Ziordia to Alsasua; however, its poor condition makes it hard to recognize unless the visitor knows it is located there.

[29] To show this factor the table shows the azimuth, that is, the angle of each segment of the line in relation to the North measures clockwise. Most concurrent segments show very small variations in azimuth, usually less than ten degrees. The three towers in Navarra have over a 100 degrees of difference.

Figure 21: Arriving at the tower of Ziordia (Photograph by the author, 2021).

The characteristics of the environment not only preclude visibility between the neighbouring sites and Ziordia but also hinders its legibility, as the line of vision is completely cut off after several metres in any direction. For that reason, it is difficult to picture the tower's function as it would have been during the period it remained active.

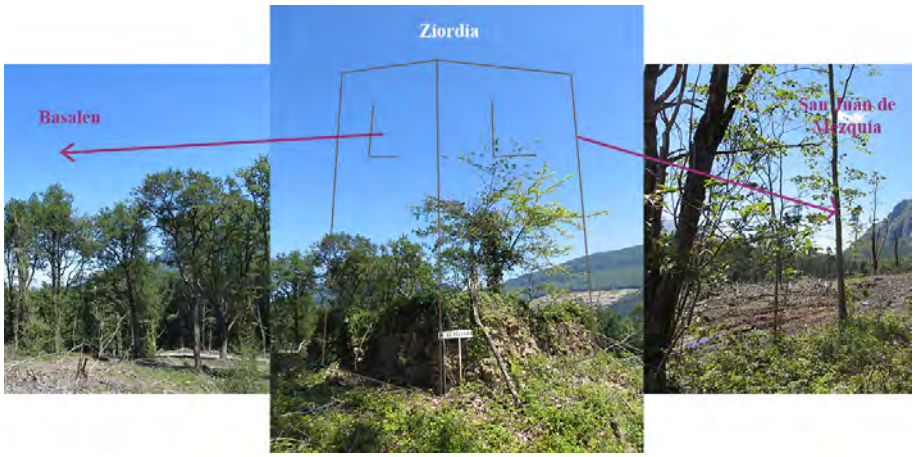


Figure 22: Intervisibility in the direction of the neighbouring stations from Ziordia. (Photographs by the author, 2021).

BASALEN (NO. 41)

There is no visual connection with towers 40 and 42, nor with Altsasu. Due to the steep incline and the vegetation, the tower itself is only visible for less than a ten metres radius in any direction, though there is a clearing that makes it easily identifiable from the path. There are no other visual landmarks during the climb, such as electric posts, to guide visitors.

Figure 23: Arriving at the tower of Basalen (Photograph by the author, 2021).

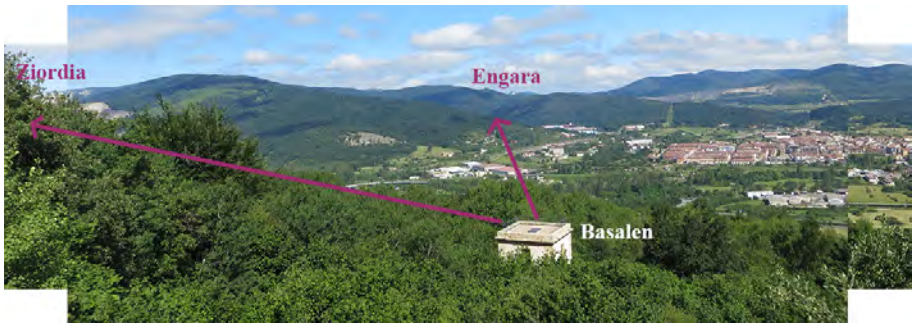


Figure 24: Intervisibility in the direction of the neighbouring stations from Basalen. (Photographs by the author, 2021).

On the other hand, there is a ringdove hunting stand immediately above the station, which allows for an unimpeded view of the surrounding landscape, including Alsasua, Basalen and the cement plant in Olazagutía.

Engara (No. 42)

The combination of abundant vegetation and deteriorated ruins means that the visibility in the Engara tower, whether internal visibility (between stations within the network) or external visibility (from the surroundings of the tower) is almost null. Though intervisibility is a condition of the network that should be considered and transmitted to the public during a possible rehabilitation effort, it has no bearing in the site's evaluation as it stands today.

4.2.4 Materiality and conservation

In general, the telegraph stations in the Basque Country and Navarra were constructed entirely with limestone, employing ashlar blocks in the more structurally demanding spaces —i.e. corners, thresholds, putlocks, impost lines, cornices and plinth— and rubble masonry on the other elements. That is the case on each of the three towers located in Ziordia and Alsasua. They did not seem to deviate from the norm in the area.

Figure 25: Façade of stone towers before whitewashing and common ailments. Left: Vegetation and loss of material in Ziordia. Right: Salt crust and loss of material in Basalen, before restoration. (Representation and photographs by the author, 2021).

While stone[30] has proved to be a very effective material for the resilience of the optical telegraph towers from a technical perspective, their survival has been less assured. In the Castilla Line, somewhere between 23% and 31% of the stations used stone almost exclusively (Lalana-Encinas, 2021); of those, eight still possess significant remnants today. That is because, though stone walls are structurally more suited to withstand the march of time and the loss of the secondary structure than brick walls, the material —particularly the ashlar blocks— could and in many case was taken for reuse in other buildings, resulting in major integrity loss (Lalana-Encinas, 2019, p. 94).

The main agent of degradation in stone towers is the biosphere, whether moss or the roots of small vegetation. Other ailments present in the three buildings —before the restoration of Basalen— include alveolar weathering, superficial salt crusts and loss of material, particularly mortar.

Ziordia (No. 40)

The tower of Ziordia was preserved integrally until 1956 when the City Hall moved to use the ashlar blocks in the village's pelota court (Zufiaurre Goya, 1987, p. 167). The site still contains ruins identifiable as having belonged to an optical telegraph tower. The building retains only part of the lower body; however, the putlocks are still clearly visible on three sides. The walls currently have an average height of 1.30 meters, and the interior is filled with dirt and small plants. There has been a significant loss of constructive material in approximately seven years, as Ajamil Baños (2014, p. 123) previously recorded a height of 1.80 meters.

The most dramatic negative change, however, is the mass logging of oak trees that has taken place in the last two years, and that has changed the environment immediately to the south of the tower from a lush forest to a steep dirt slope, almost to the very foot of the ruins themselves. New oaks are growing in the surroundings, but the impact on the site's wellbeing has been considerable.

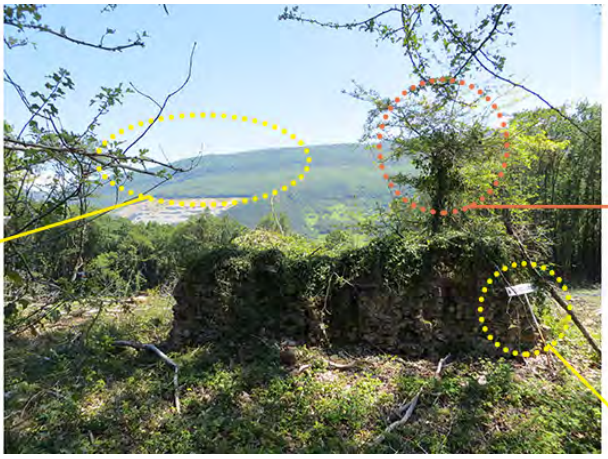


Figure 26: Current state of the site of Ziordia (Photograph by the author, 2021).

