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GIS-Based Susa Valley Industrial Heritage Route: Industries of the Late 19th Century Established Around the Dora River for Hydropower

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ABSTRACT

The Susa Valley in Piedmont, Italy, historically served as a transit area between the Po Valley and France. Divided by the Dora Riparia river, it has an Upper Valley with a mountainous landscape and a Lower Valley extending to Susa, featuring an agricultural plain.

Until the 1880s, the economy relied on agriculture, leading to emigration due to the insufficiency of agriculture alone to sustain families. In 1864, following the transfer of the capital from Turin to Florence, had a sharp impact on the capital of Piedmont. The city experienced a decline in population and economic activities within a few years. The Municipality of Turin appealed to foreign and national industrialists in 1865, encouraging them to invest in various industrial facilities in the city to counteract the negative consequences of the capital's relocation.[1]

After Italian unification, the Susa Valley's industrialization began, spurred by the completion of the Fréjus Tunnel in 1871. Numerous establishments came into operation, including the Nobel Dynamite Factory in Avigliana (1872), the Colano ironworks (1876) in Bussoleno, Buttigliera Alta ironworks (1906), Moncenisio workshops in Condove(1906), the Fratelli Bosio knitwear factory in Sant Ambrogio (1871), followed by the opening of mills in Borgone (1882), Chianocco (1887).

Industrial establishment was initially tied to factors like water resources and communication systems until long-distance electric power transmission in the early 1900s.

The birth of the first industries radically transformed the appearance of many lowland villages. This transformation involves the importation of new building types from the city characterized by their large dimensions. Simultaneously, it triggers a significant urban expansion to cope with the resulting demographic growth.[2]

As a result of researches, it has been noticed that there is a lack of a comprehensive approach looking at all these structures together and emphasizing this critical period for the valley.

This thesis proposes designing an industrial route to experience six companies, that completely changed the character of the Susa Valley, contributing to the economic, demographic, and sociological development of the region, under the same umbrella.

In connection with the subject, it examines the history and scope of the concept of industrial heritage and cultural route and tries to understand these concepts through examples from around the world.

Due to advancements in technology, transportation, and communication, the increasingly complex networks of relationships between different locations can be analysed using GIS technologies, which is one of the spatial analysis software. That's why, another subject examined by the thesis is GIS and its current usage areas, and it aims to create the route based on GIS.

Keywords: Industrial heritage, cultural route, geographic information systems, Susa Valley, 19th century.

[1] "Riuso e progetto ambiti di fondivalle," G.A.L. Escartons e Valli Valdesi S.C.A.R.L., accessed November 17, 2023. https://www.evv.it/wp-content/uploads/2018/06/Fondivalle_GAL_EVV_2017_web.pdf.

[2] Antonio De Rossi, *La trasformazione del territorio alpino e la costruzione dello Stato: il secolo XIX e la contemporaneità in Valle di Susa* (S.I: Centro culturale diocesano, 2011).

PART I.

INDUSTRIAL HERITAGE AND CULTURAL ROUTES

1.The Concept of Industrial Heritage

The advent of industrialization gave rise to distinct locales, architectural styles, and surroundings. Following the 18th-century industrial revolution, there emerged fresh architectural elements, construction methodologies, and building designs. Moreover, industrialization ushered in substantial alterations in the environment, resulting in heightened population densities in urban regions and the transformation of natural and rural landscapes into urbanized spaces. Consequently, the city assumed a novel aspect characterized by an industrial aesthetic and a redefined organizational structure.

The industrial facilities and structures had a profound impact on both the regional economies and the day-to-day realities of urban living, thanks to the introduction of novel production processes. This transformed environment was characterized by the clustering of industries and the requirements of a burgeoning population, including fresh faces in the workforce within an evolving society. These individuals called for enhanced public amenities and infrastructure, thereby playing a part in shaping the recognizable urban settlements of the 20th century.

As production technologies advanced swiftly, lifestyles and production cycles underwent significant shifts, leading to noticeable alterations in the physical landscape, industrial infrastructure, and economic and social circumstances. Concurrently, urban areas expanded, causing industrial sites that were once situated on the outskirts to find themselves amidst residential or commercial zones. Additionally, the global population growth inevitably led to an increased demand for goods and services. This necessitated larger spaces for factories to accommodate new equipment and ramp up production, resulting in the relocation of industry away from city centres. Consequently, a majority of factories relocated from their original sites and some of the original buildings were demolished, while others fell into disuse and abandonment over time.

The dismantling of industrial edifices captured the interest of experts and the public alike. Records from this pivotal era in human history held as much value as any other historical artifact. The mechanical aesthetics brought forth by industrialization paved the way for architectural movements like modernism, constructivism, and futurism. Consequently, industrial structures, serving as spatial evidence of these trends, are regarded as crucial for passing on cultural heritage to future generations.[3] The tangible remnants of industrialization, encompassing

[3] Ayça Aslıhan Diker, "Protecting Industrial Heritage Areas As Component Of Urban Identity: Adana Industrial Heritage Route" (doctoral thesis, Eskişehir Technical University, 2023).

"machinery and engines, factories, mills and warehouses, canals and railways," have come to symbolize the ingenuity and practical achievements of the Industrial Revolution.[4] In the midst of rapid change, industrial structures have largely sought to be preserved as relics representing the scientific, technological, architectural, social and cultural progress of their respective eras.

During that era, the fate of these industrial structures became a subject of inquiry for both international and national organizations, leading to a growing recognition for the preservation of industrial relics in the mid-20th century.[5] These advancements gave rise to modern notions like "industrial heritage" and "industrial archaeology," prompting a reconsideration of how to utilize and repurpose these edifices.[6]

1.1. Historical Development of the Industrial Heritage Concept

Prior to the recognition of industrial structures, these sites and buildings were seen as unexpected intrusions in their respective locations and times of emergence. Industrialization was often associated with notions of joblessness, decay, and profoundly dismal towns with landscapes marred by destruction. Moreover, these constructions were not primarily valued for their aesthetic appeal.[7] For a considerable period, industrial buildings were deemed unattractive, superfluous, and unclean due to the perception that they lacked the grand architectural elements found in other monumental structures.[8]

The recognition of the importance of preserving industrial structures originated in Britain, the birthplace of the industrial revolution. The abandonment and demolition of industrial facilities after the 1950s triggered a public outcry. Workers who had been employed in these factories for generations opposed the loss of their historical heritage and worked to safeguard it. In response to these concerns, initial efforts were made by both professionals and volunteers, who sought to impede the swift demolition of industrial buildings.[9]

Initially, the identification and documentation of these structures were referred to as "industrial archaeology," and they were labelled as "industrial monuments." However, the term "industrial heritage" gained prominence when discussions about conserving

[4] Nilay Koyuncu Peker, "Conservation Principles for Industrial Heritage İzmir-Alsancak Liman Arkası District" (master's thesis, Middle East Technical University, 2019).
[5] Ayşem Kılınç, "Value Assessment for Industrial Heritage in Zonguldak" (master's thesis, Middle East Technical University, 2009).
[6] Merve Kurt, "The Concept of Authenticity in The Protection of Industrial Heritage: The Case of Samsun Tobacco Factory Building" (master's thesis, İhsan Doğramacı Bilkent University, 2014).
[7] Elvan Aynal Arcı, "Value Assessment for Cotton-Based Industrial Heritage in Adana" (master's thesis, Middle East Technical University, 2019).
[8] Koyuncu Peker, *Conservation Principles for Industrial Heritage*.
[9] Kılınç, *Value Assessment for Industrial Heritage.*

industrial buildings began to take place on the global stage.[10]

The term "industrial archaeology" was initially coined by Michael Rix in 1955 in an article of the same name published in the journal "Amateur Historian". Rix identified factories, machinery, steam engines, locomotives, canals, and railways left behind by the industrial revolution as constituting industrial archaeology, all of which symbolized a transformative shift in the world.[11] In his article, Rix emphasized the significance of documenting and safeguarding the remnants of industrialization before they disappear.[12] He also provided the inaugural definition of the concept, reiterating the idea of *"recording, preserving in selected cases, and interpreting the sites and structures of early industrial activity, particularly the monuments of the Industrial Revolution"*.[13]

The inaugural global conference focusing on industrial archaeology and the preservation of industrial landmarks took place in Ironbridge, Britain in 1973, leading to the establishment of The International Committee for the Conservation of the Industrial Heritage (TICCIH).[14] The attendees aimed to foster an understanding of the cultural and historical significance of the industrial past. Over time, there was a surge in scholarly research, and non-governmental organizations, along with smaller volunteer groups, emerged, all dedicated to this field.[15]

On the other side, in collaboration with ICOM (International Council on Museums) and the Eco-museum at Le Creusot, ICOMOS organized the initial worldwide symposium on "The Industrial Heritage and Modern Society, Sites - Monuments - Museums" in Le Creusot in 1976. The event featured sessions focused on 'Scientific Research and the Industrial Heritage', 'Conservation of Industrial Buildings, Sites and Machinery', and 'Presentation and Animation of Industrial Sites and Buildings'.[16]

In addition to the meetings and congresses held, UNESCO's inclusion of an industrial structure (Wieliczka Salt Mine) in its heritage list for the first time in 1978 played an important role in better understanding the importance of industrial heritage and seeing it valued as cultural heritage.

In 1985, the Council of Europe, in conjunction with ICOMOS France, convened a global symposium titled "The industrial heritage, what policies?"

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[10] Koyuncu Peker, *Conservation Principles for Industrial Heritage*.
[11] Ibidem.
[12] Aynal Arcı, *Value Assessment for Cotton-Based Industrial Heritage.*
[13] Kılınç, *Value Assessment for Industrial Heritage.*
[14] It is called as FICCIM (First International Congress on the Conservation of Industrial Monuments), and the second was held with the name of SICCIM (Second International Congress on the Conservation of Industrial Monuments. It later continued under the name TICCIH.
[15] Kılınç, *Value Assessment for Industrial Heritage.*
[16] Yudhishthir Raj Isar, "Industrial Heritage and Modern Society: International Symposium Held at the Ecomuseum of the "Communauté urbaine", Le Creusot-Montceau-les-Mines", *Museum* 29, no. 4 (1977): 240-242.

This event aimed to encompass all of Europe in order to assess the current state of industrial heritage. It advocated for comprehensive documentation and cataloguing of industrial sites, including all associated equipment, and the formulation of robust policies for preservation.[17]

The Council of Europe organized a more extensive assembly in 1990, known as the "Recommendation on the Protection and Conservation of the Industrial, Technical, and Civil Engineering Heritage in Europe." This recommendation aims to highlight the significance of safeguarding and conserving this heritage in a post-industrial society. This approach encompasses not only structures and technical landmarks, but also extends to the surrounding environment, knowledge, techniques, and ways of life associated with this distinct category of historical heritage.[18]

Besides addressing and resolving conservation matters, it was equally crucial to raise public awareness about the concept of industrial heritage. This led to the establishment of The European Route of Industrial Heritage (ERIH) and the European Federation of Associations of Industrial and Technical Heritage (E-FAITH), both aimed at publicizing transformations in industrial areas and drawing tourist interest.[19]

In the following years, there was a focus on the industrial heritage of the 20th century. The international symposium on " Conservation of 20th Century Architectural and Industrial Heritage" took place in Istanbul, Türkiye in 2002. The symposium emphasized the importance of collaboration, exchanging information and experiences, and establishing boundaries for interventions.[20]

One of the most important international guidance document for the industrial heritage is The Nizhny Tagil Charter signed in 2003. It is possible to read the purpose of the Charter from its preamble;

"The buildings and structures built for industrial activities, the processes and tools used within them and the towns and landscapes in which they are located, along with all their other tangible and intangible manifestations, are of fundamental importance. They should be studied, their history should be taught, their meaning and significance should be probed and made clear for everyone, and the most significant and characteristic examples should be identified, protected and maintained, in accordance with the

[17] Koyuncu Peker, *Conservation Principles for Industrial Heritage*.
[18] Council of Europe, "Recommendation No. R (90) 20 on the Protection and Conservation of the Industrial, Technical and Civil Engineering Heritage in Europe", September 13, 1990, https://search.coe.int/cm/Pages/result_details.aspx?ObjectId=09000016804e1d18.
[19] Yaren Şekerci and İlknur Akıner, "Evaluation of Industrial-Cultural Heritage: The Case of Zollverein Mine Complex in Germany," *Planlama* 31, no.2 (2021): 151-163.
[20] Koyuncu Peker, *Conservation Principles for Industrial Heritage*.

spirit of the Venice Charter, for the use and benefit of today and of the future." [21]

In 2011, TICCIH expanded the scope of the 2003 charter and published a new guide called The Dublin Principles to provide a theoretical framework towards a sustainable approach.

The final noteworthy development in this area is the presentation made by TICCIH during the sixteenth international congress in 2015, titled "Industrial Heritage in the Twenty-First Century, New Challenges". The primary objective is to generate a digital representation of industrial heritage, allowing people to access information online. This will serve as a valuable resource for conducting research, making comparisons, and exploring the ever-evolving and fascinating realm of Industrial Heritage.[22]

1.2. Definition and Scope of Industrial Heritage

When we look at the first definitions of the concept of industrial heritage in around second half of the 20th century, it can be easily seen that a much narrower scope was considered. Prior to the widespread acceptance and formalization of the term, industrial archaeology was characterized as the study and assessment of physical remnants dating back to the industrial revolution era. This encompassed factories, machinery, steam engines, locomotives, canals, and railways, all of which were incorporated into this definition due to their symbolic representation of global transformation.[23]

The scope of industrial archaeology sparked debates among various researchers. While some acknowledged that it encompassed remnants and structures from the industrial revolution era, opponents advocated the notion that any archaeological field isn't confined by specific timeframes and industrial archaeology encompasses remnants from all historical periods. This perspective finds support in the fact that industrial heritage sites from diverse epochs are included in the UNESCO World Heritage List without restrictions.[24]

Another area of contention revolved around determining which structures should fall under the category of industrial heritage. Initially, emphasis was placed on grandiose edifices and instances of civil architecture possessing significant aesthetic merits. However, in contemporary times, this scope has expanded to encompass archaeological remnants, contemporary architectural creations, industrial zones, bridges, shipyards, warehouses, and even cranes, all of which can be considered within the realm of safeguarding.[25]

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[21] TICCIH, *The Nizhny Tagil Charter for the Industrial Heritage.*
[22] Koyuncu Peker, *Conservation Principles for Industrial Heritage*.
[23] Koyuncu Peker, *Conservation Principles for Industrial Heritage*.
[24] Ibidem.
[25] Diker, Protecting *Industrial Heritage Areas.*

If a short and concise definition is made for the current approach, according to Stuart, industrial landscape can be simply defined *"as a landscape that has been modified by the effects of human activity dominated by industry"*.[26]

Even though it is not explicitly mentioned in the definition, it is still possible to understand from this sentence; industrial heritage has now become a concept that covers all assets within the industrial context, including social life independent from the production process but supporting it in a way.

It is possible to see from The Nizhny Tagil Charter for The Industrial Heritage how the scope of the concept has expanded through time;

"Industrial heritage consists of the remains of industrial culture which are of historical, technological, social, architectural or scientific value. These remains consist of buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and stores, places where energy is generated, transmitted and used, transport and all its infrastructure, as well as places used for social activities related to industry such as housing, religious worship or education."[27]

After this, the scope of the concept continued to be discussed. Several researchers have contributed to evaluating, documenting and developing remnants of the industrial society. TICCIH published the Dublin Principles in 2011 and expanded the definition of industrial heritage;

"The industrial heritage consists of sites, structures, complexes, areas and landscapes as well as the related machinery, objects or documents that provide evidence of past or ongoing industrial processes of production, the extraction of raw materials, their transformation into goods, and the related energy and transport infrastructures. Industrial heritage reflects the profound connection between the cultural and natural environment, as industrial processes – whether ancient or modern – depend on natural sources of raw materials, energy and transportation networks to produce and distribute products to broader markets. It includes both material assets – immovable and movable –, and intangible dimensions such as technical know-how, the organisation of work and workers, and the complex social and cultural legacy that shaped the life of communities and brought major organizational changes to entire societies and the world in general."[28]

[26] Koyuncu Peker, *Conservation Principles for Industrial Heritage*.

[27] TICCIH (The International Committee for the Conservation of the Industrial Heritage), "The Nizhny Tagil Charter for the Industrial Heritage", July 17, 2003.

[28] TICCIH (The International Committee for the Conservation of the Industrial Heritage), "Dublin Principles", November 28, 2011, https://ticcih.org/about/about-ticcih/dublin-principles/.

As can be seen, many understandings that were not in the previous texts have found a place in the new definition text. Issues such as talking about sites and landscapes, not only structures, and taking a more holistic approach, emphasizing the connection with the cultural and natural environment, and incorporation of intangible dimensions into the concept as well as tangible heritage attract particular attention.

In simpler terms, this definition made it possible to acknowledge an entire landscape as one cohesive element, rather than merely identifying individual buildings or clusters within an industrial site. This expanded the concept of industrial preservation to encompass recognized patterns of activity in both time and location.[29]

2. The Concept of Cultural Routes as a Tool for the Protection of Cultural Heritage

Cultural routes, arising as an alternative means to ensure the perpetuity of cultural heritage, present a modern and inventive strategy. They offer a comprehensive approach to cultural heritage, serving as a prevalent and impactful avenue for acquainting urban residents and visitors with the identity components of cities, thus shaping their abstract or concrete image. Simultaneously, they promote sustainable urban development through their economic contributions.

According to a quote from Karataş, a cultural route is a transportation corridor at the local, regional, national, or international levels that gains significance due to the cultural and natural heritage elements it encompasses. These routes have objectives such as heritage preservation, rural development, and tourism enhancement, whether they were utilized in a certain period of history or designed in contemporary times.[30]

According to the Cultural Routes Declaration of ICOMOS , cultural routes, described as innovative, complex, and multidimensional, present numerous architectural, archaeological, artistic, and intangible components as a unified whole. They aid in preserving and carrying forward the values of these components into the future. Cultural routes serve as a key to introducing, evaluating, and safeguarding the various cultures, traditions, and histories of humanity. They enable the heritage to be passed on to future generations, particularly by increasing awareness among local communities and subsequently, the broader population, to protect and preserve the cultural legacy established over centuries on a larger scale.[31]

[29] Luis Loures, "Industrial Heritage: the past in the future of the city," *Wseas Transactions On Environment and Development* 4, no. 8 (2008): 687-696.

[30] Oya Deniz, "A Cultural Route Proposal in the Context of the Continuity of Urban Memory: Bursa Industrial Heritage Route," (master's thesis, Bursa Uludağ University, 2022).

[31] Dilara Nil Özocak, "In The Footsteps of Evliya Çelebi: Proposal for Cultural Routes for the Promotion and Recovery of the Cultural Heritage

Cultural routes broaden the definition and offer improved preservation for cultural heritage assets by integrating them into the system. These route paths, which share a collective historical heritage, serve to inform travellers about heritage, monuments, art, intangible heritage, and even lifestyles.

Cultural routes, particularly those linking heritages across various countries or regions, exemplify, through a voyage across space and time, how the heritage of diverse nations and cultures enriches a collective and dynamic cultural legacy. These routes serve as conduits for cross-cultural conversations and foster a deeper comprehension and appreciation of history.[32]

Cultural routes are living historical features distinguished by two primary attributes: their establishment to link two or more distinct geographical points, and their role in fostering connections among diverse human communities due to their historical usage. Facilitating transmission, transportation, communication, and exchange, cultural routes inherently serve as conduits of cultural interaction.[33]

Cultural routes are designed not solely to serve as tourist guides, but also to offer a presentation of cultural values within a specific theme. Each formation within the route is regarded as an essential component of the whole, and it holds individual value for each of them.[34]

"The consideration of Cultural Routes as a new concept or category does not conflict nor overlap with other categories or types of cultural properties—monuments, cities, cultural landscapes, industrial heritage, etc.—that may exist within the orbit of a given Cultural Route. It simply includes them within a joint system which enhances their significance."[35]

The subjects covered by cultural routes span from ancient megalithic cultures in Europe to 20th-century architectural styles, encompassing both constructed heritage and natural landscapes.[36]

Through numerous meetings and conferences focused on safeguarding cultural heritage, the concept of cultural routes emerged with the goal of preserving this heritage. This concept shifted the understanding of cultural heritage from being primarily a national

in Aleppo," (master's thesis, Fatih Sultan Mehmet Vakıf University, 2021).

[32] Council of Europe, "Cultural Routes of the Council of Europe programme," accessed October 16, 2023, https://www.coe.int/en/web/cultural-routes/about.

[33] Alberto Martorell Carreño, "The transmision of the spirit of the place in the living cultural routes: The Route of Santiago de Compostela as case study". (16th ICOMOS General Assembly and International Symposium: 'Finding the spirit of place – between the tangible and the intangible', Canada, September 29-October 4, 2008).

[34] Özocak, In *The Footsteps of Evliya Çelebi.*

[35] ICOMOS, "The ICOMOS Charter on Cultural Routes," October 4, 2008.

[36] Council of Europe, *Cultural Routes of the Council of Europe.*

or regional concern to one that is a universal heritage for all of humanity.