[30] Usually limestone in the area of the Basque Country and Navarra and granite in the area of Madrid.

Basalen (No. 41)

The tower of Basalen —locally known as "El Castillo"— is one of the few stations in the Castilla Line that have been the subject of an integral restoration[31]. The Government of Navarra and the Servicio de Patrimonio Histórico sponsored the restoration efforts in late 2019, with a project by Jose Luis Franchez Apezetxea[32].

Before the intervention, the tower of Basalen had been one of the better-conserved sites, as it maintained nearly all of its structural integrity despite the loss of the wooden and metallic elements. The greatest danger to the structure, prior to 2019, had been the creeping vegetation and the possibility of landslides that were adding pressure on the south-eastern façade while steadily resulting in ground erosion in the north-western side (Lalana-Encinas, 2019). A secondary but still present concern were the damages due to salinization and alveolar weathering.

Nowadays, the floors and interiors have been restored, along with several other measures. The walls have been whitewashed, though they already show chromatic alteration on the south-eastern façade, which receives less sunlight. The wall openings have been covered with woodwork. Finally, there is a metal staircase to access through the first floor, a trap door on the roof and a short metal railing on the top floor.

Figure 27: The site of Basalen before restoration. (Photographs by the author, 2019).

[31] The other restored buildings are Moralzarzal (No.5) Quintanilla de la Ribera (No. 34) and Martín Muñoz de las Posadas (No. 11).

[32] Jose Luis Franchez is an architect specialized in restoration, and author of El arte de construir: del románico al eclecticismo en la arquitectura navarra.

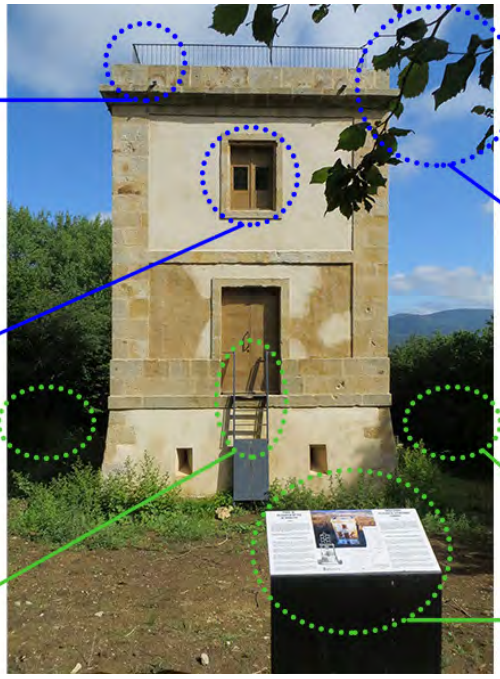


Figure 28: The site of Basalen after restoration (2021). (Photograph by the author, 2021).

Engara (No. 42)

Of the five case studies, the tower of Engara —also known as "Torretxiki" — shows the least amount of direct impact on its environment. Only part of the foundations and the lower body of the tower remain (Cruz Pérez, 2014, p. 151), with a height of 0.80 meters in 2014. There is also evidence of the presence of a moat with a width of 4 meters, possibly a later addition to the site to repurpose it as a fortification during the Carlist wars (Ajamil Baños, 2014, p. 133).

Figure 29: Current state of the site of Engara. (joseimaz, 2019).

4.2.5 Public perception and stakeholders

Ziordia (No. 40)

Casual enquiries to the residents show that there is some awareness of the site's existence and its original function, and it is acknowledged as a telegraph station. The toponymy reflects this awareness, as the hill designation is "el Telégrafo".

Several factors can have contributed to this state of affairs. While the current conservation of the site is poor, it was standing relatively intact as late as 1956; so it is still remembered by several generations. The site is not only easily accessible but a popular route for leisure and harvesting. Finally, the ashlar blocks are a usual sight, as they are in the local frontón, which is used regularly and hosts regional competitions.

Tellingly, while there is no official signage related to the tower in the immediate surroundings, the site is still marked by a hand-written sign, indicating that the ruins may have deteriorated, but they have not been forgotten.

Figure 30: Left: Ashlar blocks of the tower in the public frontón (Basotxerri, 2017). Right: Unofficial signage on the tower (Photograph by the author, 2021).

Basalen (No. 41)

The tower of Basalen seems to be better known by its popular appellation of "el Castillo", which would indicate that, while it is a familiar entity, the awareness of its function has faded from collective memory. While the access is difficult for the first half of the way, it is still close enough to be a destination point.

On the other hand, the tower's restoration seems to have had very little input from Alsasua's City Hall or its inhabitants, as it was spearheaded by the Comunidad Foral of Navarra and the *Institución Príncipe de Viana*. There was a ceremonial transfer of the keys in December of 2020 to Alsasua's current mayor, Javier Ollo, which received a small amount of coverage by local news, but was otherwise unremarked.

Before the restoration project, in 2017, the *Institución Príncipe de Viana* had already worked to grant the site official protection, initiating proceedings to declare it a *Bien Inventariado*.

Engara (No. 42)

The tower of Engara has the alternative appellation of "Torre Txiki." Other than a small entry in the City Hall's webpage[33] and some references related to nearby hiking trails, there does not seem to be much awareness of its existence. Even when considering stakeholders on a larger scale, people interested in the telegraph towers as a network, Engara's poor conservation and somewhat inaccessible location mean that its two neighbours have largely overshadowed it.

[33] http://www.alsasua.net/torre-txiki/

4.3. Case 2: Transilla and Tariego (Palencia)

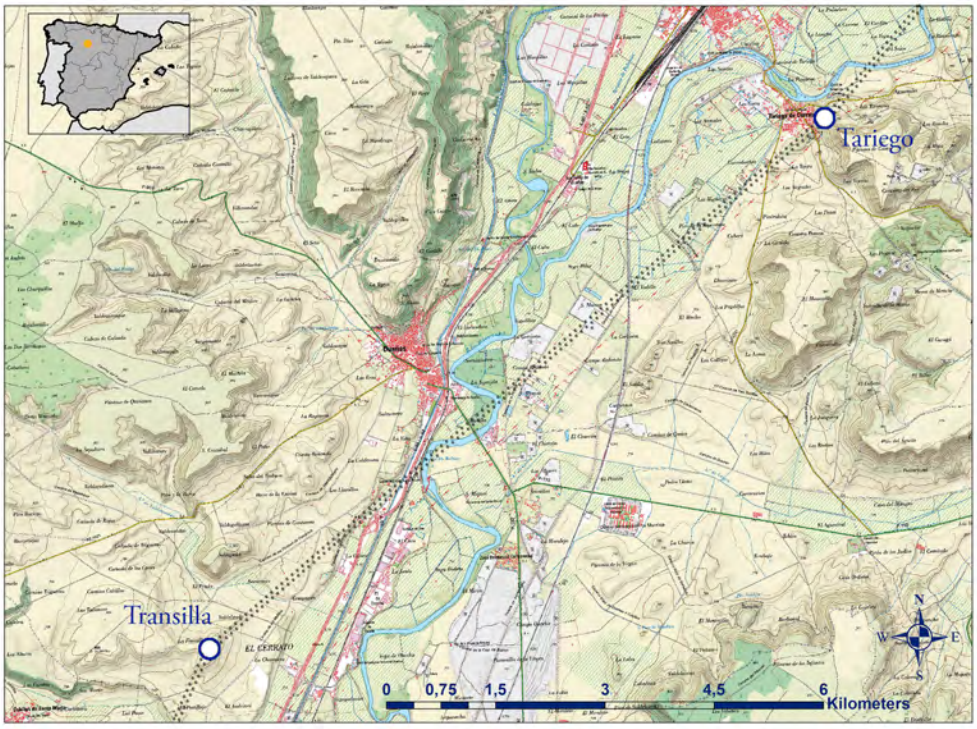


Figure 31: Emplacement and disposition of the stations in the second case study (Elaborated by the author). Note: the base map uses the MTN-25 of the Centro Nacional de Información Geográfica (CNIG).