2.1. Historical Development of the Concept

The discussion of the concept of 'Cultural Routes' began with a report presented by a working group at the Council of Europe in 1960, aiming to create collective awareness about Europe's most significant cultural sites and to incorporate these areas into leisure civilizations. The conclusions set forth in this report paved the way for the initiation of the idea to rediscover European cultural heritage through journeys, and for the development of this concept.[37]

In the 1964 report titled 'L'Europe Continue', presented by a Council of Europe working group with a focus on raising public awareness about culturally significant areas, the emphasis was on creating awareness about European culture through travel routes. The report also highlighted objectives such as establishing tourism networks linked to the cultural geography of Europe and introducing the historically significant regions and culture of European civilization to global citizenship.[38]

The first official endeavour related to cultural routes occurred in 1984 when the Council of Europe invited member states to launch the European Cultural Routes Programme. Following this invitation, in 1987, the Program of the Cultural Routes of the Council of Europe was initiated with the aim of demonstrating how the cultural heritage in various countries of Europe would contribute to a shared cultural legacy, as well as to promote and strengthen alternative tourism patterns.[39] The program's objectives are twofold: firstly, 'to acted as mechanisms towards the European ideal', and secondly, 'to achieve the purpose of building and improving pan-European dialogues'.[40]

Following the program, during the 2nd Conference of European Ministers Responsible for Architectural Heritage, held in Santiago de Compostela, Spain, the Santiago de Compostela Declaration declared the Santiago de Compostela Pilgrimage Route as the first European Cultural Route. This recognition aimed to symbolize Europe's development and serve as a reference for future planned routes. (In the subsequent years, it was expanded to form the European Routes of Migration network). In 1993, this route was designated by the UNESCO World Heritage Committee as a "World Heritage" in the category of a group of monuments.[41]

As a result of the Santiago de Compostela Cultural Route pioneering the concept of routes and being designated as a World Heritage site, it garnered attention. Consequently,

[37] Özocak, In *The Footsteps of Evliya Çelebi.*
[38] Ibidem.
[39] Deniz, *A Cultural Route Proposal.*
[40] Shaochen Wang, "The Protection, Designation and Management of Cultural Routes: A Case Study of the Tea & Horse Road in China," (doctoral thesis, University College London, 2022).
[41] Ayça Aslıhan Diker, "Protecting Industrial Heritage Areas as Component of Urban Identity: Adana Industrial Heritage Route" (doctoral thesis, Eskişehir Technical University, 2023).

during the World Heritage Committee meeting held in Madrid in 1994, in collaboration between UNESCO and ICOMOS, the term "cultural route" was introduced and defined for the first time.[42] The idea was presented as a heritage route that can be understood through the ongoing dynamics of movement across both space and time. Moreover, it encompasses an entirety and emphasizes interactions and communication between various regions and countries.[43] As a result of the meeting, the first document related to the subject was published under the title "Routes as a Part of Our Cultural Heritage".

As a result of the protocol signed between the Council of Europe and the Grand Duchy of Luxembourg in 1997, The European Institute of Cultural Routes (EICR) was established with the aim of implementing cultural routes. The institute's primary objective is to document all pertinent information regarding the route and maintain specialized libraries on related features. Additionally, it is tasked with conducting research on relevant cultural routes within Europe and coordinating educational initiatives. The institute places a strong emphasis on acknowledging cultural routes from a tourism perspective and works through cross-border operations and activities to foster communication among pertinent European nations.[44]

Following the establishment of The European Institute of Cultural Routes, in 1998, the International Council on Monuments and Sites (ICOMOS) expanded its scope beyond just Europe and formed the 'ICOMOS Cultural Routes Committee (International Committee on Cultural Routes - ICCR)' with members from various parts of the world.[45] The primary aim of the ICOMOS International Committee on Cultural Routes is stated as;

"...to promote, consistent with the aims of ICOMOS international cooperation, the identification, study and enhancement of cultural routes and their significance in relation to their main value as a whole, and in connection with the protection, maintenance and conservation of their monuments, groups of buildings, archaeological remains, cultural landscapes and sites, as they are connected through cultural values and historical links."[46]

In 2002, a web portal titled 'A Common Heritage: Cultural Routes and Landscapes', where information and activities related to routes are shared, was established by the European Institute of Cultural Routes, ensuring its accessibility to all of humanity.[47]

In 2005, UNESCO defined four heritage categories, which include

[42] Diker, *Protecting Industrial Heritage Areas.*
[43] Esra Karataş, "The Role of Cultural Route Planning in Cultural Heritage Conservation: The Case of Central Lycia," (master's thesis, Middle East Technical University, 2011).
[44] Wang, *The Protection, Designation and Management of Cultural Routes.*
[45] Özocak, In *The Footsteps of Evliya Çelebi.*
[46] Karataş, *The Role of Cultural Route Planning.*
[47] Çekül Vakfı. *Kültür Rotaları Planlama Rehberi*. (İstanbul: Tarihi Kentler Birliği Yayınları, 2015).

cultural landscapes, historic cities and town centres, heritage canals, and heritage routes. The concept of cultural routes was first formally defined as "heritage route," ensuring its consideration worldwide. In the same year, through the implementation of the Southeast European Cultural Corridors Project under the Varna Declaration, numerous efforts were made to promote, utilize, and preserve cultural corridors. Through the website established as part of the project, the unique cultural corridors and heritage of Southeast Europe were presented digitally.[48]

In 2008, The ICOMOS Charter on Cultural Routes was published as a reference source for cultural routes. The issued declaration aimed to provide a broader definition of cultural routes, establish fundamental principles for route creation, address issues concerning route management, define usage guidelines, and ensure the preservation of routes. In the ICOMOS Charter on Cultural Routes, cultural routes are defined in the broadest sense as follows;

"Any route of communication, be it land, water, or some other type, which is physically delimited and is also characterized by having its own specific dynamic and historic functionality to serve a specific and well determined purpose, which must fulfil the following conditions:

a) It must arise from and reflect interactive movements of people as well as multi-dimensional, continuous, and reciprocal exchanges of goods, ideas, knowledge and values between peoples, countries, regions or continents over significant periods of time;

b) It must have thereby promoted a cross-fertilization of the affected cultures in space and time, as reflected both in their tangible and intangible heritage;

c) It must have integrated into a dynamic system the historic relations and cultural properties associated with its existence."[49]

Following the progress made throughout the entire process, the promotion of cultural routes in Europe emerged as a triumph, assuming significant importance in the expansion of cultural tourism, particularly targeting lesser-known areas and rural regions.[50]

In 2010, the Enlarged Partial Agreement on Cultural Routes was ratified. This agreement defined cultural routes in Europe as collaborative projects encompassing cultural, educational, heritage, and tourism elements, with the goal of developing and promoting an itinerary or a series of routes based on a historical path, cultural concept, figure, or phenomenon of transnational importance. This serves to enhance the understanding and appreciation of shared European values (CoE, 2010). Recently, various new studies, backed by the Council of Europe and various national cultural agencies, have been exploring cultural routes in

[48] Deniz, *A Cultural Route Proposal.*

[49] ICOMOS, *The ICOMOS Charter on Cultural Routes.*

[50] Wang, *The Protection, Designation and Management of Cultural Routes.*

Europe. Many of these endeavours seek to assess the significance of cultural routes and consider their potential as a tool for advancing regional tourism.[51]

In 2012, a Council of Europe meeting was held in France with the participation of UNESCO, the European Union, UN World Tourism Organization, Economic Development Organization, NGOs, local governments, and universities. During this meeting, a joint decision was made to utilize creative and innovative tools within a framework of a network of routes to highlight educational and participatory potentials, as well as to ensure visibility. As a result of this meeting, the document titled "The Colmar Declaration: 25 Years of Council of Europe Cultural Routes" was published. In the same year, the "Crossroads of Europe" initiative was established with the aim of promoting European cultural routes to the private sector, tourism companies, local and national governments, and other relevant stakeholders, increasing awareness, and fostering collaboration.[52]

2.2. Cultural Route Examples

2.2.1. The Cultural Routes of the Council of Europe

The European Cultural Routes (ECR) was launched by Council of Europe in 1987, mentioned in the previous section. It is an invitation to experience networks that share a common history and cultural legacy. The ECR designation is awarded to routes that promote the shared cultural history and memory of Europe. The program also expanded beyond Europe's borders and began to include routes as far as North Africa or the Middle East.

In the year 2023, there are 47 Cultural Routes represented by the Council of Europe. They play a significant role in interpreting the diverse aspects of contemporary Europe. At that point, it's important to note that a "route" in this context doesn't always refer to a tangible path to be followed. Instead, it can consist of a group of cultural stakeholders considered to be in the same category.

The Cultural Routes of the Council of Europe provide an array of options, encompassing diverse themes such as architecture, landscape, religious impacts, gastronomy, intangible heritage, and significant figures in European art, music, and literature.[53]

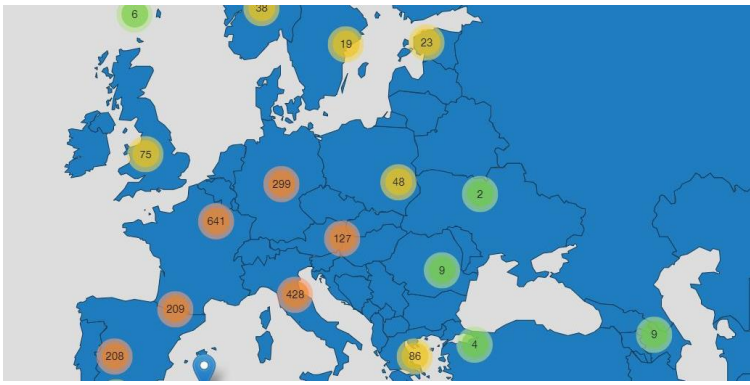

Figure 1: Cultural Routes Database of Council of Europe[54]

[51] Ibidem.
[52] Çekül Vakfı. *Kültür Rotaları Planlama Rehberi*.
[53] Council of Europe, *Cultural Routes of the Council of Europe.*
[54] Council of Europe, "Cultural Routes Database", accessed October 19, 2023, https://www.coe.int/en/web/cultural-routes/cultural-routes-database-main-page.

The Council expresses its promise regarding the cultural routes it offers as follows;

"The certification "Cultural Route of the Council of Europe" is a guarantee of excellence. The networks implement innovative activities and projects pertaining to five main priority fields of action: co-operation in research and development; enhancement of memory, history and European heritage; cultural and educational exchanges for young Europeans; contemporary cultural and artistic practice; cultural tourism and sustainable cultural development."[55]

The Council of Europe presents a framework for managing transnational cultural and tourism initiatives, fostering collaboration among national, regional, and local authorities as well as various associations and socio-economic stakeholders.[56]

The routes established by UNESCO and the Council of Europe, created by ministries, associations, and municipalities of countries, and formed by various groups conducting research and documentation to preserve cultural heritage collectively shed light on the definition of the concept of cultural routes today.[57]

The most important example that can be given for the cultural route is undoubtedly Santiago de Compostela Pilgrim Routes certified in 1987, which contributed greatly to the start of the whole process (*Fig. 2*).

[55] Ibidem.
[56] Ibidem.
[57] Özocak, In *The Footsteps of Evliya Çelebi.*

The legend of St. James tells of his remains being transported by boat from Jerusalem to northern Spain, where he was buried in Santiago de Compostela. This discovery led to the Way of St. James becoming a major Christian pilgrimage during the Middle Ages, offering a plenary indulgence to those who completed it. This pilgrimage created a rich heritage, with tangible elements like places of worship and accommodation, as well as intangible heritage in the form of myths, legends, and songs along the Santiago Routes.[58]

Figure 2: Nine routes to the Catedral de Santiago de Compostela[59]

2.2.2. UNESCO Routes of Dialogue

UNESCO aimed to bring a multicultural and impartial perspective to history teaching and initiated the Dialogue Routes program in order to contribute to the development of regional interhistorical dialogue.

[58] Council of Europe, "Santiago de Compostela Pilgrim Routes," accessed October 16, 2023, https://www.coe.int/en/web/cultural-routes/the-santiago-de-compostela-pilgrim-routes.
[59] "Camino Routes," Follow the Camino, accessed October 4, 2023, https://followthecamino.com/en/camino-de-santiago-routes/.

The program is based on the idea of movement dynamics and exchange, encompassing both tangible and intangible dimensions, and a mutual cultural understanding in spatial and temporal continuity.[60]

One of the most striking examples that can be given is The Silk Roads Programme. It is a prominent project under UNESCO's 'Routes of Dialogue' initiative, stands as a cornerstone endeavour in the realm of social and human sciences. Over a span of over thirty years, it has functioned as a valuable instrument for comprehending the dynamic interactions and mutual enrichment of cultures and societies.[61]

The Silk Roads, known for their extensive trade networks, were more than just conduits for goods. They facilitated the widespread exchange of knowledge, ideas, cultures, and beliefs due to constant movement and mingling of populations. This significantly impacted the histories and civilizations of Eurasian peoples. Travelers were attracted not only by commerce but also by vibrant intellectual and cultural exchanges in cities along the routes. These cities became centres of culture and learning, leading to the sharing of various disciplines. This mutual exchange influenced the development of languages, religions, and cultures.[62]

Today, many historic buildings and monuments still stand, marking the passage of the Silk Roads through caravanserais, ports and cities.

The UNESCO Silk Roads Platform revitalizes and expands historical networks in the digital realm under the light of this enduring heritage. It brings people together in a continuing dialogue along the Silk Roads, aiming to enhance mutual understanding between diverse and often interrelated cultures in the surrounding regions (*Fig. 3*). Various aspects of the routes are explored through a series of themes, spanning from festivals and creative industries to world cultural heritage, museums, underwater heritage, and many more.[63]

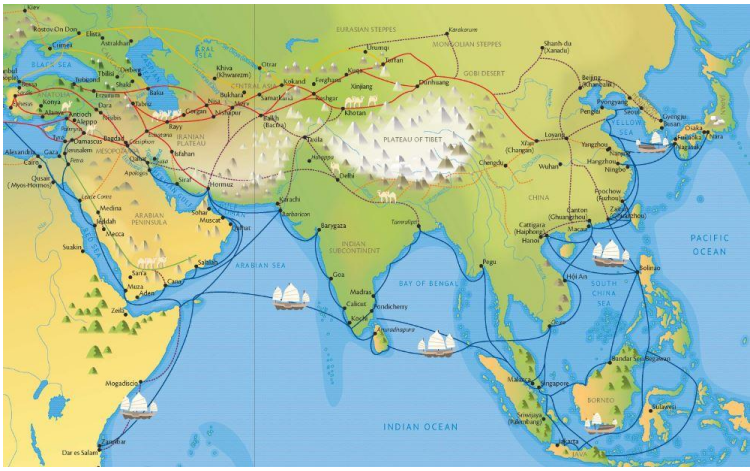

Figure 3: UNESCO Silk Roads Map[64]

[60] Tuğçe Kuruç, "Guide for Creating Cultural Route as a Tool for the Protection of Cultural Heritage" (master's thesis, Mimar Sinan Fine Art University, 2018).

[61] UNESCO, "Silk Roads Programme", accessed October 19, 2023, https://en.unesco.org/silkroad/content/unesco-celebrates-35-years-dialogue-along-silk-roads.

[62] UNESCO, *Silk Roads Programme.*

[63] Kuruç, *Guide for Creating Cultural Route.*

[64] UNESCO, *Silk Roads Programme.*

The other notable instance of the program is the Slave Route Project (*Fig. 4*), initiated in 1994 with the aim of establishing a global framework for diverse and interdisciplinary discussions on the enduring impact of slavery in contemporary societies.[65]

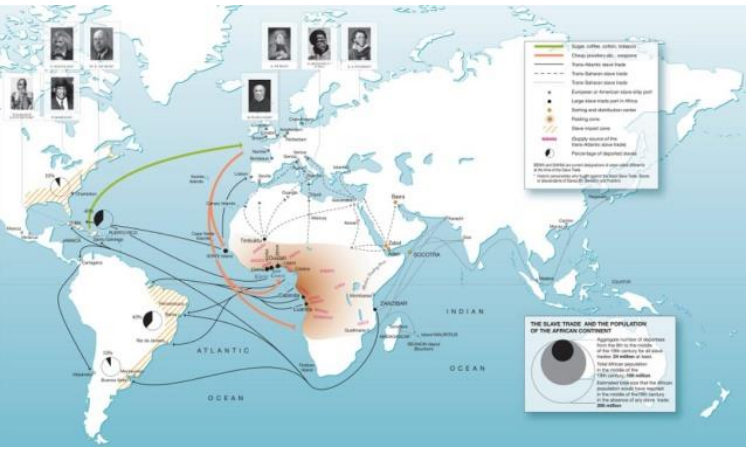

Figure 4: Slave Route Map[66]

2.3. Industrial Heritage Route

Industrial heritage tourism has become increasingly prevalent in recent years as a new cultural program within the scope of tourism activities. One of the most significant reasons for this is the desire of cultural tourists to learn about nostalgic and authentic experiences related to traditional industrial activities. These experiences constitute the driving force behind industrial heritage tourism.[67]

Industrial heritage tourism involves the establishment of tourist-related activities and industries on human-made sites, structures, and environments that have their origins in industrial processes from earlier epochs.[68]

The studies and published texts related to industrial heritage and industrial tourism have extensively emphasized the concept of routes, recommending the presentation of heritage as an industrial route to increase awareness about industrial heritage.

One of the most significant examples of this is the Recommendation text published by the Council of Europe in the year 1900, which was also mentioned in the previous section;

"Local and regional elected representatives in order to attract their attention both to the historic value of this heritage and to the possibilities resulting from action centered on enhancement and new forms of use, including the promotion of tourism by organizing specific cultural routes and encouraging industrial tourism."[69]

Following, in the section "Present and communicate the heritage

[65] UNESCO, "Promoting shared history and memory for reconciliation and dialogue," accessed November 15, 2023. https://en.unesco.org/partnerships/partnering/promoting-shared-history-and-memory-reconciliation-and-dialogue.

[66] UNESCO Collective Healing Initiative, "Slave Route Map," accessed November 16, 2023. https://collective-healing.org/portfolio/slave-route-map/.

[67] Diker, *Protecting Industrial Heritage Areas.*

[68] Philip Feifan Xie, "Developing industrial heritage tourism: A case study of the proposed jeep museum in Toledo, Ohio" (*Tourism Management* 27, no. 6 (2006): 1321-1330).

[69] Council of Europe, "Recommendation No. R (90) 20 on the Protection and Conservation of the Industrial, Technical and Civil Engineering Heritage in Europe", September 13, 1990, https://search.coe.int/cm/Pages/result_details.aspx?ObjectId=09000016804e1d18.

dimensions and values of industrial structures, sites, areas, and landscapes to raise public and corporate awareness, and support training and research" of the Dublin Principles, it is stated that one of the necessary steps for promoting industrial heritage is the creation of an industrial route;

"Programmes and facilities such as visits of active industrial heritage sites and the presentation of their operations as well as the stories and intangible heritage associated with their history, machinery and industrial processes, industrial or city museums and interpretation centres, exhibitions, publications, websites, regional or trans-boundary itineraries should be developed and sustained as means to raise awareness and appreciation for the industrial heritage in the full richness of its meaning for contemporary societies."[70]

The industrial heritage route is a subcategory within cultural routes, covering a network of sites and areas linked to agricultural and food production, transportation, energy generation, paper and textile manufacturing, mining, etc.

Industrial heritage routes have been widely used as a preferred method for the sustainable and comprehensive preservation of industrial facilities as cultural heritage, especially in Europe, over the past twenty years. Particularly in European countries where the industrial revolution and the concept of industrial heritage are prominently influential, industrial heritage routes enhance the cultural value of the facilities and areas within the route, as well as integrate them with the city. This integration strengthens the historical and environmental identity of industrial cities, making them a popular choice for cultural and tourism activities, and thus contributing to the local economy.[71]

2.3.1. ERIH and Industrial Heritage Route Examples

The first step towards the plural evaluation of industrial heritage structures within the scope of a route was taken in Europe. Stemming from the idea that the industrial revolution is the most significant factor shaping Europe's common identity, ERIH emerged with the aim of creating an industrial heritage route as a method of comprehensive preservation for these structures.[72]

ERIH, or the European Route of Industrial Heritage, serves as the tourism information network for industrial heritage across Europe. This network is overseen by the ERIH association, comprising approximately 350 members spanning 27 countries.[73]

ERIH has a route system consisting of "Anchor Points", "Regional Routes" and "European Theme Routes". It indicates industrial heritage sites by

[70] TICCIH (The International Committee for the Conservation of the Industrial Heritage), "Dublin Principles", November 28, 2011, https://ticcih.org/about/about-ticcih/dublin-principles/.

[71] Diker, *Protecting Industrial Heritage Areas.*

[72] Ibid.

[73] ERIH (European Route of Industrial Heritage), accessed October 16, 2023, https://www.erih.net/.

pinning them on a master plan. In order for a site to be pinned in the ERIH master plan, it must present industrial history or its products, be significant for industrial history, and accessible to visitors at least two days a week. Today ERIH presents over 2.200 sites. On the other hand, for a site to be an "Anchor Point", it must have an exceptional historical importance in terms of industrial heritage which also offers a high quality visitor experience. They are the milestones of European Industrial Heritage.[74]

Secondly, "Regional Routes" comprise a number of industrial monuments that are less significant but have a mark on European industrial history. The region's industrial heritage is worth a visit for residents and tourists.[75] ERIH has 22 regional routes, 11 of which are in Germany.

Finally, "Theme Routes" focus on specific questions relating to European industrial history and reveal - often in connection with the biographies - potential links between radically different industrial monuments all over Europe. [76] ERIH presents its routes under 18 different themes which are application of power, chemistry, communication, housing, industrial architecture, industrial landscapes, industry and war, iron and steel, mining, paper, production and manufacturing, salt, service and leisure industry, textiles, transport, water, company museums, UNESCO World Heritage.

The Ruhr region, which was an important settlement area where industrialization emerged and developed in Germany in the 19th century, can be cited as an example of an industrial heritage route. The Route of Industrial Heritage in the Ruhr area is a curated tourist route encompassing 27 significant historical sites and attractions (*Fig. 5*). Spanning 400 kilometres, it offers a comprehensive exploration of the region's industrial legacy, showcasing landmarks from the past 150 years (*Fig. 6-7*). This includes the UNESCO World Heritage site, Zollverein in Essen. The route encompasses themes of coal, steel, energy, transport, chemicals, and water, providing insights into the area's industrial evolution. Each anchor point is marked by distinctive yellow signage, offering detailed information about the location's historical and thematic significance. Additionally, over a thousand locations, including former workers' settlements, contribute to the rich tapestry of industrial heritage along the route.[77]

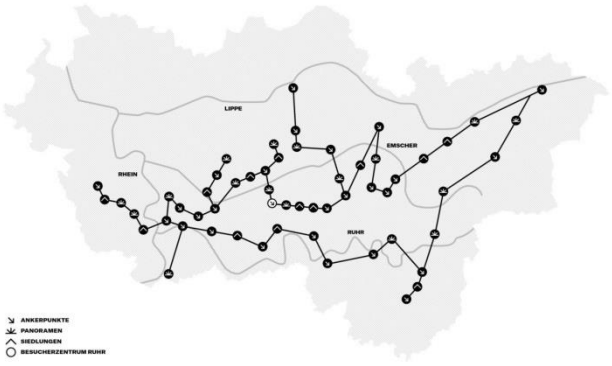

Figure 5: Ruhr region industrial heritage route.[78]

[74] ERIH.
[75] Ibid.
[76] Ibid.
[77] Route-Industriekultur, accessed October 19, 2023, https://www.route-industriekultur.ruhr/en/.
[78] Route-Industriekultur.

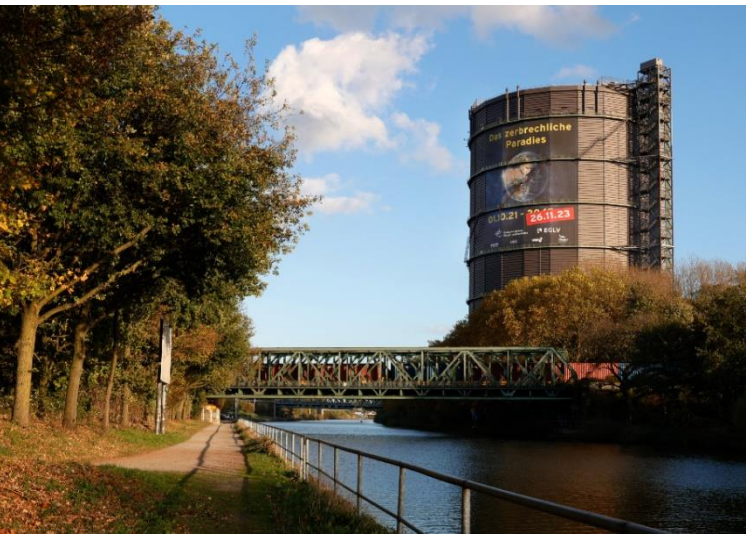

Figure 6: The Oberhausen Gasometer[79]

Figure 7: The Zolverein mine in Essen[80]

Another example that can be mentioned here is the Berlin Industrial Culture route. The route was created by the Berlin Industrial Culture Centre.

The Berlin Industrial Culture Route considers the city as an open-air museum, aiming to explore, recognize, and sustain its industrial heritage. Eighteen focal points representing the city's industrial past and development have been chosen. These include industrial heritage sites with diverse functions like production, energy, transportation, and communication, all made accessible to visitors. Additionally, the route connects with the European Route of Industrial Heritage, ensuring a universal linkage with structures marked by the ERIH logo.[81]

Bicycle routes have been set up to offer various experiences of industrial heritage. These routes not only include industrial structures but also provide details like route length, estimated travel time, recommended rest stops, and information about public transportation connections.

Figure 8: Berlin bcycle route example[82]

[79] Nord Rein West Falen, "Cyciling the route der industrial culture (industrial heritage trail)," accessed November 16, 2023. https://www.nrw-tourism.com/a-industrial-heritage-trail.

[80] Nord Rein West Falen, *Cyciling the route der industrial culture.*

[81] Deniz, *A Cultural Route Proposal.*

[82] Evinc Dogan, "Tracing Industrial Heritage: The Case of Berlin Bicycle Route" (*Toleho* 1, no. 2 (2019): 59-67)

PART II.

GEOGRAPHIC INFORMATION SYSTEMS (GIS)

3. General Information about GIS

In today's rapidly digitizing world, Geographic Information Systems (GIS) stand out as a fundamental and integral part of the technological landscape. This technological revolution is bringing about revolutionary changes in various sectors by offering limitless possibilities in the collection, analysis, and visualization of geographical data. This study aims to delve deep into the impacts that GIS holds in the modern world.

This research will address the current practical applications of GIS. Traditionally utilized in geographic analysis and map creation, GIS now plays a pivotal role in sectors such as energy, environment, healthcare, transportation, and many others. This paper will explore the applications of GIS in different industries and how these applications benefit organizations and societies.

Particular emphasis will be placed on its role in the tourism sector. From travel planning to the development of holiday destinations, the creative solutions that GIS brings to the tourism industry will be vividly showcased. Furthermore, critical aspects like the design of cultural routes and the management of tourist areas through GIS will be explored.

This research will reveal that GIS transcends being merely a technological tool and deeply influences the operations of various sectors. Understanding the impacts of GIS in these domains will serve as an important guide in formulating strategies for future applications.

3.1. Definition

It is possible to find various definitions of what GIS is. It would be appropriate to give more than one definition in order to explain it better.

The first definition of GIS in the modern sense was made by Burrough (1986). He explained the GIS as;

"A powerful set of tools for collecting, storing, retrieving, at will, transforming and displaying spatial data from the real world."[83]

In 1989 Aronoff basically defined the GIS as;

"Any manual or computer based set of procedures used to store and manipulate geographically referenced data."[84]

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[83] Mr Ershad and Ershad Ali, "Definition, Development, Applications & Components." Department of Geography, Ananda Chandra College, India, March 26, 2020.

[84] Ershad, *Definition, Development, Applications & Components*, 2.

It is possible to find a more comprehensive definition from the Environmental Systems Research Institute. According to the ESRI a geographic information system (GIS) is;

"A system that creates, manages, analyses, and maps all types of data. GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like there). This provides a foundation for mapping and analysis that is used in science and almost every industry. GIS helps users understand patterns, relationships, and geographic context. The benefits include improved communication and efficiency as well as better management and decision making."[85]

The core feature of all GIS definitions is the examination and retention of georeferenced data which means a data tied to a known Earth coordinate system, as evident from the given descriptions. In a broader sense, GIS is a system designed to aid in addressing issues involving geographic elements.

3.2. Main Data Types

Spatial data refers to information associated with a specific location, such as the number of trees in a particular forest, a city's population. In Geographic Information Systems, it is crucial to consistently link data with a location, a process known as geocoding. Each database in GIS must include an element indicating the geographical location, termed as a geographic code (geocode), to define the spatial position within the data.[86]

GIS utilizes two primary types of data: vector and raster. (*Fig. 9*) In addition to this geographical data creation, it is possible to store the descriptive-attribute information that distinguishes GIS from other CAD/CAM type graphic software in the same environment with geographical information. That's why, attribute data can be considered as the third main data type.[87] Spatial data informs us about the location of events, whereas attribute data reveals the details of what is happening, describing the nature or characteristics inherent in the spatial data.

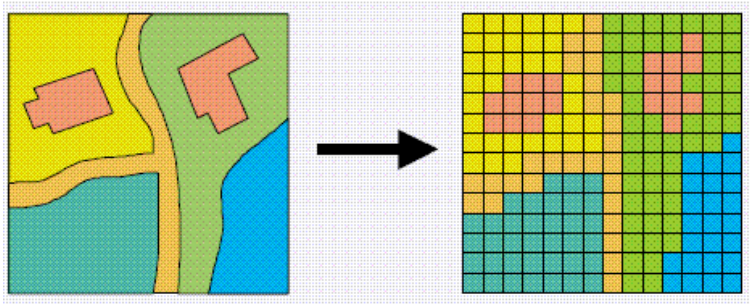

Figure 9: Vector and raster data[88]

Vector data represents discrete objects, including points, lines, and polygons, with layers representing geometries sharing common attributes.

[85] "What is GIS?" ESRI, accessed October 2, 2023. https://www.esri.com/en-us/what-is-gis/overview.

[86] Vahap Tecim, *Coğrafi Bilgi Sistemleri: Harita Tabanlı Bilgi Yönetimi* (Ankara: Vahap Tecim, 2008), 79-80.

[87] Tecim, *Coğrafi Bilgi Sistemleri,* 80.

[88] "Raster basics," ESRI, accessed November 12, 2023. https://desktop.arcgis.com/en/arcmap/latest/manage-data/geodatabases/raster-basics.htm.

For instance, point data represents single entities like the locations of electric poles or banks in a city, while line data represents interconnected features such as power lines or roads. Polygon data depicts specific, enclosed regions, like areas covered by power plants or forests.

On the other hand, raster data, composed of pixels with each pixel holding a value, is commonly found in topographic maps, satellite images, and aerial surveys. Raster data is essential in fields like meteorology and disaster management.

There are two types of raster data, continuous and discrete. Continuous raster data, such as elevation or temperature maps, undergo gradual changes and have fixed registration points like sea level. Discrete raster data, like land cover maps, assigns specific classes to pixels, defining distinct thematic areas.[89]

While Vector images maintain high quality when resized, making them versatile for various applications, enlarging raster data may result in pixilation, and stretching can cause distortion.

3.3. Purpose

GIS aims to address problems with a geographical dimension. To illustrate the scope of GIS, in addition to the simple example questions provided below, GIS can also seek solutions for more complex queries;

-What is the best place for X?

-What is in region or point A?

-What are the secondary roads connected to this provincial road?

-What types of areas cross this provincial road?

-How many Objects-B are there in Turin?

-Which areas are affected by my decision?

-What areas does river D cover when it floods?

In addition to such questions, it is also possible to make analyses such as the erosion risk of any region and the degree of this risk, areas suitable for agriculture, regions at risk of earthquakes, etc., with GIS.

Vahap Tecim summarized the purposes of GIS usage in his relevant book as follows;

"Although used for various purposes in different fields, generally, GIS aims to achieve the following three objectives:

a) Increase productivity using maps and geographic information,

b) Enhance management in the geographic database,

[89] "The Different Types of GIS Data," MGISS, published on February 28, 2022. https://mgiss.co.uk/the-different-types-of-gis-data/.

c) Present better strategic ways utilizing geographic data to support decision-making."[90]*

4. Application Scope of GIS

As an effective spatial analysis tool used by many sectors, GIS has a wide application area and is used extensively today. Due to its features, GIS is included in all kinds of applications related to location information. In particular, GIS has begun to be used as an important common concept in many applied professions such as urban and regional planning, cadastre, agriculture, forestry, landscape, geology, defence, security, tourism, archaeology, local government, population, education, environment, health and so on. Today, there are many projects and application examples realized with GIS in the world.

In this section, it will be useful to give a more detailed explanation and specific examples of some areas where GIS is commonly used.

4.1. Agriculture

Agriculture is one of the most important industries utilizing GIS technology for the purpose of coordinating agricultural production, improving productivity through the application of suitable techniques, and handling the processing and marketing of agricultural products. It is essential to acquire the most fundamental information for policy formulation, strategic planning, and ultimately ensuring sustainability in the agriculture sector, which fulfils the basic need of nourishment for humanity. Elevating efficiency in agricultural operations mandates the adoption of fitting technology for production.[91]

The selection of GIS software in agriculture can differ based on its intended use. Certain tools focus on displaying crop varieties, yields, and their distributions. Some are designed to visualize soil moisture levels, aiding users in determining optimal crops for planting. Additionally, there are software options facilitating the comparison of economic implications between forestry and logging. Consequently, it falls upon individual farmers or agriculture managers to identify a GIS solution that furnishes the necessary data for making well-informed decisions regarding their farmland.[92]

For instance, prolonged dry periods and excessive precipitation in areas lacking proper drainage can have detrimental effects on crop yields. Agriculture GIS technology enables farmers to evaluate water stress levels for each crop, identifying visual cues that indicate either an excess or shortage of water. This information is valuable for adjusting irrigation

[90] Vahap Tecim, *Coğrafi Bilgi Sistemleri: Harita Tabanlı Bilgi Yönetimi* (Ankara: Vahap Tecim, 2008), 55.
* translated by the author.

[91] Recep Nişancı, Volkan Yıldırım, and Ebru Çolak, "Coğrafi Bilgi Sistem Uygulamaları," *Bilim ve Teknik*, September 2010, 63.

[92] Kateryna Sergieieva, "GIS in Agriculture: Best Practices for AgriTech Leaders," EOS Data Analytics, december 15, 2022. https://eos.com/blog/gis-in-agriculture/

practices. Water stress is commonly assessed using indices like NDWI or NDMI (*Fig. 10*).[93]

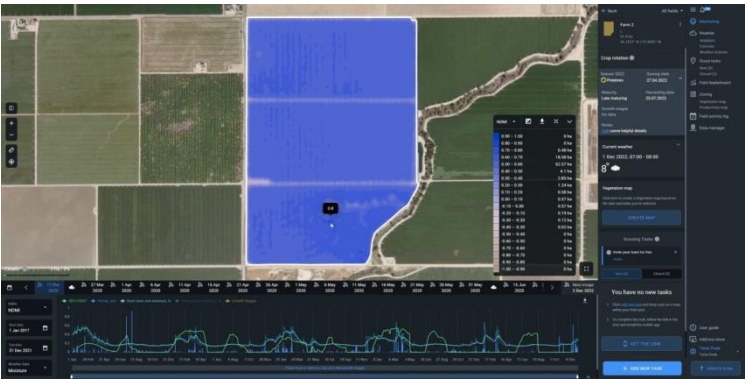

Figure 10: Water deficiency identification with NDMI index[94]

4.2. Architecture and Urban Planning

Urban planning endeavours necessitate a substantial reliance on spatial data. Essentially, the planning process encompasses stages such as data gathering, input, analysis, synthesis, considering alternative scenarios, and presenting the finalized plan.

GIS enables a detailed understanding of a city's current needs through processing geospatial data from sources like satellite imaging. This technology is essential for balancing competing priorities and solving complex problems in urban development, such as optimizing building placement and evaluating waste disposal site feasibility. GIS tools are adaptable, catering not only to densely populated areas but also to smaller towns and informal settlements. Planners utilize GIS to assess how new constructions align with existing infrastructure, meet regulatory demands, and identify opportunities for efficient resource use, including optimal locations for renewable energy sources.[95]

One of the important examples is noise exposure maps. With the help of these maps it is possible to orchestrate urban mobility plans with special consideration for the impact of environmental noise (*Fig. 11-13*).

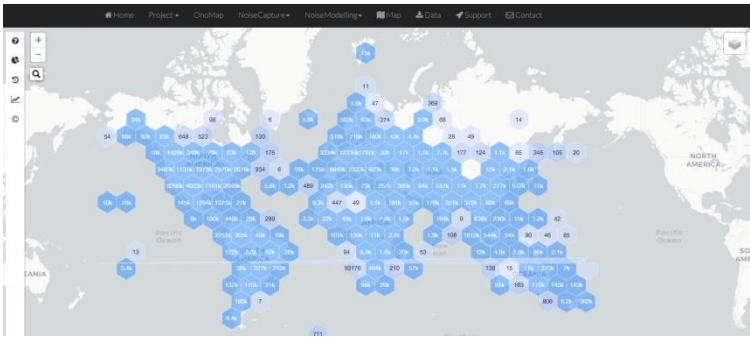

Figure 11: The map feeded in real-time by the raw data collected using the NoiseCapture mobile application to explore the noise environment everywhere in the world.[96]

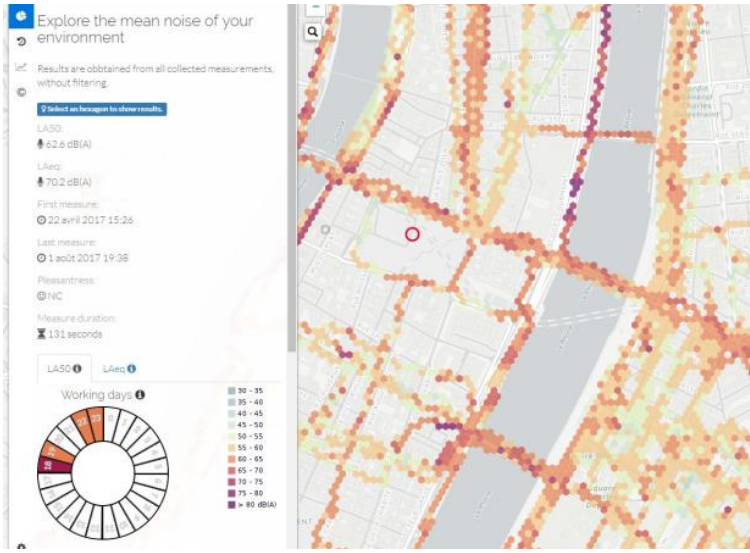

Figure 12: Mean noise of the selected area[97]

[93] Sergieieva, *GIS in Agriculture.*
[94] Ibidem.
[95] "Why GIS Is Important in Urban Planning," USC Dornsife, published on August 21, 2023. https://gis.usc.edu/blog/why-is-gis-important-in-urban-planning/.
[96] "Noise Maps," Noise-Planet, accessed October 2, 2023, https://noise-planet.org/map.html.
[97] *Noise Maps.*

Figure 13: How a metamodel can be used for evaluate in real time, the effect of several parameters of noise emission and propagation on the noise prediction in a city.[98]

Although there are countless things that can be done with GIS in the field of architecture and urban planning, other applications that can be mentioned include examples such as planning high-rise buildings in a way that does not obstruct the view, mastering the collective dynamics of interacting objects in urban phenomena at the scale of individual households, people, and units of real estate and at time scales approaching "real-time", and orchestrating parking available by collecting the percent of spaces occupied versus search time.[99]

4.3. Geomarketing

Geomarketing is a field that incorporates geolocation into the planning and execution of marketing endeavours. Its primary objective is to assess locations using available data to identify the most favourable sites for specific services.[100] Geomarketing has diverse applications and is currently utilized in various fields and sectors.

For example, banks today, need to be market driven and market responsive. The success of a bank relies not only on its location but also on its capacity to deliver services tailored to the needs of its customers. By utilizing GIS data, banks can not only decide on optimal branch locations but also identify the specific product offerings that cater to the requirements of their customers in distinct regions.

Filling in market and service gaps by understanding where customers, facilities, and competitors are with address locating, database management, and query tools, identifying under-served areas and analysing competitor's market, and capturing locations where existing mobile transactions occur and assisting in mobile security infrastructure are some of the benefits of GIS in banking (*Fig. 14*).

[98] "Using a metamodel for noise prevision in a city," UMRAE Official, published on October 14, 2019, YouTube video, https://www.youtube.com/watch?v=orc5ZbN2dlY&ab_channel=UMRAEOfficial.

[99] "1000 GIS Applications & Uses – How GIS is Changing the World," GISGeography, last modified October 1, 2023. https://gisgeography.com/gis-applications-uses/.

[100] "Geomarketing and GIS for Real Estate: Finding Potential New Hotel Locations in Zagreb (Croatia)," GISCloud, published on May 13, 2021. https://www.giscloud.com/blog/geomarketing-and-gis-for-real-estate-finding-potential-new-hotel-locations-in-zagreb-croatia/.