4.3.1 Socio-political and physical context

Four towers of the Castilla Line are within the province of Palencia, including the pair in the case study. They are in the municipalities of Dueñas and Tariego.

Dueñas is one of the most populated municipalities in Palencia, with a census of 2624 people in 2020. Tariego has 476 inhabitants, which may be a factor of its proximity to the provincial capital (14 km). However, both show a clear regressive trend; they have lost close to 20% of their populations in the last decade.

Both municipalities show numbers slightly below the provincial average for the group of people over 65 years old. However, we must consider that Palencia's population is nearly a fourth of Navarra's and substantially more aged. In Dueñas, the number of people over 65 (22.77 %) is markedly higher than those in the below 16 years-old bracket (14.24 %), though it is similar to the young adult group, that is, between 19 and 39 years old (23.69 %). In Tariego, the largest group is the 40 to 64 bracket (43.30 %), but the people over 65 nearly double those below 16 (21.17 % to 12.43 %).

Municipality	Population over 65	Municipal Average	Provincial Average
Dueñas	614	22,77	25,66
Tariego de Cerrato	77	21,17	

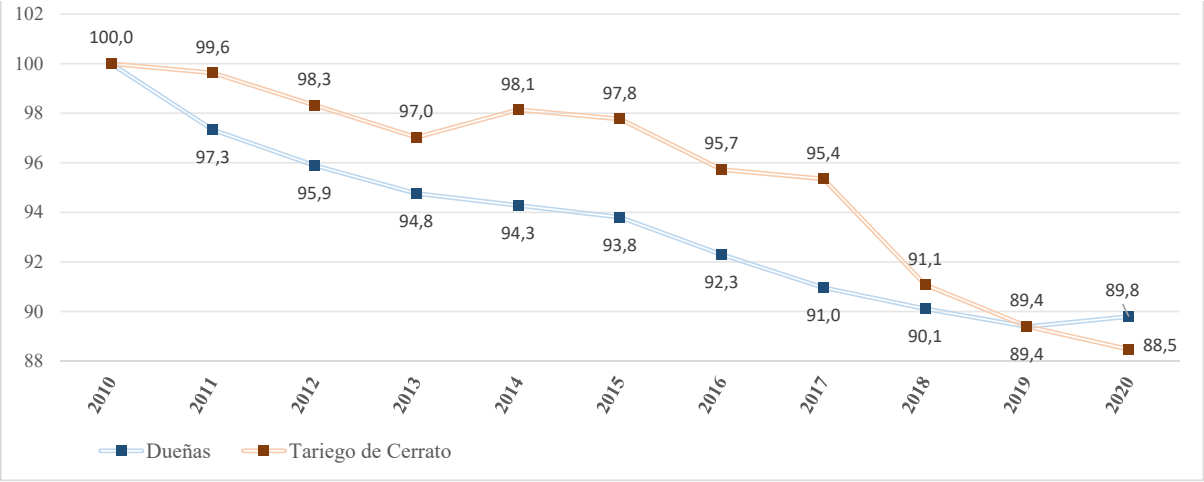


Figure 32: Population over 65 years old related to the provintial average in 2020 and evolution of the overall population figures during the last decade. (Elaborated by the author with data by the National Statistics Institute). Note: The comparison has been made using index numbers.

Dueñas and Tariego are part of the Pisuerga Valley. The terrain is fairly homogeneous, with only slight differences in altitude and plains that extend across large distances. However, there are natural corridors that concentrate most of the modern and historical infrastructure, from the optical telegraph to the railways and highways (Palacios Rodriguez (Coord.), 2010, p. 30).

The area has a temperate climate. The average annual precipitation[34] is between 444 and 448 mm. On average, over 82 days will have over 1 mm of rainfall, and approximately 13 days will have over 10 mm. The average annual temperature is 11.6 ºC, and the average sunlight is 2600 hours. Hence, visibility was possible over longer distances than in the Navarran case.

The majority of the land cover[35] has traditionally been used for rainfed crops fields and pastures. Additionally, the site of Tariego is within a Monte de Utilidad Pública (MUP), that is, a publicly owned area with recognized social and environmental benefits.

4.3.2 Access and immediate environment

Transilla (No. 20)

The site is approximately 2.2 km and 785 m over sea level (60 m above Dueñas). There is a straight dirt path running almost parallel to the A-62 highway. It is wide enough for a car and can be followed for most of the way; however, the last tract must be covered on foot. No crop fields or wild vegetation hinder the route.

[34] Data obtained from AEMet (Agencia Estatal de Meteorología).

[35] Data obtained from IDECyL (Infraestructura de Datos Espaciales de Castilla y León).

Dueñas is remarkably accessible, especially in comparison to the Navarran sites. Indeed, it seems like distance is the main challenge from a management perspective. However, that has not had a positive impact on public awareness. While the tower is accessible and highly visible, it is remarkably unknown. There is no signage at any point, neither on route nor on the building's surroundings.

Figure 33: Tha path to the tower of Transilla, looking towards Dueñas (1) and towards the station (2). (Photographs by the author, 2019).

Tariego (No. 21)

The site is very close to the population centre, approximately 0.3 km away. It stands at 821 km over sea level (85 m above Tariego de Cerrato). The telegraph tower is the principal landmark of the Senda de los Torreones[36], which opened to the public in September 2014.

The route has abundant signage and rest areas. The last and abruptest stretch has likewise been equipped with a staircase and handrails. While ensuring universal accessibility is impossible due to the topographic characteristics of the environment, every effort has been made to ease the way.

Figure 34: Above: Sign for the Senda de los Torreones, trail posts and old wine cellars and cave houses under the tower. (Centre low: Photograph in the official pamphlet of the Senda de los Torreones, https://tariegodecerrato.es/index.php/turismo/senda-los-torreones/. Others: Photographs by the author, 2021).

[36] Sponsored by *Programa DUAL de Formación y Empleo*, and the Junta de Castilla y León.

Figure 35: Approach from Tariego de Cerrato through the pines (1), the tower in the distance (2), the stairs to the site (3), rest area near the tower after the ascent (4) and the return to Tariego (5). (Photographs by the author, 2019).

4.3.3 Internal and external intervisibility

Palencia' towers are 785 and 821 metres of over sea level, in a very homogeneous location with few changes in the topography. Their placement is archetypical.

Pair of towers	Distance (km)	Average distance in section(km)	Azimuth (º)
19 - 20	12,77	12,21	202
20 - 21	11,17		231
21 - 22	17,90		219

Figure 36: Relation of orientation, angle and distance to determine the conditions of intervisibility between towers (Elabored by the author).

Transilla (No. 20)

Transilla is very visible from the A-62 highway, and though it is hidden from the town centre, it quickly becomes visible on the path, as its position means that it contrasts against the sky. Therefore, it remains recognizable in a radius of a few kilometres, with very few interruptions to the line of sight.

Figure 37: Arriving at the tower of Transilla (Photograph by the author, 2019).