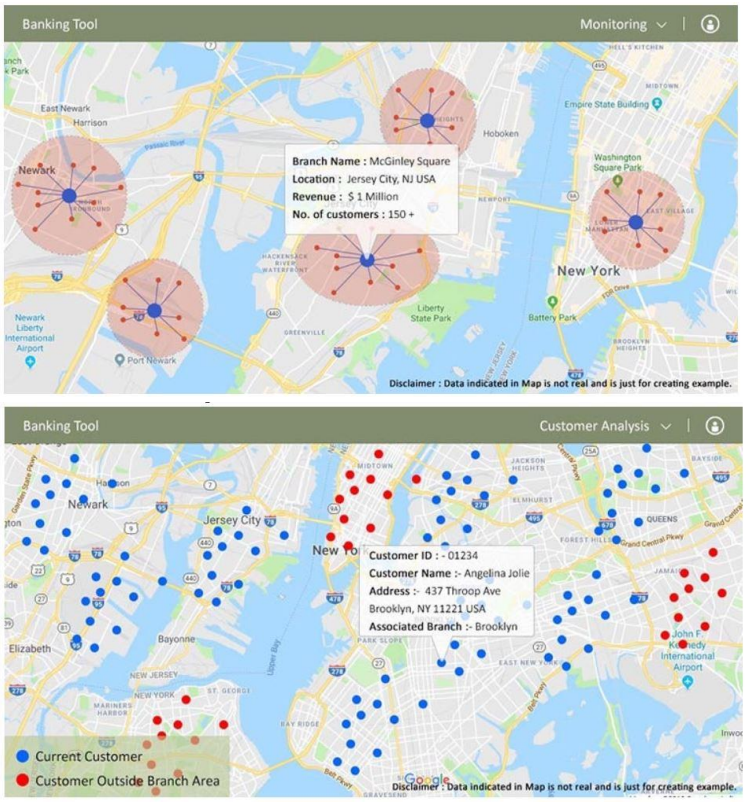

Figure 14: Customer Analysis and Management Map, and Performance Monitoring.[101]

4.4. Civil Protection & Military

GIS technology provides valuable assistance to security forces in ensuring the safety of both individuals and communities by swiftly and accurately generating information. Information acquired through space observations or directly captured through ground-level video/photos can be assessed on GIS-generated maps to address security concerns.

In civil defence services such as mobilization, nuclear incidents, fires, and natural disasters, the use of electronic maps enables tasks like allocating resources optimally and tracking vehicles to be efficiently conducted through GIS.

In military settings, GIS is employed effectively for tasks like map creation, generating three-dimensional terrain models, and devising tactical initiatives. GIS aids planners at strategic, tactical, and operational levels in evaluating force structures, capabilities, and manoeuvring options.[102]

For instance, it is possible to analyse how risky a flight is through dangerous airspace (*Fig. 15*).[103]

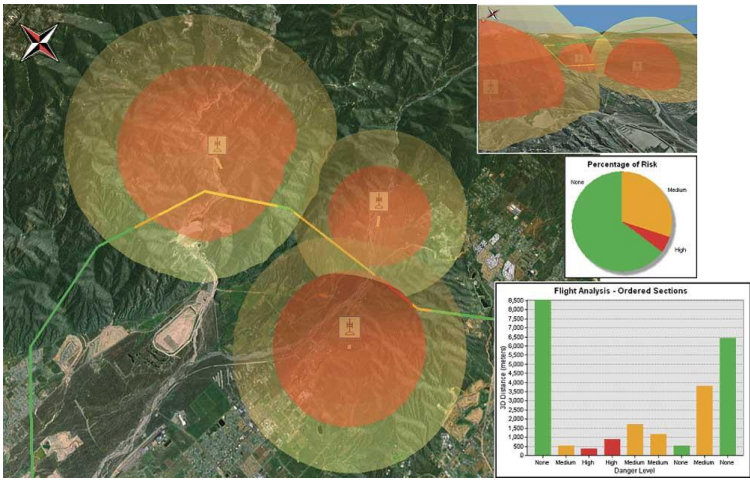

Figure 15: The 3D flight route has been intersected and classified based on the threat volume that contains it.[104]

Other specific examples include; parachuting from the skies safely by evaluating the underlying surroundings of the area, overlaying accurate geographic data for battlefield application and making life-saving decisions, spying on enemies with satellites, constructing a base site without it being visible from nearby

[101] Akshay Upadhyay, "GIS in Banking Sector – Scope/Benefits/Uses," IGISMAP, accessed October 2, 2023, https://www.igismap.com/gis-in-banking-sector/.

[102] Nişancı et al., *Coğrafi Bilgi Sistem Uygulamaları*, 61.

[103] Nathan Shephard, "Answering Real-World Questions," *ArcUser*, Fall 2010, 8, https://www.esri.com/news/arcuser/1010/files/3danalysis.pdf.

[104] Shephard, *Answering Real-World Questions*.

major roads using the 3D skyline tool, addressing vulnerabilities and formulating preparedness measures in case of terrorism and emergency situations, and monitoring disturbed surfaces one day to the next to find Improvised Explosive Devices.[105]

4.5. Disaster Management

GIS has the capability to pinpoint regions susceptible to either natural or human-made calamities. Once these areas are identified, municipal authorities can utilize the information furnished by GIS to raise awareness and assist in equipping their inhabitants for potential disasters.

In order to minimize loss of life and property in case of potential emergencies or disasters in the city, and to reduce economic losses while ensuring the uninterrupted continuation of social life, it is crucial to manage and evaluate these situations strategically. In this process, GIS technologies stand out as one of the most effective tools for swiftly assessing all kinds of data related to the city. [106]

For instance, during a flood, it is possible to conduct analyses in real-time using GIS technologies, such as identifying potential flood-prone areas, determining access routes to the region, ensuring access to buildings and people, inspecting infrastructure facilities, organizing rescue teams, distributing heavy machinery, and pinpointing suitable locations for tent cities.[107]

At this point, ArcGIS Living Atlas' Live Earthquake Map can also be mentioned. It is a map layer that enables someone to find out exact details about the event's location, magnitude, depth, or tsunami warning as soon as you feel or hear about an earthquake (*Fig. 16*).[108]

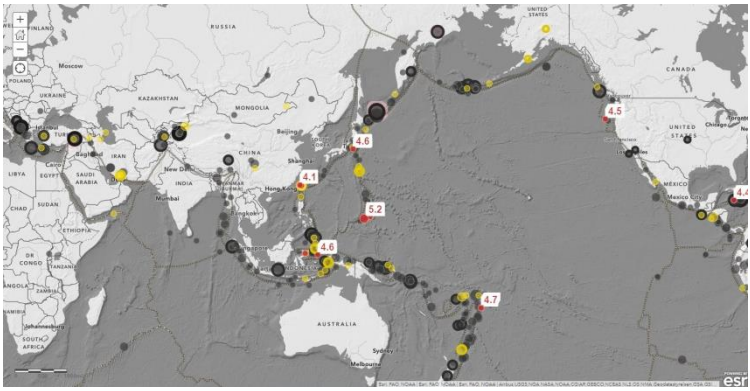

Figure 16: The web map to answer the questions about earthquake time, magnitude and impacts on people and environment. Different colours represents the earthquake time (Red < 24 hours, Yellow < One Week, Gray < 3 months) while the outline of the point indicates impact.[109]

Another important example is Emergency Management Service (EMS) of Copernicus. Copernicus provides Information for emergency response and disaster risk management with the help of this service. It is possible to find three types of mapping which are on demand mapping, exposure mapping, and early warning & monitoring.

Copernicus EMS On Demand Mapping offers detailed information upon request for specific emergency situations resulting from natural or human-made disasters globally, while

[105] *1000 GIS Applications & Uses.*
[106] Nişancı et al., *Coğrafi Bilgi Sistem Uygulamaları*, 62.
[107] *1000 GIS Applications & Uses.*
[108] Emily Meriam, "Live Earthquake Mapping for Everyone," *ArcGIS Blog* (blog), February 25, 2020, https://www.esri.com/arcgis-blog/products/arcgis-living-atlas/mapping/earthquake-mapping-in-real-time-for-everyone/.
[109] Meriam, *Live Earthquake Mapping.*

the exposure mapping element delivers precise and regularly updated data regarding the existence of human settlements and population. Besides, Early Warning and Monitoring provides essential geospatial information on a European and global scale by delivering ongoing observations and forecasts for floods, droughts, and forest fires.[110]

Figure 17: Latest Copernicus EMS - Rapid Mapping Activations[111]

Figure 18: Flooding of the Bisenzio River and some smaller secondary rivers in Tuscany due to heavy rainfall on November 2, 2023.[112]

For example, rapid mapping offered under the on demand mapping system delivers geospatial information within a matter of hours or days upon receiving a service request, aiming to assist emergency management activities during the immediate aftermath of a disaster (*Fig. 17-18*).

4.6. Ecology

Due to excessive utilization and environmental contamination, species that support biodiversity are experiencing a decline and are at risk of extinction. One of the key uses of GIS is the mapping, analysis, and planning of biodiversity in natural environments. GIS aids in the compilation of biodiversity data into a database, the establishment of catalogues for various species, the development of maps illustrating their geographical distributions, and the identification of species under threat.[113]

The use of GIS in the field of ecology is of vital importance, which is why it is so widely used. Gauging over time a decrease in biodiversity or an abundance of species (invasive or disturbance-increasing) using temporal GIS, measuring mathematically species diversity and richness in a community, studying ecosystems in geographic space and through (geological) time along geographic gradients of latitude, elevation, isolation, and habitat area, describing existing conditions of habitat and predicting risk of extinctions, the

[110] Copernicus Emergency Management System. https://emergency.copernicus.eu/.
[111] *Copernicus Emergency Management System.*
[112] Ibidem.
[113] Catia Matos, "3 Ways GIS Tools Can Help Biodiversity Conservation," Medium, published on August 17, 2021. https://catia-matos.medium.com/3-ways-gis-tools-are-used-in-biodiversity-conservation-525ea076268e.

chance of recovery, and mitigation measures – such as prohibiting hunting, specifying wildlife photo locations through geotagging and streamlining the importing process, assessing long-term climate trends, measuring seasonal trends in phenology, and decomposing image time series to seek recurrent patterns in space and time, and characterizing distinct physical environments and associated land cover of global ecosystems are just a few examples.[114]

A specific example can be given for the last one. The U.S. Geological Survey (USGS) has developed an updated geochronology database (USGS Geochron) to include geochronology summary and analytical data created or funded by the USGS. Geochronological data are integral to geologic mapping and are utilized by researchers to study the Earth's lithosphere and landscapes and to manage resources and natural hazards (*Fig. 19*).[115]

Figure 19: USGS-generated geochronology data

4.7. Economy

GIS provides robust instruments and methodologies for economic developers to identify strategies for maintaining economic growth and rebounding from economic challenges. GIS models equip economic developers with the means for examining, integrating data, visualizing, modelling, and cooperating, enabling them to thoroughly assess the situation before making a decision.[116]

Some of the current studies carried out by GIS in the field of economics encompass various aspects, including illustrating the movement of people or goods from one point to another based on values. These studies also involve measuring the extent of economic globalization by analysing international trade data over time, spatially distributing production while considering transportation costs and factor mobility, and geographically diversifying stock portfolios across different countries and global stock markets.

For instance, It can be seen that the IMF used GIS in its World Economic Outlook in 2013 and its study of the projecting the future economy (until 2018) and key macroeconomic indicators (*Fig. 20*).[117]

[114] *1000 GIS Applications & Uses.*

[115] "USGS Geochron Database Explorer," USGS, published on March 30, 2023, https://www.usgs.gov/tools/usgs-geochron-database-explorer.

[116] Ian, "GIS & Economic Development," GIS University, accessed October 2, 2023, https://gis-university.com/discover-how-gis-unlocks-the-full-potential-of-economic-development/.

[117] "International Monetary Fund: World Economic Outlook 2013," accessed October 2,

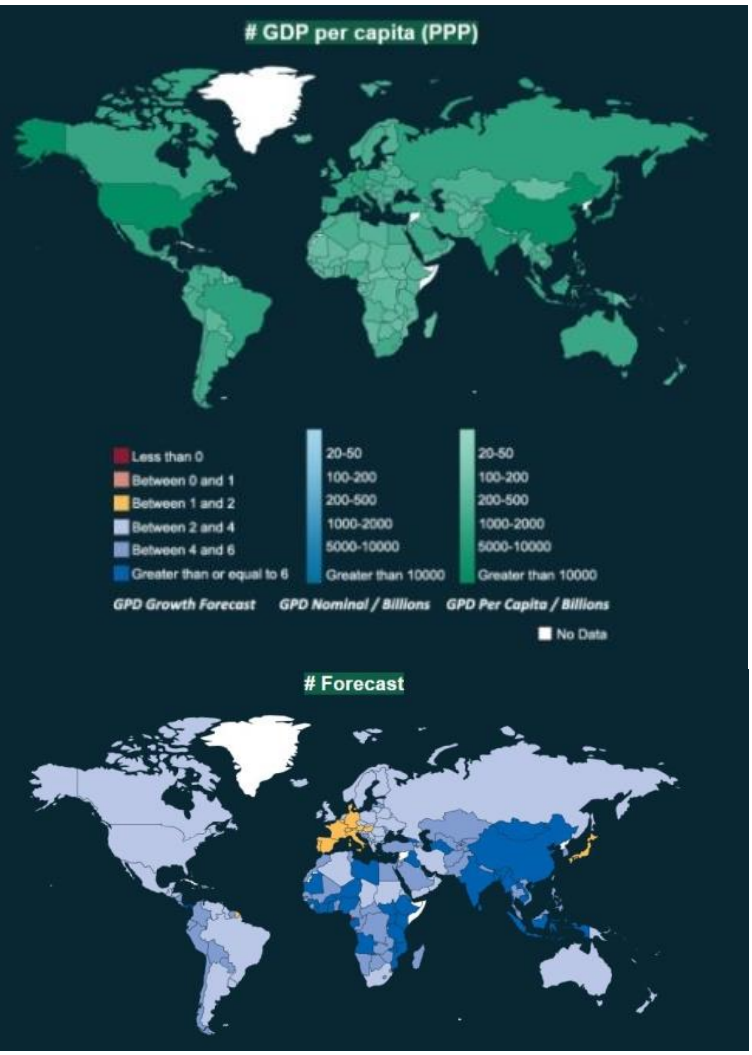

Figure 20: Data Visualization Based on GDP, Forecast and PPP for 2010 – 2018.[118]

Similarly, The Heritage Foundation created a map representing the economic freedom throughout the world with the help of GIS technologies (*Fig. 21*).[119]

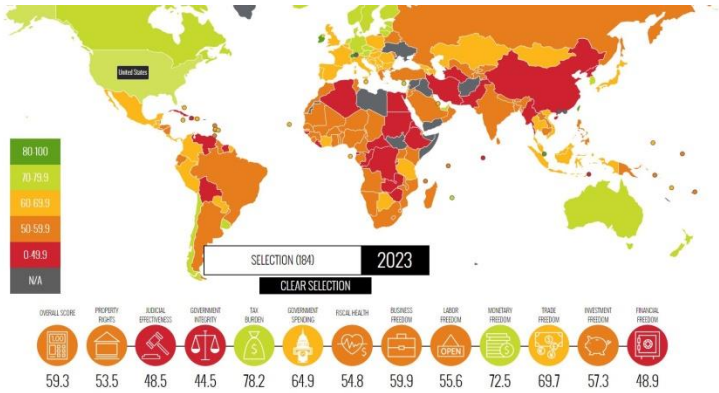

Figure 21: Interactive Heat Map[120]

4.8. Transportation

GIS provides effective solutions in transportation planning, logistics problem-solving, road condition monitoring, vehicle tracking, and determining the most efficient routes. Applications of this nature are critically important for distribution, transportation, and cargo companies, as well as for bus operators, fire departments, and similar organizations. They focus on the real-time tracking of vehicles on maps and facilitating communication between the vehicle and the monitoring system. For example, a transportation company may wish to ensure that their vehicles are adhering to planned routes at designated times, or that cargo is being delivered punctually. GIS-based navigation systems, which allow for the examination, querying, and analysis of data inventories pertaining to roads, provide managers with an efficient means of oversight.[121]

Undoubtedly, the GIS application that almost every citizen frequently uses

2023, http://sadmim.ir/project/imf_gdp/2018.html.

[118] *International Monetary Fund.*

[119] "2023 Index of Economic Freedom," The Heritage Foundation, accessed October 2, 2023, https://www.heritage.org/index/heatmap.

[120] *2023 Index of Economic Freedom.*

[121] Nişancı et al., *Coğrafi Bilgi Sistem Uygulamaları*, 61.

in the field of transportation is navigation applications. In this way, people can easily access information such as how to get to the place they want to go, by which means of transportation, how long it will take to arrive, and the traffic situation (*Fig. 22).*

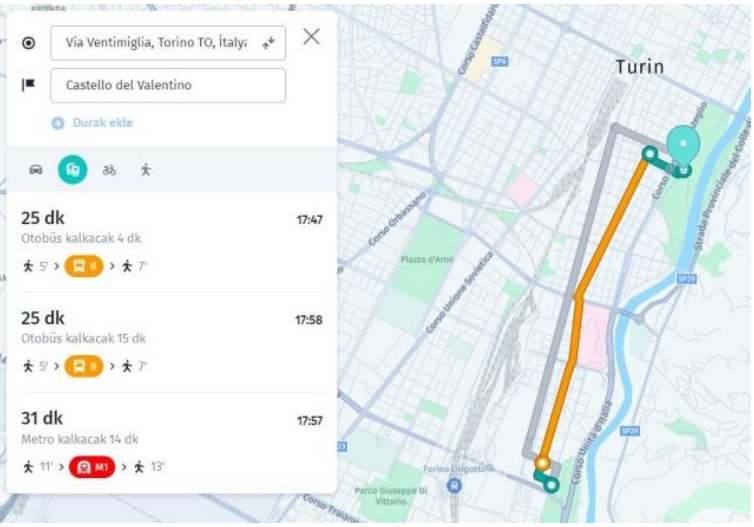

Figure 22: HERE WeGo satellite navigation software.[122]

At this point, it would be appropriate to talk about GIS network analysis tools, which are indispensable especially for transportation analysis.

Network analysis involves employing a series of analytical techniques with networks. Geometric networks are employed to comprehend the flow of various elements within these networks.

The movement of objects within the network is governed by specific rules. These rules play a crucial role in shaping the outcome of the chosen route or result in each type of analysis (*Fig. 23*).[123]

[122] HERE WeGo, https://maps.here.com/.
[123] "5 Types of Network Analysis in GIS," GISGeography, updated on August 10, 2023. https://gisgeography.com/network-analysis/.

Figure 23: Simplified schematic representation of the working mechanism of network analysis.[124]

The most prevalent routing problem is point-to-point analysis, which involves identifying the most efficient route among a set of points according to specific criteria. It is generally useful to understand the nearest point, and shortest or fastest route to go to a certain point. In addition, it is possible to obtain different analysis by selecting transportation type such as automobile, bus, train, or pedestrian (*Fig. 24*).

Figure 24: Shortest route network analysis.[125]

[124] *5 Types of Network Analysis in GIS.*
[125] Ibidem.

Another analysis type is service area/drive time analysis. Drive-time areas represent the distance that can be covered within a designated duration. It is important to understand what is happening a certain minute away from a point (*Fig. 25*).

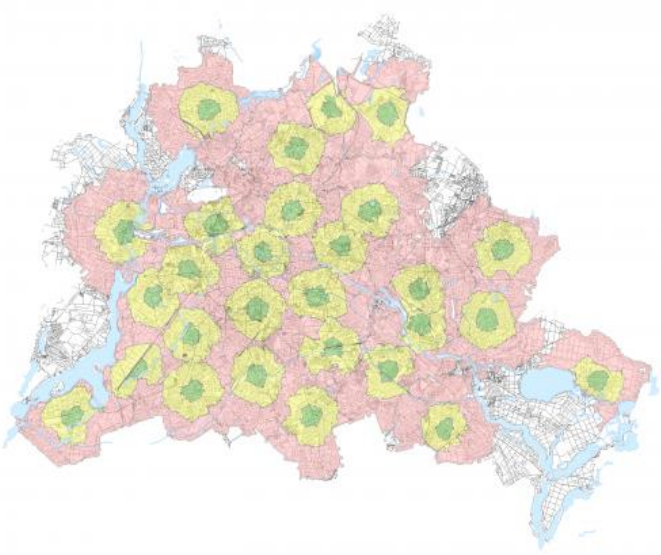

Figure 25: Service are network analysis.[126]

Figure 26: Optimize fleet network analysis.[127]

Optimize Fleet is another network analysis tool designed to identify the most effective route for various fleet services, such as delivery, repair, or transit. It is the optimal approach to minimize the overall operating cost (*Fig. 26*).

The OD Cost Matrix (Origin Destination Cost Matrix) calculates the most cost-effective path from multiple starting points to multiple destinations. For instance, it can provide routes and directions for all stores and warehouses (*Fig. 27*).

Figure 27: OD Cost Matrix network analysis.[128]

4.9. Public Health

In recent years, there has been a noticeable surge in the adoption of Geographic Information Systems in the global healthcare sector. This trend stems from the fact that GIS technology allows for the comprehensive consolidation of pertinent information in healthcare planning and organizational management. It facilitates

[126] Ibidem.
[127] Ibidem.
[128] Ibidem.

seamless analysis and the visual presentation of outcomes.