The tower of Tariego is clearly visible from the ground and in a radius of several kilometres around the building even without magnifying equipment. However, visibility is moderately hindered by its location, as it blends into the background. The tower of Cabezón has disappeared, though the town can be seen in the distance.

Figure 38: Intervisibility in the direction of the neighbouring stations from Dueñas. (Photographs by the author, 2019).

TARIEGO (NO. 21)

The tower of Tariego de Cerrato is one of the most noticeable landmarks[37] in any of the optical telegraph's associated landscapes. Its location on a promontory, immediately above the town, ensures that it can be seen for kilometres. It is also visible from all entrances to the population centre. Furthermore, the fact that it is a freestanding construction draws attention to it. These factors make it the most visually significant building in its location, even over the town's church.

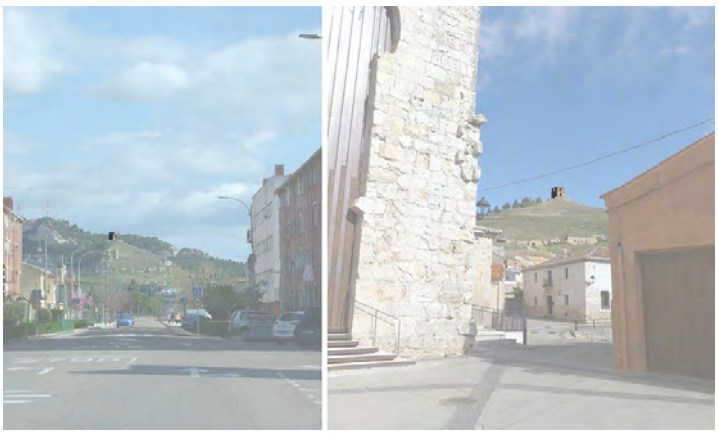


Figure 39: Glimpsing the tower of Transilla (Photograps by the author, 2019).

Similarly to the previous case, Tariego shows a clear line of sight to Transilla, though it cannot be seen without binoculars or other magnifying equipment as it does not rise significantly above the terrain. The tower of Isilla in Villamediana does not have visible remnants, likely due to the construction of an army broadcasting centre near its location. However, there is a clear line of sight in its general direction, which improves the site's legibility, as visitors can understand that a building would have been visible.

[37] Other towers with this characteristic are Adanero (No. 11), Codorniz (No. 12), Campajares (No. 33) or Quintanilla de la Ribera (No. 34)

Figure 40: Intervisibility in the direction of the neighbouring stations from Tariego. (Photographs by the author, 2019).

4.3.4 Materiality and conservation

The telegraph towers located in Castile and Leon usually employed solid brick with flush joints laid horizontally, though stone was used in the plinth to guarantee the stability of the structure. (Santos y Ganges & Lalana-Encinas, 2021). Windowsills were resolved with a row of bricks placed vertically but did not appear to have had added anchorage. The tower in Dueñas did not deviate from the norm for this area and technique. The tower in Tariego includes four rows of ashlar masonry at the base, and the truncated pyramid in the lower body is further reinforced with blocks in the corners and a line of rubble masonry at the level of the first floor[38].

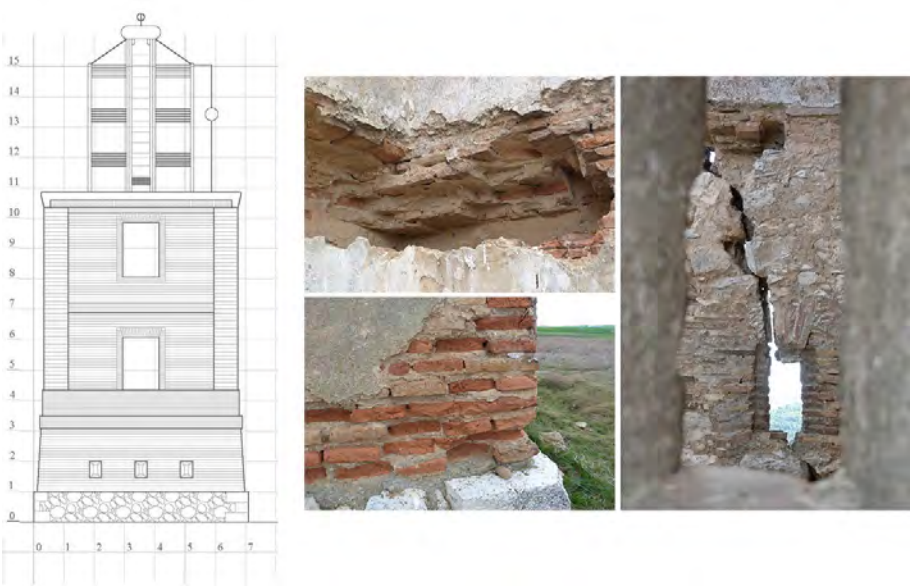


Figure 41: Façade of brick towers before whitewashing and common ailments. Left: Loss of material in Transilla. Right: Stress fractures in Tariego. (Representation and photographs by the author, 2019).

20 to 28% of the towers in the Castilla Line employed brick in their construction (Lalana-Encinas, 2021). Ten of those stations still possess a recognizable presence on the site. In the absence of the wooden floors, which braced the structure and distributed the weight, brick walls have begun to sag (Lalana-Encinas, 2019, p. 94). The structural weak point running down the thresholds of the windowsills is also very prone to fracture and loss of material. Despite that, several towers

[38] Despite this, I consider this tower as belonging to the brick group rather than the mixed group, as it shares more characteristics with the former than the latter.

constructed in brick still have visible remnants in their respective locations. This group includes one of the longest sequences of adjacent towers without missing stations, between Labajos (No.10) and El Collado (No.16), in the provinces of Ávila, Segovia and Valladolid.

One of the main damaging agents in brick towers is the water absorbed by capillarity, though its effects were minimised by adding a stone plinth. Common ailments present in the two towers of the case study include efflorescence, loss of material (brick, mortar and particularly in the whitewashing) and resulting debris in the immediate vicinity.

Transilla (No. 20)

The tower of Transilla, occasionally appearing in texts as "La Frausilla" is in remarkable good condition. The roof and other wooden elements have been lost; however, there is clear evidence of the original position of the stairs and wooden beams, as the original junctions with the wall are still clearly visible. The façades stand to the full height of the tower, approximately 10.35 meters.

The worst deterioration has occurred on the windowsills on the first floor, which show a partial loss of material. This loss is particularly prominent in the southern façade, where the deterioration has reached the putlock. There is also considerable debris in the immediate environment of the tower as well as a minor amount of efflorescence and loss of mortar. However, part of the original whitewashing remains in the northern and eastern façades.

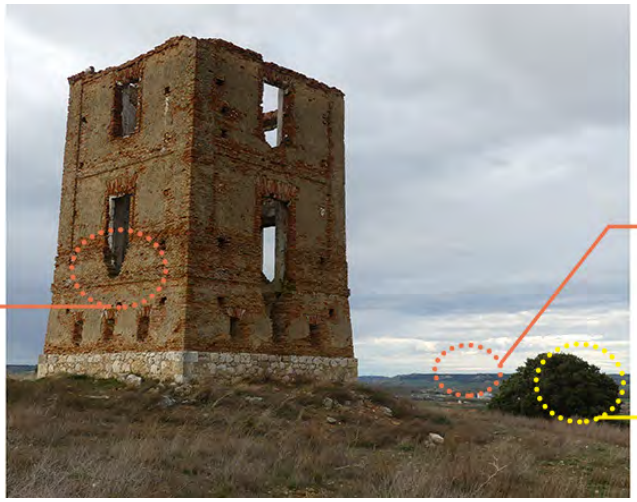


Figure 42: Current state of the site of Transilla (Photograph by the author, 2019).

Tariego (No. 21)

The tower of Tariego is also in good condition; however, it does show further damage to its structure[39] along similar lines to the case of Transilla. All of the walls maintain the full original height. The original positions of the floors and the circular staircase are also clear from the remnants of their junction points.

[39] This may be because of its location, as it is subjected to strong winds.

The walls present a more significant loss of material, as well as fractures that run down the windowsills on all three floors. They have particularly affected the northern and southern façades. The original loss of the bracing wooden structure and the current fractures are causing the walls to sag, though this effect is partially counteracted by the plinth and the rows of stone that form the lower body.

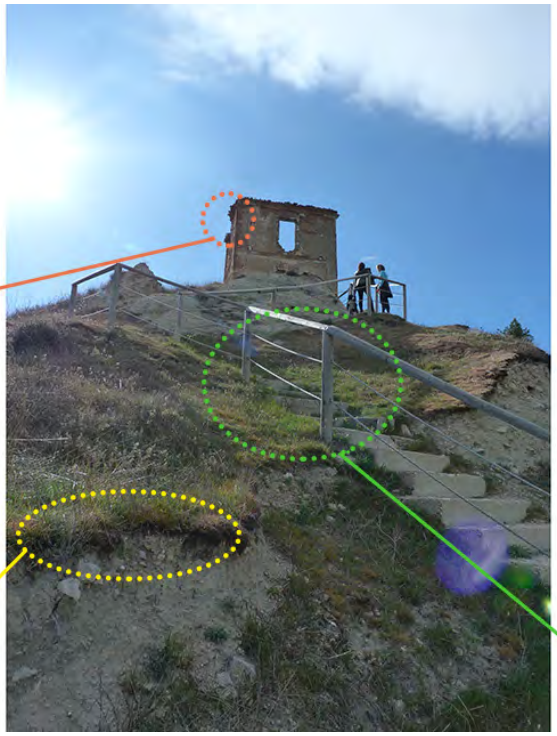


Figure 43: Current state of the site of Tariego (Photograph by the author, 2019).

4.3.5 Public perception and stakeholders

Transilla (No. 20)

Despite its relatively good condition, there seems to be little local interest in the tower of Transilla. It does not appear as a landmark on walking trails, and unlike others, it does not show signs of frequent visits, such as graffiti or other marks. That apparent indifference has spread to large-scale stakeholders, who often turn their attention to the neighbouring tower in Tariego de Cerrato in response to local awareness and interest in that site.

Tariego (No. 21)

In contrast with the previous example, the tower of Tariego is perhaps the tower with the most protagonism in its environment in the Castilla Line. Its conspicuous position has made it one of the defining entities of the landscape, and the town has adopted it as its emblem. It appears prominently in the heraldic shield and even features prominently in the town's Wikipedia entry. By all accounts, people know where it is, what it is and value its presence.

That interest resonates with the larger-scale stakeholders in turn. In 2012 the Asociación de Amigos del Telégrafo organized a seminar and exposition for the 150th anniversary of the telegraph and featured the tower several times on their webpage.

The site also features heavily in the 2020 draft for the municipal planning regulations (NUM). The tower is explicitly mentioned as one of the municipality's artistic and cultural values.

Figure 44: Left: Tariego's heraldic shield (Erlenmeyer, 2014). Right: Reenactment in the tower (clickturismo, n. d.)

4.4. A Framework for Intervention

Up until this point, the chapter has only provided layers of information. I have described physical and social characteristics, addressing different contextual elements that are nonetheless complementary. That layered approach to knowledge gathering allows for a more balanced and accurate result (Mason, 2002, p. 16).

Within the heritage value chain process[40] this is only the first step of the management framework, covering the identification of characteristics and resources. The next step would be the creation of more detailed documentation. That step will not be explored in the MSc thesis however, as that was the focus of my previous experience in La línea de Castilla del telégrafo óptico; it would, in any case, exceed the reach of this document. Hence, this section will focus on interpreting and valuing the existing characteristics according to the method and the parameters that were detailed in section 3.3.

Translating the five different core aspects of the framework —socio-political context, access and environment, intervisibility, materiality and conservation and public perception— into a numerical scale of values results in the following distribution:

	Ziordia	Basalen	Engara	Transilla	Tariego
Context	3	8	8	5	3
Access	7	6	3	9	9
Intervisibility	2	4	1	9	8
Conservation	3	8	1	7	7
Perception	6	5	2	1	10
Average	**4,2**	**6,2**	**3**	**6,2**	**7,4**

Figure 45: Value quotients for the five studied aspects (Elaborated by the author).

[40] See *3.3 A Systematic Approach to Intervention* in p. 20.

On the relative value of its components, the second case study (Palencia) shows a higher quotient —6.8 to 4.4 in Navarra—. Its sites are, on the whole, better prepared to engage stakeholders and generate benefits. Yet, the first case study is unique; its particular characteristics could be used to design a stronger narrative.

The results have been translated into Kiviat diagrams. The aim is to analyse the five aspects, how they relate to one another and what preliminary conclusions can be reached.

4.4.1 Case 1: Engara, Basalen and Ziordia (Navarra)

Approaching the three stations of Navarra as stand-alone elements would already show a series of similitudes. They employed the same material in roughly the same configuration. They were in elevated positions and after 150 years unattended, forests have grown around them. This situation greatly limits visibility and makes the sites harder to read. Access is similarly hindered, and in several instances requires visitors to travel off-road, without visual aids or paths to guide them.

However, it is pertinent to reiterate a clear point of interest. As established, environmental conditions —terrain, vegetation and climate— are less conducive to the network's original function in Navarra than Palencia, as they limit visibility in the distance. The result has been a collection of sites very close together forming an acute angle, quite dissimilar to the ideal plain angle. The trio's unique disposition, unparalleled in the Castilla Line and extremely rare on a national and even international level, adds additional value to the group. While that has not been the case in Basalen's restoration of 2019, from an academic perspective there are clear benefits to preserve the trio as an ensemble rather than as weaker, stand-alone elements. Their proximity opens other avenues of exploration as well, like the possibility of hiking between all three sites within the same day.

Ziordia (No. 40)

The municipality of Ziordia has a diminishing, aged population. As a result, of the low demand, public transport is available but very sporadic. On the other hand, private transportation is very convenient due to its position between Vitoria and Altsasu; it is also possible to reach it on foot from Altsatsu. There is a clear path for most of the itinerary with a gradual slope. Only part of the tower's lower body remains, and the presence of trees interrupts the view after a few meters. Conversely, its presence does not have a great impact on the residents' everyday life.

The footprint of the Ziordia site is relatively small, and it develops on two axes, with three aspects having poor conditions and two being well represented. The inference is that the site is very vulnerable; intervention should be throughout, considering several issues simultaneously. Additionally, it should be done soon to prevent further degradation. On the other hand, the graph shows that there are positive characteristics, so that the site still presents exploitable avenues for revaluation and rehabilitation.