Organizations in health and human services employ GIS software to chart instances of diseases, enabling them to pinpoint high-risk areas and potentially trace the source of certain conditions. Armed with this data, they can focus awareness campaigns on the areas that require it most.[129]

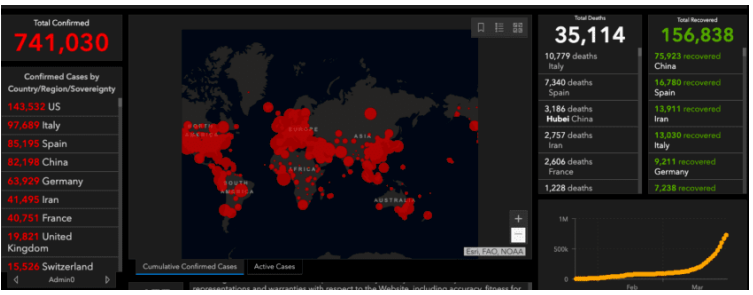

Figure 28: Coronavirus COVID-19 Global Cases by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)[130]

The most recent example where GIS is widely used and people's attention is directed to GIS is the Covid-19 pandemic. To control and prevent the spread of the Covid-19 pandemic, there was a crucial need for scientific and technological support. Among the primary reasons for this were the rapid transmission of the outbreak and the extended incubation period. GIS played a significant role in the fight against the pandemic, aiding in the identification of spatial transmission patterns, prevention and control efforts, spatial allocation of resources, and the spatial detection of social sensitivities. The real-time collection of data related to the global impact of the pandemic from all countries, presented through dynamic map applications, facilitated simultaneous monitoring of the outbreak worldwide (*Fig. 28-29*).

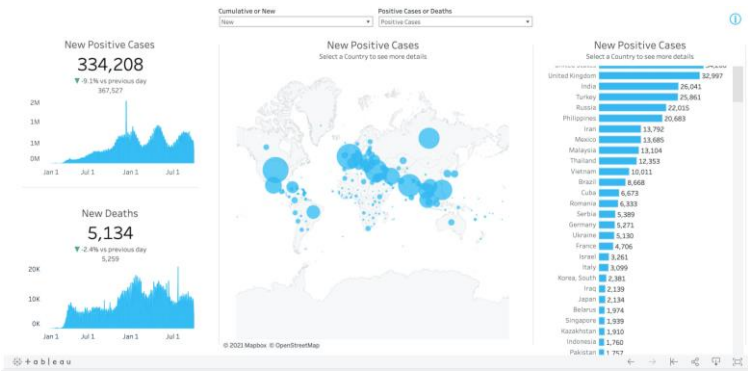

Figure 29: Coronavirus (Covid-19) cases in between January 21, 2020 and April 29, 2022[131]

Although examples of the main common areas of use have been given so far, GIS serves many more fields such as astronomy, archaeology, business, climate change, crime, education, energy, engineering, environment, gaming, geology, history, hydrology, insurance, media, mining, politics, real estate, society, sports, telecommunication, and so on. From now on, specifically the use of GIS in the field of Tourism is focused on.

5. GIS in Tourism Management

Tourism industry has a vital role in the economies of numerous countries worldwide. The success of this industry hinges on effective development, management, and marketing of travel-related amenities, destinations, and activities. Many nations heavily rely on

[129] Nişancı et al., *Coğrafi Bilgi Sistem Uygulamaları*, 61.
[130] "COVID-19 diplomacy," Diplo, accessed October 2, 2023, https://www.diplomacy.edu/.
[131] "COVID-19 Data Hub - How data made a difference," Tableau, accessed October 2, 2023, https://www.tableau.com/covid-19-coronavirus-data-resources.

tourism as a primary source of economic sustenance.

Given the inherently geographic nature of tourism, Geographic Information Systems play a crucial role in providing essential documentation for tourism services. They assist in creating maps and guides tailored for tourist use and establish a supportive mechanism for organizations making decisions about investments in the tourism sector.[132]

These GIS systems enable the utilization of current information and facilitate a range of analyses aimed at optimizing performance, reducing expenses, enhancing services, and achieving other benefits in the field of tourism.

While a substantial amount of information about countries, states, or cities is readily accessible on the internet for tourists, there are still challenges in obtaining the most accurate details. Sorting through the vast volume of information can be both time-consuming and confusing. To address these issues, GIS technology has been implemented in the tourism industry.

GIS not only furnishes details about tourist attractions but also encompasses a database of geographical features, transportation options, lodging facilities, demographic information, and more. It produces specialized maps that aid tourists in gaining a more comprehensive and detailed understanding of their destination.

The widespread application of geographic information systems in the tourism industry has naturally led to the development of various instances where GIS solutions are employed to enhance business profitability. Although it is impossible to include all examples, some applications, aims, or methods of GIS in tourism are mentioned below.[133]

-The capability of spatial analysis in GIS empowers businesses to pinpoint emerging patterns in location-based searches and establish fresh data-driven correlations. Entrepreneurs can assess intricate relationships among different data categories, enabling them to make optimal decisions for tourism development.

At this point, it is necessary to mention location-allocation tool of network analysis of GIS that is not mentioned in the transportation section. This tool is ideal for selecting optimal site.

The optimal site selection considers demand when determining the most suitable location among multiple facilities. For instance, it can aid in deciding the ideal placement for new hotels based on existing ones and the prevailing demand (*Fig. 30*).

[132] Nişancı et al., *Coğrafi Bilgi Sistem Uygulamaları*, 61.

[133] Vladimir Ovramenko, "GIS Applications in Tourism and Hospitality," LinkedIn, March 24, 2023, https://www.linkedin.com/pulse/gis-applications-tourism-hospitality-vladimir-ovramenko.

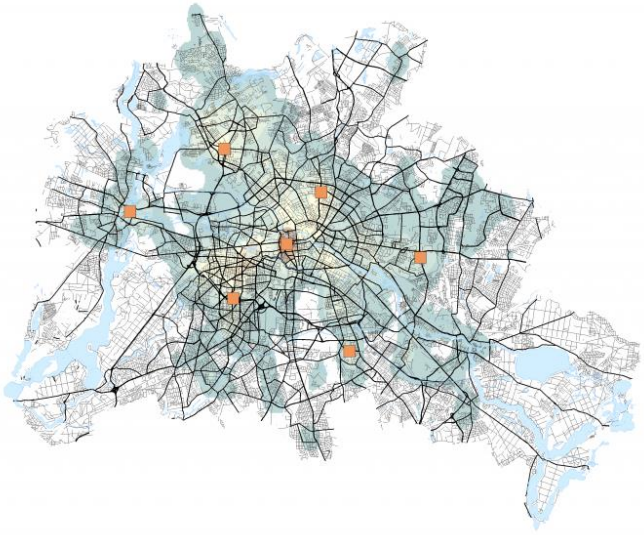

Figure 30: Location-allocation network analysis.[134]

-The combination of spatial and non-spatial data in GIS systems enables the retrieval of up-to-date details concerning traffic conditions, transportation availability, and the most efficient routes to a specific destination.[135]

-GIS solutions also help create travel scenarios for different target audience segments, including not only tourists but also visitors on business or family holidays, or visitors traveling by foot, personal vehicle or public transport (*Fig. 31*).

-Tourism-oriented GIS solutions can streamline subway mapping data, making it more accessible for visitors unfamiliar with the area (*Fig. 32*).

[134] *5 Types of Network Analysis in GIS.*
[135] Ibidem.

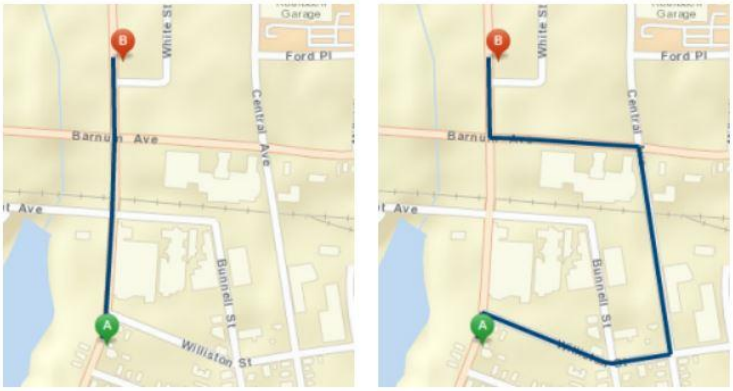

Figure 31: Route for a truck whose height is less than 3.5 meters (left) and another route for taller trucks (right).[136]

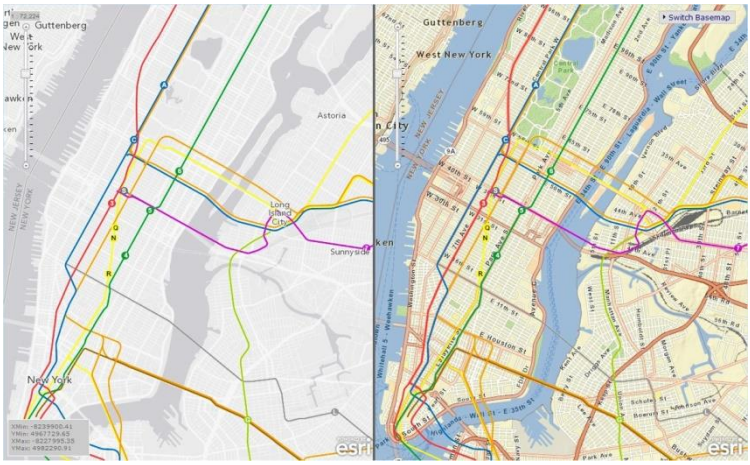

Figure 32: New York City Subway Map.[137]

-GIS produces thematic maps which can help tourists understand their destination in a better and detailed manner. Providing nearly precise information about the desired destination enables tourists to elevate their experience and gain insights into the culture and values of the local population (*Fig. 33*).

[136] "Configure travel modes," ESRI, Accessed October 2, 2023, https://doc.arcgis.com/en/arcgis-online/reference/travel-modes.htm.
[137] Jimmy Song, "What is GIS Mapping Software & Who Uses Them?" *Zenduit* (blog), October 3, 2018, https://zenduit.com/what-is-gis-mapping-software-who-uses-them/.

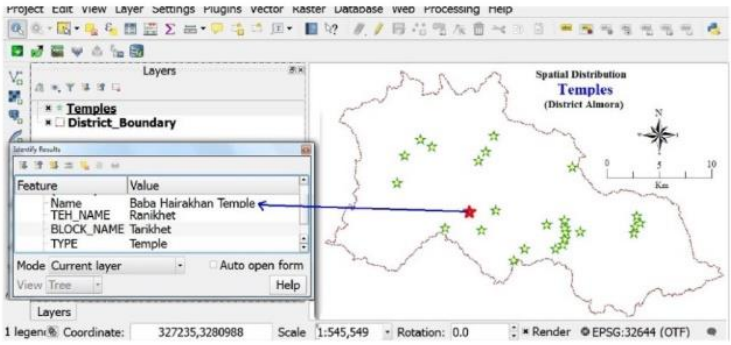

Figure 33: Temples of Almora District[138]

-GIS systems offer numerous possibilities to improve marketing strategies and identify fresh regions for promoting specific local attractions or particular services (*Fig. 34*).

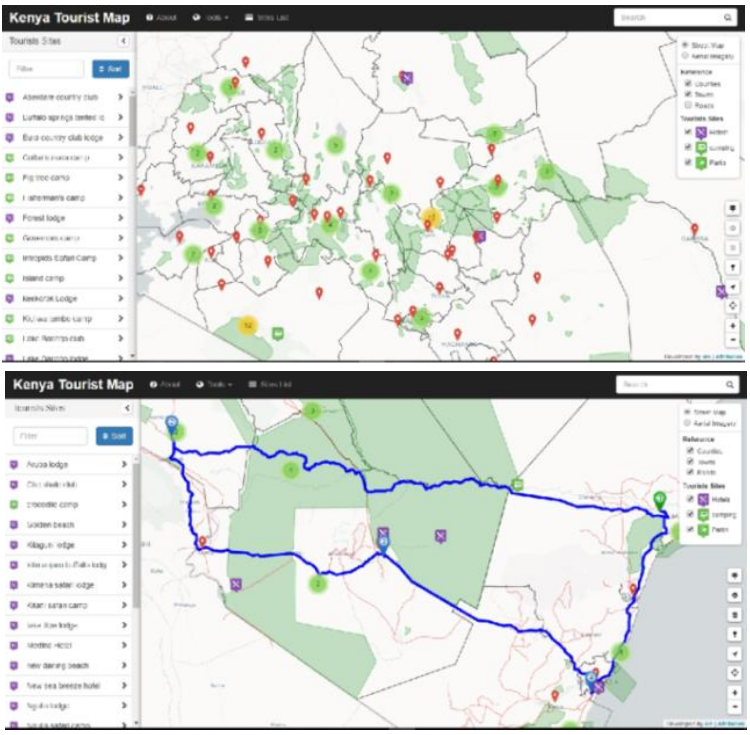

Figure 34: Kenya tourist attraction sites on a web GIS application and optimal routes for an itinerary planning.[139]

-Through the extensive collection and analysis of spatial data, GIS applications enable tourists to explore and evaluate various lodging choices within a specific area.

-A slightly more specific example is that utilizing GIS solutions, satellites can aid in the identification of islands, even previously undiscovered islands, across the globe (*Fig. 35*).

Figure 35: The Global Island Explorer which allows for the visualization and query of the new global islands data.[140]

-It is possible to see the destination before physically being there (*Fig. 36*).

Figure 36: Street view of Lubiri Ring Road[141]

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138 Sagar Bhatia, "G-Tourism: Using GIS in tourism," Geospatial World, September 19, 2018, https://www.geospatialworld.net/blogs/gis-in-tourism/.

139 Charles Muriuki and Benson Kenduiywo, "A Multimedia Web GIS Portal for Promotion of Tourism in Kenya," *Journal of Geographic Information System* 13, no. 1 (2021): 19-35.

140 "Global Island Explorer," USGS, accessed October 3, 2023, https://rmgsc.cr.usgs.gov/gie/gie.shtml.

141 Mapillary, https://www.mapillary.com/app/?pKey=904416697045329&lat=0.30291517432272&lng=32.564768171255&z=17&menu=false&focus=photo&x=0.5105107572784252&y=0.4392035831482682&zoom=0

-Time-travelling in the past to see just how much a location has changed over time with a historic street view (*Fig. 37*).

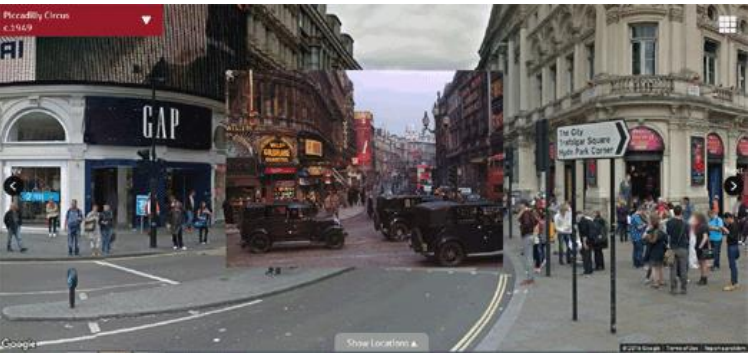

Figure 37: London's Historic Street View.[142]

5.1. GIS in Cultural/Tourism Routes

A "cultural route" can be defined as a transportation corridor, at the local, regional, or national level, developed for purposes such as preservation, rural development, and tourism enhancement, which carries cultural and/or natural heritage elements, either created in the present day or used in a specific period of history, and gains significance through this heritage.[143]

"Tourism Routes" are a type of travel that mobilizes regional tourism due to the variety of attractions brought together under a main theme and the movement of visitors from one place to another.[144]

Tourism operators create and offer routes for trips and travels with the aim of attracting more tourists and enhancing the attractiveness of popular tourism destinations. Different types of culture/tourism routes are developed over time to meet the diverse needs of tourists.[145]

Tourism routes vary depending on the purpose of visits to the region. Culture route programs are prepared to highlight new business and investment opportunities at the regional, local, and urban levels, especially with innovative themes such as culture and nature, as well as social, scientific, and technological themes, and to ensure tourism diversity. In particular, culture routes and action programs play a significant role in the development of tourism-oriented development strategies.[146]

Due to advancements in technology, transportation, and communication, the increasingly complex networks of relationships between different locations can be analysed using GIS technologies, which is one of the spatial analysis software. Specifically, network analyses involve compiling relational data into a matrix and calculating variables such as centrality and density. Network analyses conducted through Geographic Information Systems allow for the creation of the most suitable route between two points (origin and destination) using vector road data and

[142] Keir Clarke, "London's Historic Street View," *Maps Mania* (blog), March 7, 2016, https://googlemapsmania.blogspot.com/2016/03/londons-historic-street-view.html.

[143] Atila Gül et al, "Determination of Cultural Routes in GIS Environment; Isparta Province," *GSI Journals Serie C: Advancements in Information Sciences and Technologies* 3, no.2 (2020): 1-20.

[144] İsmail Kervankıran and Murat Çuhadar, "Turizm Rotalarının Oluşturulmasında Coğrafi Bilgi Sistemlerinin Önemi," (III. Disiplinlerarası Turizm Araştırmaları Kongresi, Kuşadası, April 4-5, 2014).

[145] Fatih Sucu, "Nevşehir İli İçin Coğrafi Bilgi Sistemleri Destekli Turizm Rota Planlaması" (master's thesis, Nevşehir Hacı Bektaş Veli University, 2022).

[146] Gül et al, *Determination of Cultural Routes*, 2.

support the optimal planning of visits in terms of travel time. Therefore, Geographic Information Systems are highly useful in determining tourism destination routes, as in many aspects of life.[147]

Cinque Terre trekking paths can be given as the first example for studies on tourism routes. For centuries, the Cinque Terre paths were the only link between one village and another and between these and the hinterland. Today, a network, which extends for more than 120 kilometres has been created and allows tourists to appreciate and discover the territory through different types of paths (*Fig. 38*).[148]

Figure 38: Hiking Itineraries of Cinque Terre

It is possible to access these paths via mobile phone application or directly from the website of the region.

For the second example, it is necessary to mention ArcGIS StoryMaps, a practical and useful application of ArcGIS that allows people without any GIS training to make GIS-based production and also creates cultural / tourism routes.

"ArcGIS StoryMaps is a story authoring web-based application that allows you to share your maps in the context of narrative text and other multimedia content."[149]

ArcGIS StoryMaps enables individuals to craft compelling narratives using maps rooted in Geographic Information Systems (GIS) that inform and inspire.[150] Express maps have been placed in ArcGIS StoryMaps to ensure easy use by everyone.

Express maps offer the chance to craft personalized maps that are both visually appealing and educational. Creating an interactive map can be done swiftly, with the option to include markers, pop-ups, and arrows to enrich the narrative.[151] That's why, with the help of numbered points in combination with the arrows, showing a travel itinerary is very easy for everyone.[152]

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147 Sucu, *Nevşehir İli İçin Coğrafi Bilgi Sistemleri*, 3.

148 "Paths and Outdoor - The updates on the path network and the outdoor activities," Parco Nazionale delle Cinque Terre, accessed October 4, 2023, https://www.parconazionale5terre.it/Esentieri-outdoor.php.

149 "What is ArcGIS StoryMaps?" ESRI, accessed October 4, 2023, https://doc.arcgis.com/en/arcgis-storymaps/get-started/what-is-arcgis-storymaps.htm#:~:text=ArcGIS%20StoryMaps%20is%20a%20story,stories%20with%20the%20story%20builder.).

150 "ArcGIS StoryMaps," ESRI, accessed October 4, 2023, https://www.esri.com/en-us/arcgis/products/arcgis-storymaps/overview.

151 Ibidem.

152 Mark Harrower, "What is an express map and why should you use one?" *ArcGIS Blog* (blog), January 23, 2020, https://www.esri.com/arcgis-blog/products/arcgis-storymaps/mapping/what-is-an-express-map-and-why-should-you-use-one/.

In this way, for example, travellers can map and publish their own experiences and travel routes, stops and places, and other tourists may want to follow these personal experiences. This method can contribute to the enrichment and proliferation of individual routes offered by authorities.

It is possible to give hundreds of Storymap examples to better explain the subject, but it will be enough to mention a couple here.

The first example is about Orkney islands at the northeast tip of Scotland where people still live in Neolithic life.

Thanks to ArcGIS Storymap, the author offers people an artificial tour of Orkney. He starts the tour after giving brief general information at the beginning.

As you scroll down the page, you approach a pinned point on the map and read information about this point accompanied by a visual. In this way, it is possible to visit and examine all points on the map (*Fig. 39*).

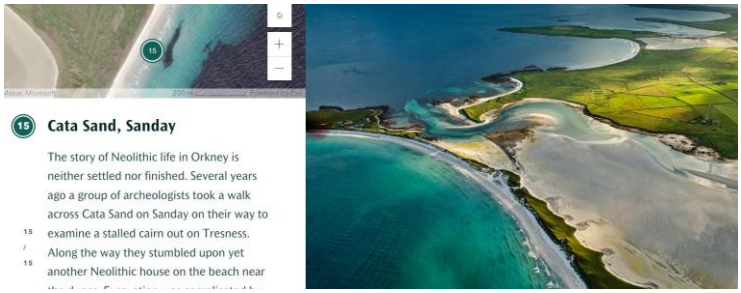

Figure 39: Neolithical Mystery Tour.[153]

[153] Jim Richardson, "Neolithical Mystery Tour," ArcGIS StoryMaps, published on August 25, 2020. https://storymaps.arcgis.com/collections/8133f8bcda3444209bd2db8a898dddb4?item=7.

Another example is from The San Luis Valley, which straddles the modern Colorado-New Mexico border, and is part of the traditional lands of the Capote band of the Ute people (Núuchi-u), who once lived across present-day Colorado and Utah.[154]

The author walks the visitor on the map and gives both geographical and historical information about the region (*Fig. 40*).

Figure 40: The San Luis Valley.[155]

As a result, Geographic Information Systems (GIS) play an indispensable role in today's digital age. This technological revolution pioneers transformation in various sectors by offering limitless opportunities in the collection, analysis, and visualization of geographical data. It has wide-ranging impacts, from healthcare services to the

[154] Carl Churchill, "The San Luis Valley," ArcGIS StoryMaps, published on January 5, 2021. https://storymaps.arcgis.com/collections/8133f8bcda3444209bd2db8a898dddb4?item=25.

[155] Churchill, *The San Luis Valley.*

energy sector, from the tourism industry to environmental management.

Especially in the tourism sector, GIS solutions bring innovation to various areas, ranging from travel planning to the development of holiday destinations. Additionally, it is evident that GIS is an indispensable tool in critical areas such as the design of cultural routes and the sustainable management of tourist areas.

This research demonstrates that GIS transcends being merely a technological tool and deeply influences the operations of various sectors. Understanding the impacts of GIS in these domains provides a crucial guide for developing strategies for future applications. It should be considered that in the future, the impacts of GIS will expand even further and touch upon new sectors.

PART III:

THE FIRST INDUSTRIALIZATION OF THE SUSA VALLEY

6. The Recent History of the Susa Valley

The Susa Valley, located in Piedmont, Italy, has historically served as a transit area between the Po Valley and France. Geographically, the area is divided by the Dora Riparia River into two zones: The Upper Valley, close to the French border and characterized by a mountainous landscape, and the Lower Valley, extending towards the city of Susa, featuring a wide agricultural plain surrounded by watercourses and connecting infrastructure.

6.1. First half of the 19th century

In 1801, Jean Antoine Joquet, a sub-prefect, wrote a memo about the Susa district, with the aim of presenting a truthful description of the area's countries, their needs, resources, and potential improvements.[156] The goal was to guide the new administration towards interventions that could uplift the region, which had been suffering from years of conflict. Joquet highlighted its low agricultural productivity due to sandy soil and frequent floods of the Dora river. He suggested hydraulic works to reclaim land.

Agriculture was the main economic sector, but it lacked the latest advancements. Joquet emphasized the need for crop rotation and the use of fertilizers to improve yields.

He emphasized the potential of the region's wines for exports. The construction of the Route du Mont-Cenis was initiated for better transportation.

However, despite the new road, the territory's economy remained largely unchanged until the mid-19th century. Agricultural activities persisted, but limitations in land use and frequent damages from flooding hindered growth. The population steadily increased, but outdated agricultural practices and small land divisions could not meet the demands of a growing populace.

In 1864, following the relocation of the capital from Turin to Florence, the shift of the court, parliament, public offices, mint, and numerous financial institutions had a profound and abrupt impact on Turin. The city experienced a notable decline in both population and economic activities. The 1880s brought further economic woes to Turin, with severe financial setbacks for local banks, an agricultural crisis, and a trade dispute with France that significantly hindered exports.

The entire 19th century was characterized by a relentless pursuit of progress in Europe. Industry and machinery became prominent showcases for a nation's technical and scientific acumen. Universal Expositions

[156] Andrea Maria Ludovici, *L'industria pensante: L'area industriale di Avigliana e Sant'Ambrogio fra storia, memoria e nuove prospettive* (Edizioni del Graffio, 2021), 13-17.

held across major European capitals prominently featured industrial machinery as symbols of economic might. However, beyond the urban centres, in the Susa Valley, the economic landscape remained rooted in agriculture, marked by seasonal emigration due to the insufficiency of agriculture alone to sustain families.

6.2. The advent of the railway

During the years leading up to and following the Unification of Italy, the socio-economic landscape of the valley underwent a significant transformation due to the construction of the Turin-Susa railway line (1852-1854) and its extension to Bardonecchia, along with the opening of the Frejus Tunnel in 1871. These projects were part of a broader strategy to improve trade, communication, and unity within Italy.

The economic benefits of secure commercial train connections between Piedmont and the newly acquired port of Genoa was emphasized, as well as the socio-political importance of such communications, which would promote the exchange of people and ideas, erasing regionalism and bringing governments and people closer together, thus preparing the nation for independence and unity.

In this context, the government examined a project proposed by the Society Jackson, Brassey, and Henfrey to build a railway from Turin to Susa between August 1851 and March 1852. After a lengthy parliamentary debate on costs, timing, and methods of implementation, the approval law was promulgated on June 14, 1852. The British company tasked with the construction completed the project in just under two years, with the line inaugurated on May 22, 1854, and opened for traffic on May 24 of the same year. It consisted of 10 intermediate stations and had a total length of 56.650 km.[157]

From its opening, the Turin-Susa line provided a rapid and convenient connection with the coach service that crossed the Moncenisio Pass from Susa to Maurienne, Chambéry, and the Rhone Valley. Over the next decade, under both state management and the private company Società delle Strade Ferrate Vittorio Emanuele, later known as Strade Ferrate dell'Alta Italia (SFAI), the flow of passengers and goods increased steadily, especially during the years of the Wars of Independence when it became a fundamental logistical and strategic tool.

Before the Frejus Tunnel, the debate about the possibility of a tunnel crossing the Alps and connecting Bardonecchia to Modane had started as early as 1832-1839. The discussions continued until 1857 and involved various projects and studies, ultimately leading to the approval of the law for the construction of Tunnel No. 2,380 on August 15, 1857. The tunnel's construction began in September of the same year and was inaugurated on September 17, 1871.[158]

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[157] Ludovici, *L'industria pensante,* 18-24.
[158] Ibidem.

The opening of the Frejus Tunnel revolutionized travel times between Italy and the rest of Europe, reducing the journey through the Alps to just 45 minutes. The construction of this railway, featuring a Fell system of artificial adhesion, had been regarded as a marvel of technology in its time, significantly speeding up communications between Central-Northern Europe and the Indies via the Mediterranean basin.

6.3. Industrial development in the late 19th century

From 1870 to the early 1900s, the level of industrialization in the lower Susa Valley and other Piedmont valleys was high, reflecting the competitive capitalist phase of the era and the associated technological level.

Several factors contributed to industrial development in the Susa Valley. These factors included the establishment of new railway infrastructures, a well-developed road network, abundant hydroelectric resources from watercourses, subsidies and incentives provided by local governments to businesses, favourable tariff regimes, low land costs, and the agricultural crisis. The region attracted German, Swiss, French, and Italian entrepreneurs who would set up their factories in the Susa Valley, particularly along the lower part of the Dora Riparia river.

The industrialization process began in 1869 when the mayor and council of Susa published an appeal in the weekly newspaper *"L'Eco Susina,"* inviting national and foreign industrialists to establish factories in the region with the promise of subsidies. This marked the first step towards industrialization in a valley that felt it was far from true prosperity due to a lack of investors and high taxes on productive activities. The need to integrate traditional agriculture with modern manufacturing industries and to create a new workforce also guided the decisions made during this time. This was an effort to counterbalance the adverse consequences of the capital's relocation.

"The Commission expressly delegated by the City Council of the city of Susa, having ensured, with the advice of technical experts, the possibility of obtaining sufficient motive power and suitable sites for establishing industries near the city, the undersigned Mayor notifies national and foreign industrialists of the decision taken by the City Council to grant subsidies to those of them who apply for them to establish industrial establishments within the city's territory, so that all those who wish to compete for said subsidies can submit their proposals within a period of three months. The subsidies will always be in proportion to the significance of the establishment. The city of Susa, situated at the foot of Mont Cenis, only 50 kilometres away from Turin, on the major international railway that provides access to the Alpine tunnel, finds itself in a very favourable position for trade and industry, with the two

international outlets of France and Italy opening up in close proximity." [159]

This appeal garnered a plethora of diverse proposals, each meticulously examined by the City Council. The abundance of submissions necessitated careful evaluation by the City Council, revealing that only a fraction could feasibly be realized.

Despite the contrast between planning and administrative intentions and individual entrepreneurial needs, the appeal received a success.

Historian Mario Cavargna underscores the pivotal role of growing demand for hydraulic power, especially as the available water resources from Turin and the surrounding areas began to dwindle.[160] The abundant watercourses with which the Susa Valley has been endowed since the past allow for the generation of a significant amount of hydraulic energy, commonly referred to as "white coal". That's why pre-existing irrigation channels scattered throughout the territory ended up being at the centre of lengthy negotiations for obtaining concessions related to increasing water flow, with the goal of adapting them for productive purposes.

Between the late 1800s and the early 1900s, several industrial settlements established themselves in the lower and middle Susa Valley. With the emergence of the first industrial establishments, the expansion of water pathways and the construction of dams began. These activities undoubtedly gave rise to a series of conflicts in the following years as entrepreneurs sought to maximize profits.

Industries in the valley included metallurgical, mechanical, textile, and chemical factories, with a growing use of hydropower. There was no electricity yet and water was therefore the only driving force that could be used to operate the machines. The three decades from 1870 to 1900 brought profound changes to the territorial structure of the Lower Susa Valley as the localization of industries reached its peak with some key industries including the Bosio textile mill in Sant'Ambrogio, the Nobel dynamite factory in Avigliana.

By 1876, the *Ferriera Colano* (later renamed *Ferro*) started operations in Bussoleno, becoming a significant industrial player in the valley. It produced a variety of products such as nails, pipes, and laminates.

Another prominent industrial venture was the Wild & Abegg spinning mill, which established its plants in Borgone, Chianocco, and Sant Antonino di Susa between 1880 and 1900. Under the direction of Swiss industrialists Emilio Wild and Augusto Abegg, the company considered using electricity as a driving force through a system of

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[159] Cosimo Caione and Stavrilia Batsivari, "Il riuso dell'archeologia industriale: Strategie d'intervento e linee guida per l'ex Maglificio Fratelli Bosio" (master's thesis, Polytechnic University of Turin, 2014).

[160] Marisa Bertolo and Mauro Minola, *Storia della Valle di Susa dall'800 ai giorni nostri: il cammnino* (Sant'Ambrogio di Torino: Susalibri, 2009), 184.

hydroelectric power plants fuelled by an artificial channel.

The Susa Valley's first significant power plant was constructed in 1898 at Coldimosso (Susa) by the Società Anonima Elettrica Alta Italia. Its production was transmitted to Turin through a 58 km long power line. Later, other power plants were built in Val Cenischia, including Novalesa (1904), Saluroglio (1906), and Colle del Moncenisio (1910, 1920-24).

Exponent of the new Turin entrepreneurial generation which at the end of the nineteenth century gave a strong dynamism to the regional economy. They radically transformed the appearance of many lowland villages. This transformation involves the importation of new building types from the city characterized by their large dimensions. Simultaneously, it triggers a significant urban expansion to cope with the resulting demographic growth. The industrialization of the Susa Valley necessitated the development of critical infrastructure such as roads, schools, and public amenities to support the burgeoning industrial communities. An exemplary case was the establishment of the Bauchiero factory (later known as *Officine Moncenisio*) in Condove in 1906, which not only brought hundreds of new jobs to the Valsusino region but also played a pivotal role in shaping the local economy and community.

6.4. From the Unification of Italy to the early twentieth century

Over time, the population had increased by 14,676 individuals since 1850, transitioning from primarily rural sustenance to a diversified economy that ranged from quarries to metallurgical and mechanical manufacturing, hydroelectric industry to cement work, textile sector, food industries, sawmills, and paper mills. By 1909, according to historical statistics, the Susa District had a total of 155 productive activities, including large factories and medium-small processes. These establishments employed around 15,000 people out of a population of 96,506, with 8,900 being workers (including 500 young minors) and 6,100 being artisans and traders.[161]

The economic differences brought about by the construction of the new railway line and the concurrent growth of the local industries deeply impacted the living conditions of individual communities. In the lower valley, where ample flat spaces facilitated the railway passing through or near towns and the establishment of various factories, the centres transformed their appearance by expanding urban fabric along new access routes to stations and factories.

Over a few decades, new constructions extended the historical centres' perspective and old "main roads" toward the new industrial neighbourhoods. This accommodated employees, workers, and labourers

[161] Andrea Maria Ludovici, *L'industria pensante,* 53.

drawn by the promise of steady employment. The industrial structures, initially located in peripheral areas, were soon integrated with existing buildings through the creation of residential neighbourhoods. Additionally, in the early 20th century, experiments with worker housing were undertaken, like the six large buildings constructed between 1907 and 1910 in Condove by the Bauchiero Manufactures. These four-story buildings with 64 rooms each immediately housed 180 worker families, constituting the most modern and populous quarter of the town.

Similar initiatives caused the lower valley centres to follow the rise of industrialization and the transformation of the transportation system. This led to public utility projects, a constant increase in the population, and a general improvement in their living conditions. Perceptive observers like Giuseppe Regaldi described the changes in places like Sant Antonino di Susa, noting how the once unhealthy air and persistent fevers had given way to improved living conditions, thanks to efforts by the municipality to address stagnant waters, develop fields, provide clean water, and establish convenient roads:

"Once the air there was unhealthy, and the pale fevers had a perennial room there. Now not anymore, because the Municipality, not forgiving the expense, built canals to give free flow to the stagnant waters, and reduced marshy fields to cultivation, provided the country of good waters, deriving them from the adjacent mountains, and opened comfortable ways, which lead to the countryside and the nearby villages. From these measures a new life emerged: work and income increased, houses of ornate architecture arose, and the people shows vigorous and flourishing health, and the pharmacist Casasco, who was often asked for remedies to tame stubborn fevers, now finds time to cultivate and distill peppermint, very prized in the valley and outside."[162]

This led to a new way of life, increased work and earnings, architecturally pleasing residences, and a thriving and healthy populace.

6.5. War years

What happened to the factories during the war years was common in the valley, each called upon for their expertise to meet the demands of the war effort. For instance, in Condove, the Bauchiero Workshops expanded their production to include not only railway equipment but also airplanes for the nascent Military Aviation, front and rear carriages for horse-drawn cannons, tracks for gun carriages, and stretchers for the wounded. The war needs quickly turned the factory into a military zone, fenced and guarded day and night. Women were excluded from the factory, and the workers were subjected to military discipline, required to strictly follow the instructions of their department heads and wear a badge that read "Auxiliary Establishments - Industrial Mobilization." Many of the workers were exempted, belonging to

[162] Ibidem, 55.

the classes called up for military service but spared due to their specialized skills, with the obligation to work for the Army.

Meanwhile, on the economic front, a recession had been underway since 1927, caused by collapsing exports (the revaluation of the lira made Italian goods too expensive for foreign buyers) and a drop in domestic demand for private consumption. These trends were exacerbated by the financial crisis of 1929. A firm and lasting turn towards protectionism took hold, accompanied by massive state intervention in the economy during the 1930s. The landscape of Italian industry underwent transformation. Chemical, electrical, metallurgical, and mechanical conglomerates rose while export-oriented industries, from textiles to agricultural processing, struggled. This division led to a divergence between companies producing consumer goods and those producing investment goods.[163]

6.6. The recent past

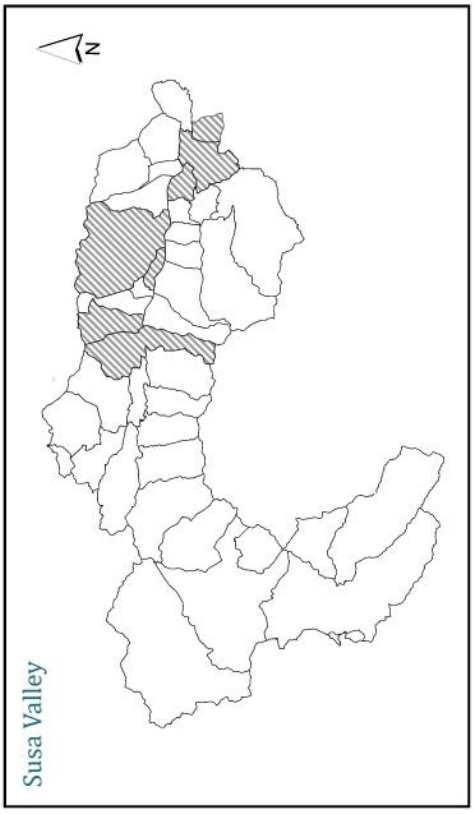
Between 1945 and 1947, the reconstruction policy initiated by the newly formed Italian Republic was centred around restoring automatic market mechanisms and granting businesses the freedom to decide on production orientations, trade relations, and workplace organization. This approach aimed at actively reshaping the Italian industrial system with a liberal inspiration, breaking free from the specific ways in which the fascist dictatorship had promoted certain forms of accumulation – corporatism, autarky, a nationalist form of expansionism, total control over foreign trade and exchanges – which were incompatible with the new political and economic conditions emerging after 1945 and the changed situation of the international market.

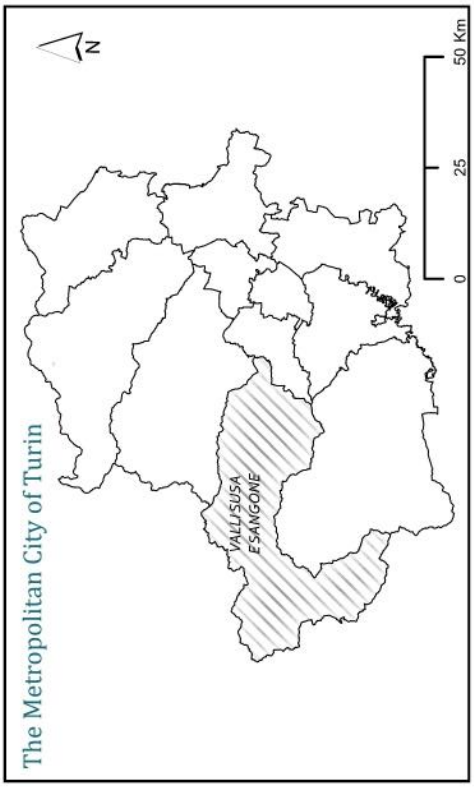
Within a few years, the post-war economic recovery led to the consummation of the last industrial revolution, with a progressive shift of the workforce from agriculture to factories, particularly impacting rural areas. If in 1951, agriculture employed 32% of the active population in Piedmont and industry 43%, by the beginning of the following decade, around 200,000 Piedmontese had moved from rural to urban areas. This pushed the level of industrial workers to 51% and that of farmers to 23%. The effects of the factory's attraction varied depending on the regions. In less impoverished rural areas, depopulation was limited by the emergence of the new figure of the worker-farmer, who, in addition to their factory job, continued to cultivate their own land and commuted. Conversely, in poorer areas such as the Alpine valleys, the exodus of labour, which had already started between the two World Wars, saw a significant increase.[164]

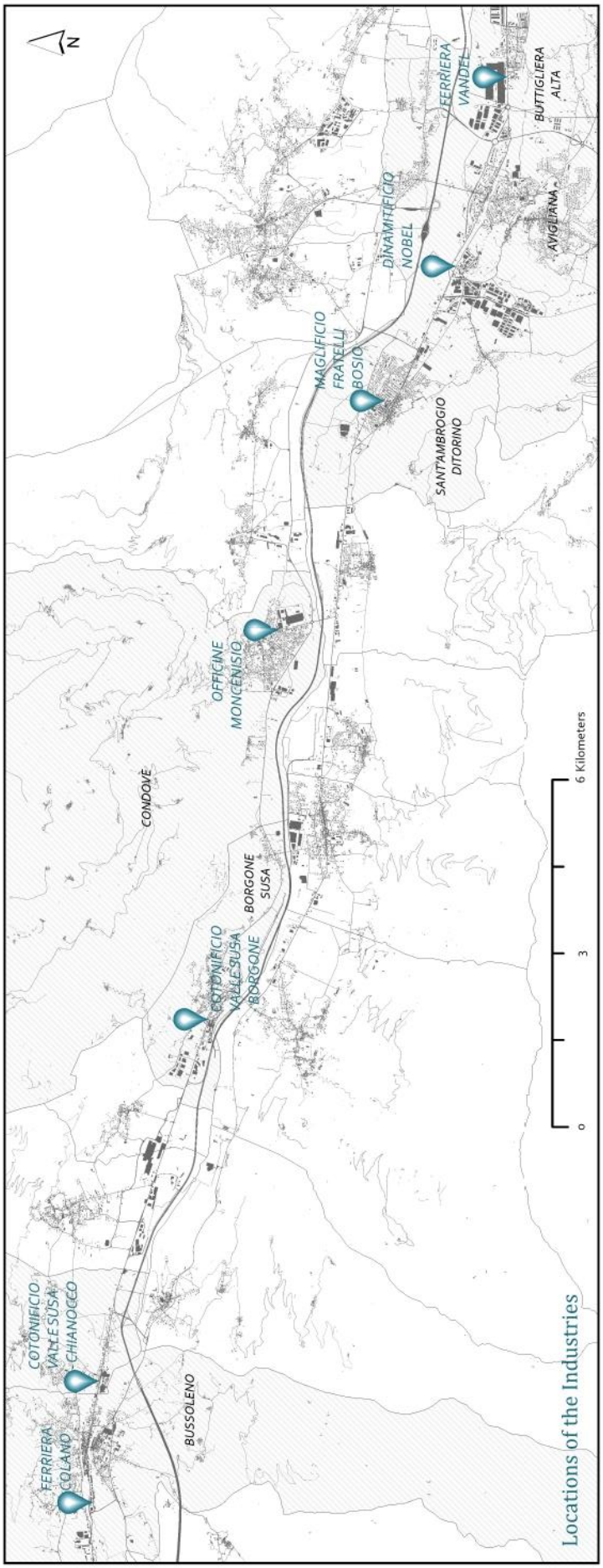
[163] Ibidem.