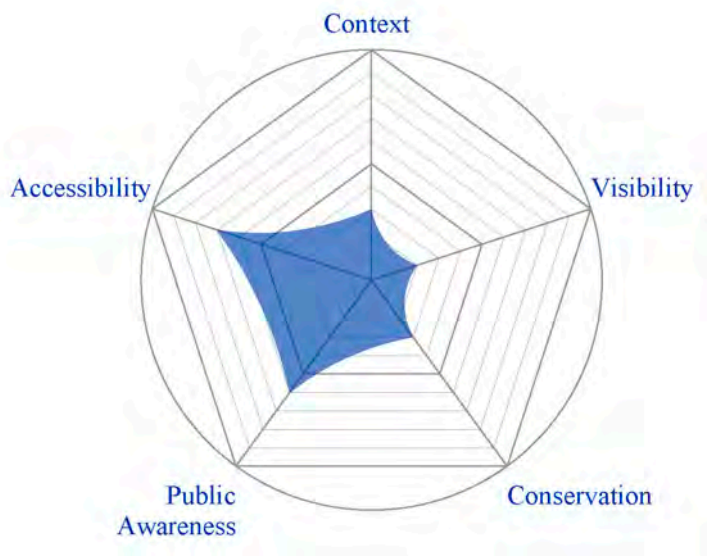


Figure 46: Footprint for the Ziordia site (Elaborated by the author).

Basalen (No. 41)

Altsasu is one of the largest settlements that still possess a significant remnant of the optical telegraph stations. It is well-communicated by public and private transport and has several services, including a tourism office. Access is complicated due to several factors: the presence of the highway, lack of signage or visible trails and a significant difference in altitude. While there is no visual connection between the neighbouring stations, and intervisibility is low on-site, the route offers several views of the city and its surroundings, supplementing the legibility of the station's original function. The tower is well-known by its local appellation and perceived as a stand-alone building. In part due to its endurance, it has also become the subject of interest in regional organisations.

Basalen is in a better situation than its two neighbouring stations, arguably one of the best in the network. While its overall quotient is lower than the Palencia cases, the graph shows that it is visibly better balanced. The 2019 restoration has not had a definite positive impact on the site, as the original condition was quite good and arguably maintained more significance than the current state. Accessibility would be a good point of improvement, but otherwise, further management should focus on divulgation and socialization in academic, scientific and local circles.

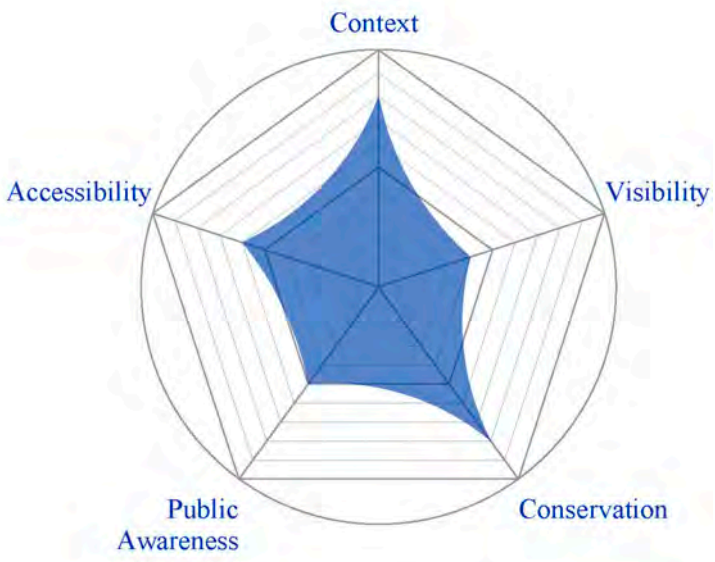


Figure 47: Footprint for the Basalen site (Elaborated by the author).

Engara (No. 42)

The topographic and climatic conditions of the area resulted in reduced distances between Engara and Basalen, so that both belong to the same municipality. Engara is closer to the population centre; however there is no path for most of the route and vegetation growth have hidden the remnants of the tower, which are scarce. For the same reason, there is very little visibility of or from the site. While Basalen remains in the collective memory, there is no evidence that has been the case for Engara. There is also far less information related to the site on a regional or national scale.

Engara is in a very precarious situation. Nearly all of its indicators show high deficiencies or risks that have negative impacts on the site. Before factoring in the pull generated by its neighbour station or its position as a node within a network, its main advantage is the relevance and populace of its municipality, as that can be the springing point for future initiatives. The most straightforward avenue of preservation rests on improving its accessibility, as it could be reinterpreted as a hiking milestone from Altsasu.

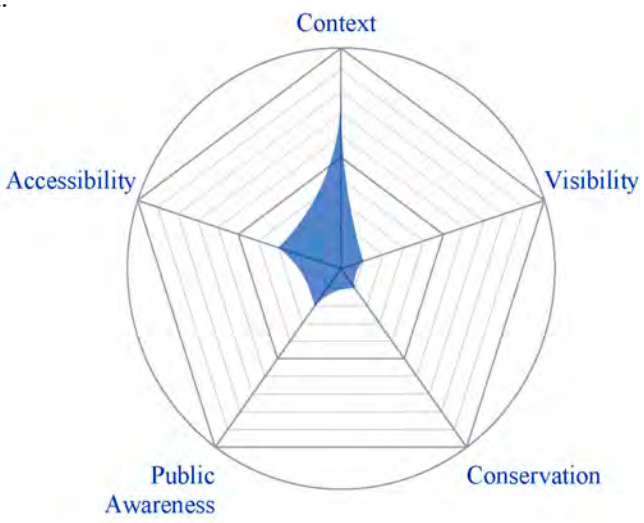


Figure 48: Footprint for the Engara site (Elaborated by the author).

4.4.2 Case 2: Transilla and Tariego (Palencia)

The two sites in Palencia are more accessible than those in Navarra and among the most accessible in the network[41]. They also employed similar construction techniques and are on a comparable level of conservation and ease of access. However, they stand at stark opposite ends regarding public perception, bracketing the examples in Navarra.

The pair of Transilla and Tariego share the rare characteristic of being visible from the neighbouring site. That is due to a combination of less abrupt terrain, generally sunny climate, the absence of tall vegetation and the good condition of the buildings. This characteristic constitutes a critical point of interest from a management perspective.

While we can value the Navarran case because of its unique solution to particular challenges, the Palencia sites follow the original project much more closely, as it reflects both the average distances and the nearly perpendicular alignment specified by Mathé. An evaluation of this group should consider its value as a tool that underscores the legibility of the communications infrastructure. Further management projects should also work to strengthen this trait (Sevilla Charter, 2019, p. 27).

Transilla (No. 20)

Dueñas is one of the most populated centres in Palencia and relatively close to the provincial capital. While it has lost residents, the trend is not very pronounced; however, it still has less than 3000 inhabitants. The tower is distant from the town's centre. There is no signage at any point but it is easy to locate and there are no significant obstacles; universal accessibility is possible. The tower maintains structural stability, and all the walls still stand. Intervisibility is very high: it is possible to see the following station with the naked eye, and the station is visible in a large radius. However, it seems to be unknown among the local population. On a regional level, it is usually either overshadowed by Tariego or paired with it.

Transilla's results form a curious footprint. It has remarkably good quotients overall, but the graphic shows that it is considerably out of balance, as one of the aspects is practically non-existent. That, in turn, makes it harder for the other aspects to compensate, and intervention will be considerably more challenging. In any case, socialization is sorely needed, and a management process should focus on raising awareness of the tower, whether through alternative use or other methods.

[41] Other sites with this characteristic include Adanero (Ávila), Codorniz (Segovia), Quintanilla de la Rivera (Araba) and Tolosa (Gipuzkoa).

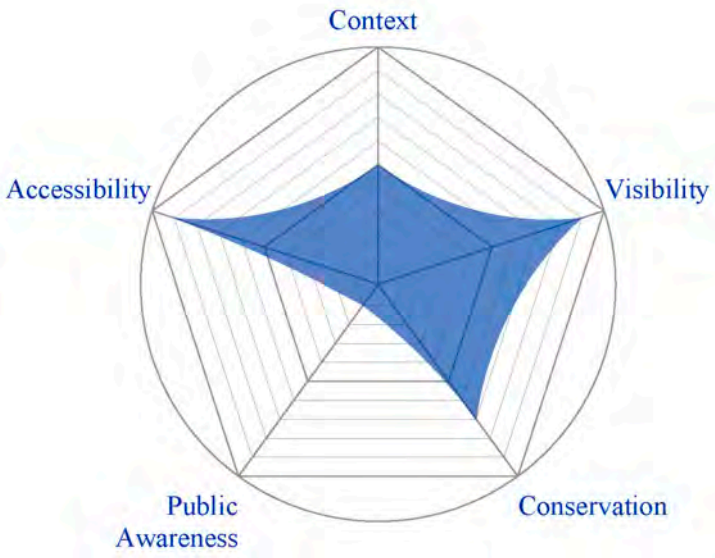


Figure 49: Footprint for the Transilla site (Elaborated by the author).

Tariego (No. 21)

Tariego de Cerrato is well-communicated with the provincial capital, but its population is only slightly higher than in Ziordia; the percentage of people over 65 is only marginally lower. There is an official route and several types of signage and rest areas; however, the last stretch to the tower is steep and not universally accessible. The building maintains nearly all of its walls and structural integrity. It is conspicuous from a distance and the site offers an unrivalled vantage point on the landscape. However, the neighbouring tower is only visible with the aid of magnifying lenses. The tower is an emblem of the town and has been the subject of direct and continued interest by the inhabitants as well as regional and national institutions.

Tariego shows the best overall condition of the five sites. That is largely due to its positive quotient regarding visibility, public awareness and —partially as a consequence— ease of access. Its weakest point is the socio-economic context of its municipality, which translates into a clear imbalance in the overall result. Otherwise, the focus should rest on consolidation efforts to prevent further physical degradation.

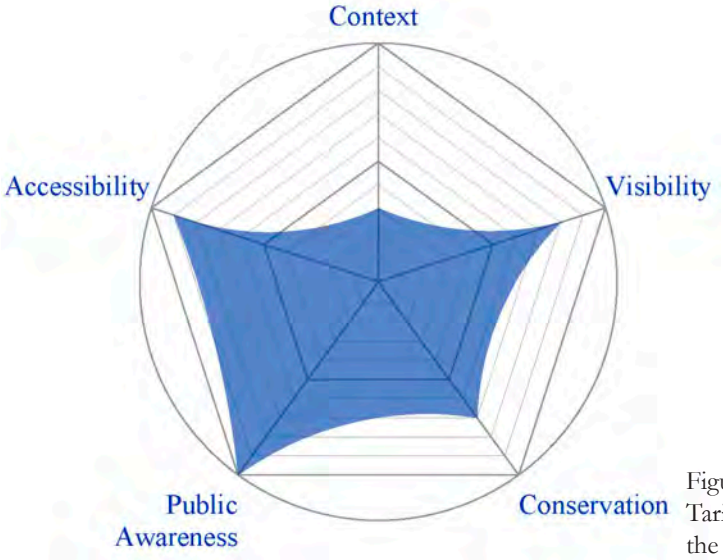


Figure 50: Footprint for the Tariego site (Elaborated by the author).

5. Conclusions

5.1 Analysing Threats and Opportunities

After establishing the background of values, resources and trends that are present at the sites, it is possible to turn our attention to the interpretation of data in order to identify the threats and opportunities that can affect that status quo (Mason, 2002, p. 25). Places —not only buildings and cities, but all perceived space— are always subject to design, and design will always be done according to clear objectives.

Regarding threats, design measures are reactive; the objective is to palliate or reverse a negative impact, at least partially; after all "many of the problems […] are rarely capable of being solved definitively, but can be managed" (Demas, 2000, p. 27). Among the threats to the optical telegraph sites, we can identify physical deterioration, loss of legibility and loss of significance.

Physical deterioration is perhaps the most striking threat to heritage. It is a noticeable flaw, and the danger it poses is obvious since it directly affects the stations' fabric. All stations have gone through varying degrees of deterioration, ranging from total destruction to minor structural losses. This threat is perhaps the easiest and the most urgent that should be addressed in an intervention initiative. Reversible bracing measures should be encouraged to halt further loss of fabric, though further alterations should not be undertaken without a full evaluation.

Loss of legibility has occurred gradually on several sites, and it is closely tied to the factor of intervisibility. It has often been a result of lack of maintenance; as the stations lost their use, there was no need to preserve the open space in its surroundings. Depending on the climate, that has often led to substantial vegetation left to grow unchecked, enveloping the tower in an alien landscape. Further, as physical deterioration increased—and height decreased—, the lines of sight broke down until their original function became, in some cases, extremely difficult to fathom. Conservation and intervention designs do not need to address this loss directly but should always consider it, as it is a substantial factor in the optical telegraph's identity.

Loss of significance may come through local disregard or through changes in setting that alter the experience. Palliating disregard requires understanding the emotional connections that remain between the people and the object. It can be addressed by way of socialization and divulgation efforts. The second has often been a result of neglect or past initiatives that may have had different objectives.

On that respect, four stations in the network have been restored integrally: Monterredondo (Madrid) in 2008, Adanero (Ávila) in 2002, Quintanilla (Araba) in 2012 and Basalen (Navarra) in 2019. While irreproachable from a technical standpoint, each of these restorations seems to have emphasized the station's image as a fortified bastion rather than as a telecommunications node.

As no alternative use[42] was planned in either site, the towers remain abandoned, but now there is a suggestion of being private and out of bounds. They have been subtly alienated from their environment:

> "A building in which decay has been arrested smells, if faintly, of a museum; and in a few years it has the «dated» appearance of someone or something that has outlived its own time." (Piper, 1947, as cited in Lowenthal, 1993, p. 252. Translated by the author.)

On the matter of opportunities, experts should instead be proactive and capitalize on the available resources to generate value. The optical telegraph sites offer several opportunities. In the first place, Spanish optical telegraph sites are a unique variation among the European models as the fortified tower was a prime component of design from the original project. The Spanish telegraph was a "modern fortress" and another link in a long line of field fortifications, such as the type of embrasured tower (Santos y Ganges & Lalana-Encinas, 2021). As such, the Spanish variant possesses scientific value that can be emphasized in divulgation efforts.

On a smaller scale, there is also opportunity in the sites' aesthetic value. Returning to the concept of serial vision , one of the principal design opportunities rests on the towers' location. They are, after all, landmarks that stand apart from their population centre; they are often in an elevated position and, as a consequence, they create interesting scenes. Observer judgement starts long before the tower itself is visible, as they move with a goal in mind and a particular speed. The environment is perceived sequentially through a series of passages, visual hazards, obstacles and perspectives: elements that already exist and can be used to order the space into a clear narrative (Cullen, 1961, pp. 17-20).

The opportunity then rests in our ability to take that existing chain of perceptions and direct the observer's experience to promote emotions and prevent indifference. Intervention should not only affect the tower and its immediate surroundings but a larger area that can still generate value. In short, expert design should seek to:

> "try to bring all the parts of the environment together into dramatic relationship so that the same notes are used but are arranged to form coherent chords and sequences" (Cullen, 1961, p. 53).