[164] Ibidem.

7. Histories of the Major Industries that Initiated the Industrialization of the Susa Valley







7.1. Buttigliera Alta Ironworks (Ferriera di Buttigliera Alta) - Vandel

Figure 41: General view of the factory[165]

Figure 42: General view of the factory and worker houses[166]

7.1.1. Foundation and early years

In the early autumn of 1890, Giuliano Vandel, owner of a nail factory in a French town near the Swiss border, purchased around eleven hectares of land in Buttigliera Alta and relocated the company *Ferriére-sous-Jougne.* Vandel's decision was influenced by factors like the inability to connect his factory to a railway line, a shift in production towards the Italian market, and customs protectionism between France and Italy. In Buttigliera, Vandel found favourable conditions for his settlement, including a flat area, the Moncenisio State Road, the Torino-Modane railway, and access to water from the Dora Riparia river. There was a substantial area with great potential for development.

[165] *Società Anonima Ferriere Piemontesi, 6.*
[166] *Società Anonima Ferriere Piemontesi già Vandel & C* (Milano: Umberto Grioni, 1913), 3.

Regarding the availability of hydraulic power, on October 28, 1890, Vandel family acquired the mills near the Dora in Buttigliera Alta, securing the essential water rights, both in his own name and on behalf of a future company named *"Ferriera di Buttigliera Alta ed Avigliana - Vandel Ainé e C."*[167]

In 1890, after acquiring the mill in Buttigliera Alta, Vandel set about creating the canal, shifting the intake works further upstream, erecting a dam across the river to augment the canal's flow, and partially tracing the path of the water channel to reach the Factory area, alongside the location of the bealera that fed the mill.

Simultaneously, they approached the Mauritian Order to acquire a strip of land that would allow the continuation of the canal to return water to the Dora, without interfering with the mill, which would be powered by the new canal and would retain the existing discharge works.

The property owned by the Mauritian Order, which started from the Dora and bordered the mill's lands, extending to the left bank of the Montabone irrigation canal, was partly subject to civic uses. Therefore, the municipal administration had to deliberate on relinquishing, on the strip affected by the canal, the ancient right of pasture reserved for the poor of the municipality.

This area was called "Praia" and covered an area of approximately 55,000 square meters (just under 15 acres), designated as perennial pasture where the less affluent residents of Buttigliera would bring their cows and a few sheep to graze free of charge.

Unable to sell the strip of land traversing Praia, the Mauritian Order granted the Vandels only the servitude of indefinite passage after the Buttigliera municipal council voted in favour of the project. This resolution was authorized on December 18, 1890 by the Provincial Administrative Board.[168]

At the end of 1891, Giuliano Vandel successfully completed negotiations for the acquisition of the land intended for the factory site in Buttigliera. This area was bordered by the mill's canal to the north, Colatti road to the east, the railway to the south, and a straight line from the railway near the current sports field to the state road, passing near the Cascinetta's enclosure wall.

The plant was planned to have various departments including a forge, two wire drawing departments, a nail-making department, warehouses, an office, a sales warehouse, a bakery, and the guardian's residence.

In addition to production facilities, the original plan for the Buttigliera settlement included service buildings for employees. Plans for a workers' village included six three-story worker houses (72 apartments in total), three villas (with 6 apartments in total), a school, and outdoor washrooms. The

[167] Silvia Zanini, "Le Ferriere di Avigliana: Una Trasformazione Produttiva ed uno Scambio Internazionale di Esperienze" (master's thesis, University of Turin, 1996), 56.

[168] Riccardo Dosio, *Ferriera: una fabbrica un paese: da Vandel ad Agnelli: industria lavoro e vita nella bassa Valle di Susa*, Torino: Piemonte in Bancarella,1985, 28.

village was self-sufficient. Houses were built using stone and bricks, and heating was done with wood and coal.

Figure 43: School of Regina Elena

The total area around the plant, including canal and mill lands, was 166,142 square meters, while the planned area for the workers' village was approximately 200,000 square meters. In reality, only just over 50,000 square meters were purchased.[169]

The construction of the facilities, which began in September 1890, was only completed in March 1892, allowing for regular operation of the workshop from that date. Additionally, peak production could only be achieved in two or three months, around June or July 1892, due to the challenge of hiring a sufficient number of workers.

The Vandel family had relocated to Buttigliera Alta with a significant portion of their workforce from their French workshops. However, this was not enough to start an industry in Italy; a larger number of skilled workers were required. These workers could not be trained in a short period, especially in a country where industrialization was not yet highly developed. This led to delays in production, resulting in no profits to distribute.

The situation remained unchanged for the year 1892, which was the first fiscal year for which a financial statement was presented. Unforeseen incidents, such as the significant incident of the collapse of a gallery in the derivation canal at the end of February, also contributed to the challenge of achieving a positive operating result. Despite these challenges, it can be stated that the result achieved in the following years was relatively good.

After the initial growth, the Vandel factory faced a crisis in 1896, leading to its restructuring. In the same year, a Martin furnace was installed for melting metallic scrap, which was imported from France as raw material. This enabled steel production and the rolling of rods used in the nail industry. However, all these efforts were unsuccessful. An extraordinary shareholders' assembly on April 29, 1896, unanimously approved the early dissolution of the company, followed by the appointment of Alfonso Vandel as liquidator.

The final liquidation statement was presented on May 19, 1897. The auditors expressed regret for the modest results but believed every effort had been made considering the unfavourable market conditions for selling industrial facilities.[170]

The Vandels, despite liquidating their previous company, were

[169] Zanini, *Le Ferriere di Avigliana, 68.*

[170] Ibidem, 81.

determined to stay in Italy and continue their venture. They added a clause to the liquidation, avoiding public auctions for property sales. This allowed them to form a new company with a different focus and lower capital, ensuring their control over the assets. On July 31, 1896, they established a new partnership called *"Vandel e C."* specializing in the production and trade of iron wires, shoe nails, and related goods.[171]

The new company purchased properties and machinery from the previous one, with the real estate valued at 353,100 lire and machinery, transmissions, goods, and supplies totalling 705,014.20 lire, according to the liquidation balance sheet of the previous company, *"Ferriera di Buttigliera Alta ed Avigliana - Vandel Ainé e Compagnia."*[172]

On May 13, 1896, the company submitted a request for a modification, proposing to reduce the canal flow from 150 to 100 modules. However, this request wasn't granted.

The matter remained unresolved for a long time. In 1902, the Prefecture, considering that conditions had changed between 1896 and 1902 and may affect the rights of third parties, decided to re-examine the case. The company was asked to submit a regularization request for the existing water diversion. The Vandel company complied, providing a project indicating the actual executed works.

The request was under review following a Prefectural Decree on March 14, 1904, and a local inspection was conducted on April 25 of the same year. Following a positive outcome, the company was granted regularization for the works carried out for the diversion of 150 modules from the Dora Riparia in the territory of Avigliana, right bank. They were also granted permission to build a stable dam in the Dora under specified conditions.[173]

In 1898, the Vandel family participated in the General Italian Exhibition, showcasing their products in the categories of manufacturing industries and metal furniture, tools, and works. Exhibitions in the 19th century typically awarded recognitions to participants. *"Vandel e Comp. di Avigliana"* was listed among the recipients of honorary diplomas.

Until 1899, the entire management of the company remained in the hands of the Vandel family. After a four-year period of company crisis, the Vandel company was reconstituted in 1899 for the second time. In 1899, there was a financial and corporate operation in the metallurgical plants that can be described as classic and well-tested for similar situations in the second half of the 19th century, especially in Italy after the enactment of the new commercial code: a new anonymous company, *"Ferriera di Buttigliera Alta ed Avigliana già Vandel e Compagnia,"* was established with a capital of 3,500,000 lire, divided into 17,500 shares of 200 lire each. The founding members included Alfonso Vandel, Achille Cornaglia, Giuliano Vandel, Raimondo Vandel, and others. They sought to

[171] Ibidem., 82.
[172] Ibidem, 84.
[173] Ibidem, 86.

formalize the establishment of the company and transfer certain properties from the existing partnership *"Vandel e C."* located in Buttigliera Alta.[174]

The properties included various lands and buildings, such as a water derivation canal from the Dora River, a mill with four grindstones, several sheds, a two-story house serving as offices and more. Additionally, there were properties situated between the provincial road from Turin to Susa and the railway line, comprising multiple buildings used for housing. All machinery, fixed equipment for power transmission, and various other items were also part of the transfer.

This transfer of properties and equipment was a means for the Vandel family to secure a substantial majority stake in the new company. It also provided an opportunity to generate funds, potentially enabling them to settle a significant portion of the accumulated debts from previous management. The total value of the transfer was acknowledged as 3,000,000 lire, allowing for 2,200,000 lire to be allocated as the Vandel family's share in the new company, and the remaining 800,000 lire to be paid in cash.[175]

The Vandels held the majority of shares in the company. To maintain this, they introduced a clause stating that out of the 11,000 shares owned by the family, 7,500 would remain registered in their names and non-transferable for a period of 5 years. Following this, 6,000 shares would remain non-transferable for the entire duration of the company.[176]

According to the company's statute, its purpose was the acquisition and operation of furnaces, rolling mills, workshops for the production of iron wires, shoe nails, and everything related to the iron industry.

With this reconstitution, there was an improvement in the financial situation, attributed to more favourable general political-economic conditions and, most importantly, the shift from a predominantly family-run operation to a more rational and careful administration under the direction of Cavalier Ferdinando Gatta.

In 1899, the *"Ferriera di Buttigliera Alta e Avigliana già Vandel e C."* company was active in various departments including forging, drawing, nail production, and electricity. The forging section utilized materials from the blast furnace, primarily pig iron, followed by slag and combustible gas. The ordinary pig irons underwent a transformation process in the Martin furnace to produce steel and iron blocks and ingots.

The forging department had two rolling mill trains, one small and one large. These mills, operating with two horizontally rotating cylinders, were used for processes like crushing, elongating, and shaping materials. The smaller mill produced homogeneous iron in various shapes, while the larger one specialized in round iron and other shapes.

[174] Ibidem, 93.
[175] Ibidem, 97.
[176] Ibidem, 99.

From the iron smelting, iron and steel were obtained in the form of blocks and ingots. These could undergo further processing through rolling and drawing to create commercial products like bars, profiles, sheets, and wires.

Following this, the materials entered the drawing department where cold rolling was performed. The products included different types of iron and wire.

Finally, the finished products were produced in the nail production department. This section manufactured various types of nails, including *"punte di Parigi"* (small cylindrical shaft nails used in carpentry and shoemaking), different types of shoe nails, rivets, and bolts.

Before reaching the market, the nails underwent a cleaning process with sawdust, and they were packaged using various coloured papers based on the nail type. The inventory also accounted for other necessary materials like sesame oil, mineral oil, and thick grease.

In 1899, the Vandel company had given a significant boost to its facilities by adding more Martin furnaces, rolling mills, and other processes to meet the increased demands. By the spring of 1900 the planned expansions were completed.

In 1900, the construction of new houses began along Via Capoluogo and the sides of Corso Torino (then Via Provinciale). These houses, along with those built by the Vandels earlier, formed the residential centre of the Ferriera hamlet for over fifty years. During this period, the workers' houses were also equipped with electric lighting. At that time, electric lighting in homes was considered a privilege and a luxury that not everyone could afford.

Various incidents, such as extended shutdowns for repairs and machinery replacements, affected operations in departments like steelworks and forging and in the year 1900, the company experienced a loss of 233,916.84 lire. Additionally, delays in procurement and higher prices for materials further complicated matters. The company faced significant price reductions in stored goods due to the ongoing general crisis in the metallurgical industry.[177]

Figure 44: Interior railway

Regarding the railway connection between the nearby Avigliana station and the ironworks, essential for minimizing transportation costs, approval was obtained in 1901 for the use of a parcel of land for the connection. The construction of the railway incurred expenses for materials purchased and materials on account of work. The railway was equipped with a

[177] Ibidem, 107.

weighing mechanism capable of handling the maximum load of the then-operational wagons, ensuring thorough control of incoming and outgoing goods. This was advantageous for the facility, which had an annual movement of over 40,000 tons.

The 1902 financial year was only six months long due to the mentioned events. During the General Assembly convened to discuss the financial report, several extraordinary decisions were made, including agreements with the Vandel family and the reduction of social capital. This reduction was deemed necessary as no amortization had yet been made to the "Plant and Machinery" account since the company's inception, necessitating its devaluation.

In 1902, a convention known as the "Vandel Convention" was established and approved by the shareholders' assembly on March 26, 1902. The convention resulted in the release of the previously restricted 6,000 shares.[178]

The convention was approved, resulting in the adjustment of the company's capital to 2,250,000 lire, divided into 15,000 shares of 150 lire each. Following the convention, the Vandels' involvement in the company diminished, marking a new phase characterized by more significant objectives and positive results.[179]

By June 30, 1903, the company recorded a profit of 160,054.90 lire. In 1904, they achieved a profit of 214,072.05 lire. These results were attributed to the intelligent management of the director and staff, who significantly contributed to the progressive improvement of the company.[180]

In 1905, a second Martin-Siemens furnace with a daily production capacity of 60 tons began operating. At that time, there were two Martin-Siemens furnaces in operation, one with a capacity of 10 tons, and the other with 15 tons, along with five reboiling furnaces and one hearth furnace. A 400 HP steam engine was also installed. The workshops employed around 650 workers. The Ferriera held a prominent position among the main iron and steel workshops in the Turin district in terms of equipment and workforce.[181]

With the increased production capacity from the new furnace, the plant could operate without the need to purchase semi-finished products externally. In 1905, they achieved a production of 23,000 tons, generating a total turnover of 5,000,000 lire. By June 30, 1905, the net profit reached 294,868.73 lire. [182]

The ironworks in Avigliana saw an increase in demand for supplies to the extent that the existing facilities were insufficient to meet the strong demand. Therefore, there was a need to enhance the facilities.

It was decided to establish a new plant in Turin. The Avigliana plant had reached its maximum potential, and it was deemed appropriate to increase

[178] Zanini, Le *Ferriere di Avigliana,* 110.
[179] Ibidem, 111.
[180] Ibidem, 111.
[181] Ibidem, 118.
[182] Ibidem, 118.

production by constructing a new one. This new facility, to be built near the Dora station and thus easily connectable, would not only serve to complement the production in Avigliana but also have the capacity to manufacture new steel products and high-strength special materials.

7.1.2. War years and acquisition by FIAT

During the years 1915-1918, there was a rapid development in industries primarily associated with wartime production. The significant profits from war supplies were coupled with the absence of foreign competition, attributed not only to the war itself but also to the ministerial decree of April 1, 1917, which prohibited the importation of all foreign goods except for food and raw materials.[183]

As it became foreseeable that the war, and consequently wartime production, would come to an end, there arose a need to prepare for the inevitable challenges of the post-war period. The idea was to consolidate diverse productions that could complement each other, ensuring the survival of businesses and reducing production costs by concentrating substantial financial resources, equipment, and established organizational structures.

Before the war's end, there was an incorporation of the "*Ferriere Piemontesi già Vandel e C.*" into the FIAT complex. The merger between *Ferriere* and FIAT demonstrated a correct strategic vision on the part of both companies. The decision aimed to anticipate the challenges that would arise in the post-war period.

Upon acquisition by FIAT, the *Ferriere Piemontesi* had two plants: one in Turin covering an area of 40,000 square meters, and another in Avigliana covering 200,000 square meters. The Avigliana plant consisted of steelworks with two Martin-Siemens furnaces of 15 tons each, a rolling mill section with two small mills, one medium-sized mill, and one large mill, with a total capacity of 40,000 tons annually. This plant also continued the original production of nails and wire in the nailery and mechanical workshop departments.[184]

The Avigliana plant produced various steel products. The production in both plants amounted to nearly 100,000 tons of steel annually, including special steels. The total workforce was around 1,300-1,350 employees, with about 550 in Turin.[185]

After the acquisition by FIAT, the company, now called *"FIAT Sezione Ferriere Piemontesi"* played a crucial role in meeting the steel demands of the group. Additionally, various properties and assets were transferred to FIAT, including lands, buildings, and industrial equipment in Turin, Avigliana, Buttigliera Alta, and Traversella, as well as mining rights for copper, iron, and other metals.

The transition to FIAT opened up new prospects for work. After the

[183] Ibidem, 146.

[184] Ibidem, 162.
[185] Ibidem, 164.

economic crisis in 1919, particularly severe in 1921, efforts began to renew machinery and facilities. This was intensified from 1925 to 1929, with interventions in all departments.

The purchase of new machinery allowed for the production of five basic types, including hot-rolled, wire, and nails, as well as drawn bars and cold-rolled, further increasing employment to 967 workers in 1925.[186]

After the immediate post-war period, engineer Giulio Baroni took over as director of the factory. He held this position from 1919 until 1954, navigating through difficult times during the severe economic crises of 1921 and 1929, especially during and after World War II.

The houses on Via Ferdinando Gatta also underwent renovations. The terracotta tile floors were replaced with coloured cement tiles. Toilets were built on the balconies opposite the entrance facades, one for each apartment.

The factory had cleared and demolished the old "Tube Factory" that had existed since 1898 between Via Capoluogo and Via Cesare Ramo. On the front of the latter, in the spring of 1937, they began construction on a large four-story residential building with sixteen apartments for employees.

A year later, construction started on another employee housing building, with six apartments, located on the south side of the main road, just beyond the area of the sports field.[187]

7.1.3. The recent past

Since the end of the war, the *Ferriera* plant had been struggling with a severe problem, worse than the others afflicting it at the time: a general technological obsolescence. This applied not only to the buildings, some of which dated back to 1890, but also to the equipment and machinery, which had been in service for about twenty years without renewal. The evolving industry demanded a radical update for a swift recovery. Until 1948, the processes remained unchanged. Apart from an attempt to revitalize the nail-making section by hiring and training young apprentices to replace many of the old nailers who were approaching retirement age, no innovations had been implemented.

In the years following World War II, the *Ferriera* plant experienced fluctuations in production. Output increased from 10,332 tons in 1946 to a peak of 13,950 tons in 1950. However, from 1951 onwards, there was a contraction, with production dropping to 161 tons in 1955. Eventually, the old equipment and machinery were dismantled.[188]

Similar fate had befallen the numerous machines in the *Chioderia* (nail-making department) several years

[186] Dosio, *Ferriera: una fabbrica un paese,* 71.

[187] Although its accuracy has not been fully confirmed since no photographs of these buildings can be found in the sources examined, it is thought that the buildings currently located in Via Cesare Ramo are the mentioned buildings.

[188] Dosio, *Ferriera: una fabbrica un paese,* 165.

earlier. Production in the *Chioderia*, which started in 1946 with 1,358 tons, reached 2,393 tons in 1948, only to decline to 407 tons in 1950, and ultimately closed in 1951 with the last 58 tons produced.[189]

The old open sheds that housed the rolling mills were demolished in two stages to make way for the modern *Bulloneria* (bolt-making department). Construction of the *Bulloneria* began in 1950 and was expanded for the first time in 1957.

The *Chioderia*, consisting of a large room dating back to 1890, covered with a tiled roof and with the floor level lower than that of the newer departments, stood until 1960. That year, the second expansion of the *Bulloneria* began, doubling the area designated for new processes.

In the early 1950s, the Ferriera Plant experienced significant development and growth, becoming a leading European player in the cold forging and forming of bolts and special parts. This growth was aligned with the broader economic boom in Italy.

The initial transfer of bolt-making machinery from Mirafiori and the arrival of equipment from the United States through the Marshall Plan kick-started a large-scale acquisition program for new production assets. The United States and Germany became principal suppliers, leading to significant upgrades in cold rolling mills and wire drawing facilities. Simultaneously, the relocation of various operations from FIAT sections in Turin played a pivotal role in the plant's advancement.

The late 1950s witnessed the construction of new residences for employees, marked by renovations in housing complexes along Via Gatta and the *Tubi* area in Via Capoluogo and Via Cesare Ramo. Beginning in 1955, a comprehensive transformation project was initiated, including the relocation of sanitary facilities from balconies to interior spaces, creating separate bathrooms and passageways between rooms.