By using the cultural, natural and intangible elements of the environment to create a satisfying itinerary, the optical telegraph becomes more than the sum of its parts; it becomes an experience that observers —whether they are locals or visitors— can value on their terms.

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[42] Establishing an use before the start of the intervention is one of the best ways to ensure its longevity:"11. The identification of compatible uses for every element, assembly or system, with its form and function, contributes to the maintenance of the values of memory of work and place of production." (Sevilla Charter, 2019, p. 23)

5.2 Future Research and Forward Projection

Not all of the towers remain, possess similar resources or can generate the same interest. In the Castilla Line, twenty sites still host significant remnants. Of those, two are isolated, while the remaining eighteen have neighbouring stations that can form groups:

	CASTILLA LINE							
	No.	**Designation**	**Conservation**	**Municipality**	**Census**	**Dist. (km)**	**Azimuth**	**Altitude**
Madrid	4	Navalpiedra	Restored	Torrelodones	***23902***	12,7	149	920
	5	Monterredondo	Restored	Moralzarzal	***13334***	11,9	159	1325
Ávila	10	Labajos	Substantial	Labajos/Maello*	590	8,7	141	1060
	11	Martín Muñoz	Restored	Adanero	211	12,3	157	955
Segovia	12	Codorniz	Substantial	Codorniz	322	10,1	172	914
	13	Tolocirio	Substantial	Tolocirio	46	10,1	173	896
Valladolid	14	Lutero	Substantial	Almenera de Adaja	22	7,6	163	866
	15	Olmedo	Ruin	Olmedo	**3646**	11,1	172	849
	16	El Collado	Substantial	Mojados	**3258**	11,6	179	849
Palencia	20	Transilla/Frausilla	Substantial	Dueñas	**2624**	12,8	231	785
	21	Tariego	Substantial	Tariego de Cerrato	476	11,1	219	821
Burgos	25	Villazopeque	In building	Villazopeque	53	12,0	237	785
	30	Prádanos de Bureba	Substantial	Prádanos de Bureba	52	15,8	222	859
	33	Campajares	Substantial	Bugedo/Ayuelas*	187	8,9	245	554
Ara	34	Altos de Quintanilla	Restored	Erriberabeitia	1383	9,9	223	800
Navarra	40	Ciordia	Ruin	Ziordia	350	4,0	267	660
	41	Basalen	Restored	Altsasu	**7645**	4,8	146	670
	42	Engara	Ruin	Altsasu	**7645**	4,1	138	710
Gipuzk	48	Tolosa	Substantial	Tolosa	***19816***	5,0	199	402
	49	Aitzbeltz	Ruin	Andoain	***14691***	8,9	194	318

Figure 51: Relation of sites with material remnants and some indicators (Elaborated by the author).

That is not to say that identification, valorisation and intervention are not advisable in sites without visible material remnants. Even without visible markers left, archaeological traces may still exist. They may be tangible traces (i.e. foundations, scattered materials, etc.) or intangible, (i.e. toponymy, popular stories, etc. These traces can still increase the understanding of the place and add a distinctive element to their landscapes. From the perspective of heritage conservation, a line of future research should develop a parallel framework for intervention that provides a specialized analysis for those sites.

However, future research should not be confined to small-scale interventions. Returning to the hypothesis posed in the introductory chapter, the optical telegraph is not, in its essence, something that exists independently, but rather it is a trans-regional construction and a linear landscape. The remnants of the optical telegraph network are also an early manifestation of contemporary society: by their very nature, they cannot be understood without a territorial perspective (Ortega Valcárcel, 1998, p. 37).

This perspective has two consequences that merit in-depth consideration. First, the preservation of the optical telegraph network's significance as a whole, rather than as individual landmarks,

should lead to the creation of specific strategies that considered the entirety of the system. In this respect, it would be valuable to compare the current policies of other linear, trans-regional cultural infrastructures, such as St. James' Way to Santiago de Compostela or the Silver Route.

Building from that consideration, the optical telegraph towers could have a positive impact on their associated landscapes. They could, for instance, be reinvented as generators of value in the territorial dynamics. In the context of a larger project of territory management, consideration should be given to their capacity to act as cultural resources and contribute to the socio-economic revitalisation of settlements by strengthening their identity and social standing.

On the other hand, that process cannot be undertaken without a proper understanding of the larger socio-political and economic characteristics of the territory. It may not always be successful or, indeed, advisable. Several of the population centres associated with remnants of the optical telegraph currently have less than a hundred residents. In those cases of acute depopulation, any approach to management becomes increasingly complex and would yield fewer benefits. While it should still be explored, it would require time and striking a very intricate balance between many different, sometimes contradictory, variables.

There are still many avenues left to explore in the subject of the Spanish optical telegraph, its preservation as a heritage element and its possible function as a dynamizing agent of the territory. As time passes, the matter becomes increasingly urgent. The questions posed here, and many others, should be asked before the material remnants —and, with them, the collective memory— are gone.

5.3 Impact and Reflections on the Research

The invention of the optical telegraph in the 19th century is a fascinating subject. It was one of the first vehicles of globalization as we understand it today, as shown by how rapidly it spread across multiple European nations and beyond. It not only predates the Industrial revolution —if not quite chronologically, at least in its character— but it also can be constructed as a direct antecedent of the Information revolution, despite predating it by more than a century. The optical telegraph's purpose was, after all, to strengthen the position of a central government; it achieved this by creating nationwide channels that would transmit a fast, rationalized[43] and secure stream of information.

The idiosyncrasies of the Spanish application resulted in a very distinctive construction that has had an impact on the territory at a national, regional and local level. Even today, overshadowed as it has

[43] By 'rationalized', I refer to the definition made by James R. Beniger (1986, p. 15): "the destruction or ignoring of information in order to facilitate the processing". That principle was at the core of the system, taking the form of dictionaries that streamlined the information received according to its general content. For more information on the Spanish Diccionario, see: Lalana-Encinas & Santos y Ganges (2021) and Otero Carvajal (1993)

been by the electric telegraph, deteriorated as its buildings are, they remain conspicuous landmarks in the landscape. Many of the towers are visible from the main highways. Other remnants are hidden but still have or can have a role in the collective memory of local communities.

While the constrictions of a Master's project mean that I have not delved into the valuing process and heritage management in depth, by creating and following a systematic approach tailored to the optical telegraph sites it becomes apparent that elaborating a useful framework for intervention is indeed possible. This framework must use criteria that go beyond mere constructive materiality; but it will contribute to the understanding of the telegraph as more than just a crumbling building of the past. By virtue of their design as nodes of a network, the sites share similar characteristics and have a similar identity. They have values that complement each other and they are threatened by many of the same weaknesses. The framework puts these issues in stark contrast, with the hope that it can become a springboard for the future.

If a rational interpretative framework is possible, there are no excuses for failing to act. This process can, in time, become the basis for a truly efficient and sustainable rehabilitation project that is respectful of the sites. A project that not only restores the buildings themselves but also generates benefits for their territories.

The remnants of the optical telegraph are a practical resource, capable of adding considerable cultural, social and aesthetic value to their associated landscapes. However, they are a resource that has often been underutilized and that, under the present circumstances, may very well have an expiration date. Action is urgently needed, but it cannot be thoughtless. Intervention must be reasoned and grounded on their tangible and intangible characteristics. It must first understand their contexts if we are to benefit from everything that the optical telegraph sites have to offer.

Image Index

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