Also in 1956, construction began on a new housing complex for employees. This four-story building housed sixteen apartments and was served by two staircases. The construction project was once again entrusted to the Maina Giuseppe company of Rivoli.

With its expansive balconies and exterior walls constructed using exposed face bricks, the building stands on the western side of Via Cesare Ramo, near its junction with Corso Susa.

In the span of about a decade, the Ferriera Plant significantly expanded its premises by acquiring adjacent lands, effectively doubling its total area to around 800,000 square meters. This expansion allowed for the construction of new roads, including Via Dora Riparia, and the creation of vehicular entrances and courtyards.

To support its growing operations, the Plant made substantial investments in machinery, including tempering and annealing equipment, rolling mills, and various specialized

[189] Ibidem, 166.

machines for different departments. Additionally, a natural gas pipeline was constructed to connect the Plant to the network in Turin.

This period of expansion and modernization not only transformed the physical landscape of the Ferriera Plant but also had a profound impact on the lives of its employees and the surrounding community. The integration of new facilities, improved housing, and expanded services contributed to a heightened sense of vitality and progress in the region.

In 1963, the number of employees at the Ferriera Plant saw a significant increase, reaching a total of 2,809, including 2,546 workers and 263 office staff. As part of a modernization program, there had been a longstanding request for the construction of a new office building to replace the old structure dating back to 1890.[190]

Figure 45: The former office building[191]

As part of a broader project to revamp the area adjacent to the main road, from Via Mulino to the end of the constructed zone towards Avigliana, the new office building was included. Construction began in 1963 and was completed the following year. The relocation of furniture and documents took several days and was carried out at the end of July 1964, so that work could resume in the new location after the annual August vacation.

In September, all the old buildings were demolished, including a small house with a bread oven, an electrical cabin, a two-story building used for offices and partially as housing, the porter's lodge, the infirmary, the bicycle storage, a dining hall, a kitchen, the fire brigade barracks, the garage, and the carpentry shed.

In the late 1970s, there was a change in leadership at the plant, with engineer Orlando Camellini taking over from engineer Pietro Motta. The overall production and economic situation was still considered satisfactory, but signs of change were beginning to emerge, with Gianni Agnelli himself forecasting an imminent period of "stagnation" in the automotive industry.

Several notable achievements were made for workers during these years, including the introduction of a shorter workweek with Saturdays considered a holiday for all, flexible hours exclusively for employees, and the establishment of company restaurants in 1973.

To meet the increasing demand for industrial water, a centralized plant was constructed, capable of delivering up to 450 cubic meters per hour. Additionally, a large purification plant

[190] Ibidem, 186.
[191] Ibidem, 9.

was built to address pollution concerns from industrial discharges.[192]

Despite these necessary and substantial expenses, they began to significantly impact production costs, particularly during a challenging period when requesting increased productivity to balance the budget was a delicate matter.

In the midst of frequent labour unrest, which sometimes escalated to acts of intimidation and violence both inside and outside the plant, a rapid decline began to unfold, erasing the prosperity the section had long enjoyed. The situation grew critical with annual losses in the billions of lire, proving difficult to contain.

The Ferriere Fiat operated under this name until 1978, when Teksid was established, bringing together all metallurgical and steel activities of Fiat. In 1982, Teksid was absorbed by Finsider, a group under State Participation. The plant closed permanently in 1992 due to the metallurgical sector crisis.[193]

In addition to staff layoffs and furloughs, there were large-scale sales of scrap and out-of-service machinery, and the elimination of non-essential expenses and services. FIAT had also decided to sell its residential properties, giving priority to the tenants living in them.

The houses in Ferriera underwent the same fate, benefiting about two hundred families who, with favourable prices and payment facilitations, became homeowners of the dwellings they lived in by 1981.

7.1.4. The Vandel Village

The Vandel complex was situated on a regular plot of land intersected by orthogonal axes: an internal village road lined with workers' houses and a provincial road with entrepreneurs' and employees' houses on one side, and office buildings on the other. The central office building served various functions, including sales and a bakery.

The Vandel village project included six three-story houses with basements along the internal road, originally intended for specialized French workers. Additionally, there were three semi-detached houses for the managers, two stories above ground, along the provincial road.

The regular sequence of garden-house-garden, observed in the Vandel settlement, follows traditional patterns of worker villages. The elongated lots for the managers' houses corresponded to the symmetric division of the respective houses and gardens. The gardens for the workers were grouped together and located on the sides, though they were also divided into regular and similar lots.

The houses designated for the managers in Vandel followed a symmetrical quadrangular layout with lateral staircases, reminiscent of the

[192] Ibidem, 193.

[193] "Fiat sezione Ferriere Piemontesi," Museo Torino, accessed November 12, 2023. https://www.museotorino.it/view/s/4165f25a93a74a008fdb42838e81f77d.

cottage-style model with a focus on family use, rooted in Central European tradition.

The worker houses in Vandel followed a linear layout, providing better sanitary conditions (ventilation with double airflow, ample sunlight) and greater practicality compared to the block-style model.

According to the 1891 census of houses and inhabitants, a one-room apartment with a kitchen housed four to five people, while a two-room apartment with a kitchen accommodated six to seven people.

Initially, the village lacked certain services like a school and a church. The Vandels, recognizing the need to provide education for the children of French families who had immigrated to Italy, approached the Society of the Sacred Heart of Jesus to organize both an Italian and a French school. This began in 1891. By May 1891, the number of boys and girls attending the school increased to 112. On October 19, 1891, the French school started as a separate course alongside the Italian one.

In December 1899, thanks to the efforts of the Society of the Sacred Heart of Jesus, an elementary school was built in Buttigliera on the properties of Countess Clementina di San Tommaso.

A church was later built in 1903, funded by the Carron di S. Tommaso family.

The original design of the Vandel village was tailored to the sociological composition of its inhabitants, who were primarily male skilled labourers with their families relocating from France. This led to a specific division of labour within the village, where skilled workers also took on domestic responsibilities. The limited services were linked to the company's financial challenges in the early 1900s, attributed in part to the substantial expenses incurred for constructing the village alongside the factory and water channel.

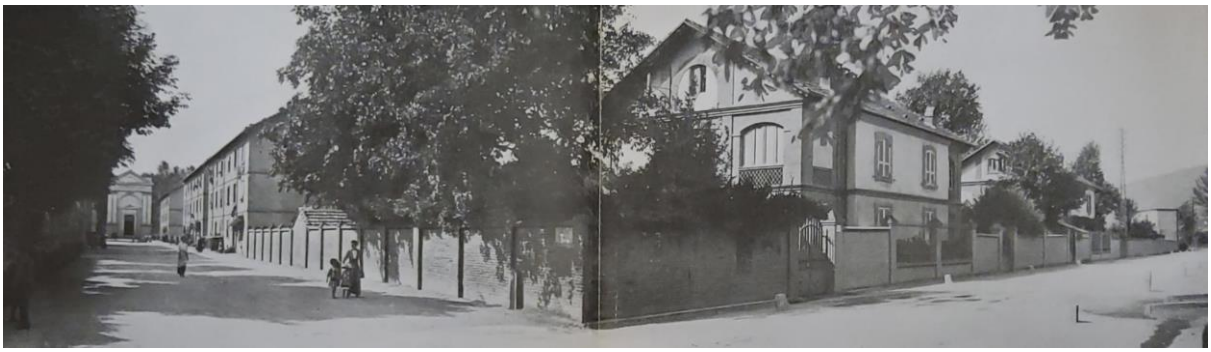
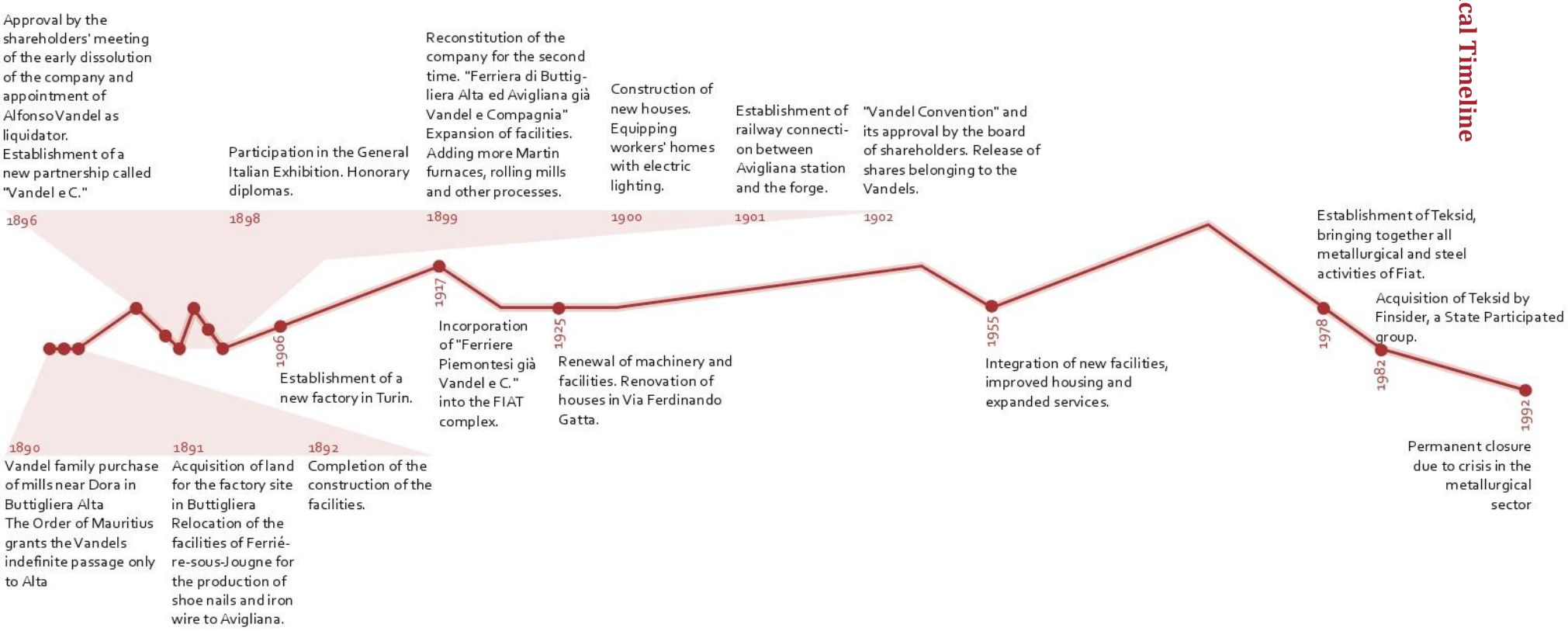


Figure 46: Vandel village[194]

[194] *Società Anonima Ferriere Piemontesi, 10.*

7.1.5. Historical Timeline



7.2. The Nobel Dynamite Factory (Dinamitificio Nobel)

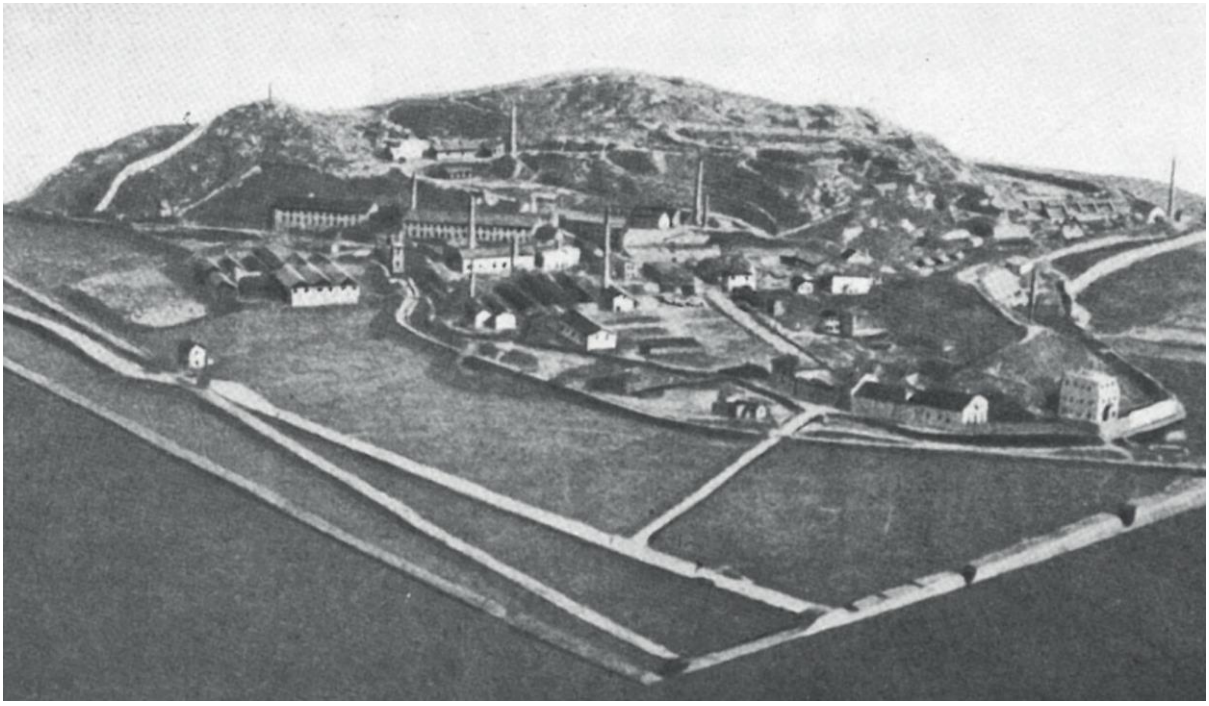


Figure 47: General view of the Valloja factory[195]

7.2.1. From foundation to the explosion of 1900

Liberalization policy of the Italian government towards the production of explosive materials for both military and civilian purposes led to the end of the state monopoly on explosive production with the enactment of the law on June 5, 1865. This marked the first in a series of laws regarding explosives from the late 1800s to the early 1900s, allowing Italian establishments like those of the Nobel Company to enjoy significant advantages in terms of production and economics.[196]

Italy, in its early years as a unified state, needed infrastructure development to connect various regions effectively. Thus, the availability of an explosives industry became crucial for constructing new infrastructure like ports, roads, and railways, fostering the unification and socio-economic development of the nation.

The historical journey of the *Dinamitificio Nobel* began in 1872 when the *Società Anonima Dynamite Nobel*, a Hamburg-based company, established its explosives manufacturing plant in Avigliana, Italy by Alfred Nobel, a Swedish scientist and inventor. This venture marked a significant milestone as it was the first of its kind in the country, manufacturing dynamite, balistite, and fulmicotone. The company was part of the larger financial group that had recently set up a similar facility in Isleten, Switzerland, to provide explosives for the construction of the San Gottardo railway tunnel. The

[195] Sacco and Richetto, *Il dinamitificio Nobel di Avigliana, 34.*
*Produced by the author.
[196] Paola Maria Delpiano, *Viaggio intorno alla Dinamite Nobel* (Torino: Editris, 2011), 112.

expansion into Italy was fuelled by the country's liberalization of the internal explosives market, which was previously restricted by a monopoly from 1861 to 1869.[197]

The Avigliana site proved ideal for the expansion of Nobel's business, with its attractive fiscal incentives, access to the two lakes and Dora river as water resources for power generation, and proximity to the *Torino-Modane* railway line. Moreover, the selected location was a large area adjacent to the so-called *"Trucco di S. Martino,"* with morphological features that would provide Avigliana's settlement with secure protection against the devastating effects of potential explosions.[198]

To establish the Avigliana plant, the Nobel group formed the *Società Anonima Italiana per la fabbricazione della Dinamite*, which later merged with the *Société Centrale de Dynamite* in Paris, the umbrella company for Nobel's southern European facilities. The plant's construction was overseen by engineer Oreste Ballardi, and the project gained approval from the municipal administration and the Prefect of Turin, Vittorio Zoppi.

The explosives factories of that era were built as a cluster of wooden buildings arranged somewhat haphazardly, resembling barracks and separated by earthworks. This design was chosen to minimize economic damage in case of explosions (as rebuilding a wooden barrack is evidently less costly than a masonry building). Additionally, it was believed that the shockwave from an explosion would carry lighter materials, presumably causing less devastation. They were covered with tarred paper or canvas and equipped with a water heating system to prevent the nitro-glycerine from freezing. On the other hand, the residences of the managers, located at a safe distance from immediate danger zones, were constructed with masonry and adorned with decorative features.[199]

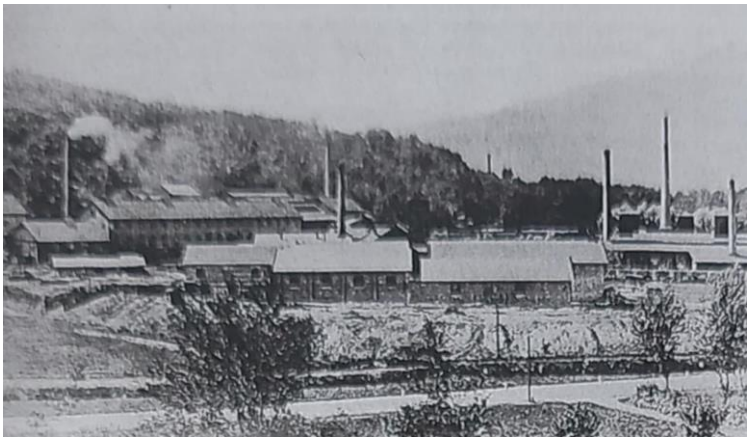


Figure 48: External view of the factory in the first years of activity.[200]

The plant commenced production on December 23, 1873, with the first nitration of glycerine based on Alfred Nobel's patent, utilizing cold water as a coolant. Over time, the production increased, and by 1875, the plant began utilizing the by-products of explosive

[197] Ludovici, *L'industria pensante,* 34.
[198] Sergio Sacco and Gigi Richetto, *Il dinamitificio Nobel di Avigliana : storia di una industria sospesa tra pace e guerra : le innovazioni e le crisi di un secolo di sviluppo tecnico e scientifico* (Susa: Piero Melli, 1991), 17.
[199] Maria Stella Tubere and Gaia Zampella, "Il Parco Diffuso Dinamitificio Nobel e il Dynamic-Ficio: Un Progetto di Riqualificazione" (master's thesis, Polytechnic University of Turin, 2023), 35.
[200] Caione and Batsivari, *Il riuso dell'archeologia industriale*, 106.

manufacturing to produce ferrous sulphate within a dedicated shed. The facility also expanded its operations to produce Nobel's newly invented explosives, ballistite and compressed fulmicotone, catering to the needs of the Royal Army. These innovations further boosted the plant's commercial success, and under the direction of Adriano Galinie from 1880 to 1893, the production capacity continued to grow.

To support the increased demand for energy, the company adopted a hydroelectric power system, utilizing the Dora River. In October 1881, the company began collaborating with the hydraulic engineer Vincenzo Soldati for redesigning the watercourse (bealera) that ran alongside the factory grounds to supply the recently acquired Borgo Vecchio Mill. This collaboration with Soldati continued until World War I, involving ongoing work on the necessary canalizations for the factory's extensive growth.

This ambitious project, however, faced resistance from local communities, leading to delays and adjustments. Nevertheless, the plant persisted and expanded its premises, with a total workforce of 250 employees spread across an area of 209,440 square meters. In addition, to streamline the transportation of raw materials and finished products it introduced a narrow-gauge railway system to connect various sections of the facility, including a crossing of the Avigliana municipal road.[201]

[201] Ludovici, *L'industria pensante,* 39.

Figure 49: Internal narrow gauge track[202]

Throughout its growth, the Nobel Dynamite Factory in Avigliana successfully established itself in the market and faced legal challenges from competitors. The company's strategic and well-executed expansion allowed it to remain at the forefront of the explosives industry in Italy and contribute significantly to the nation's infrastructure development and modernization during the late 19th century.

The most significant developments occurred in 1882, coinciding with Italy's African expedition. The Italian government aimed to acquire territories in Africa to enhance the nation's political and economic prestige on the international stage. This led to an increase in armaments and military supplies, benefiting the leadership of the dynamite factory. The surge in production necessitated immediate

[202] Nadia Colenghi, "Ipotesi per un progetto di riqualificazione dell'ex-dinamitificio Nobel ad Avigliana" (master's thesis, Polytechnic University of Turin, 2005).

modernization of certain facilities. In 1886, the diversion canal from the Dora was renovated. Additionally, in November of the same year, the first electric lighting poles were installed. This was a significant advancement for the factory, ensuring better safety through enhanced control of various processes during hours of natural darkness.

As the Nobel Dynamite Factory continued its operations, the company also focused on the welfare of its workers. The hazardous nature of the work prompted the establishment of specific training courses for the employees. The company carefully selected individuals who demonstrated technical skills, ethical behavior, and prudence. The aim was to ensure a well-trained and responsible workforce capable of handling the delicate processes involved in explosives production.

The company's success and growth were also celebrated through public events and gatherings, where administrators presented the achievements of the factory to authorities, local dignitaries, and the very workers who contributed to its success. Moreover, the Nobel Dynamite Factory ensured the well-being of its employees by providing necessary insurance coverage for illness and injuries.

In 1890, the company went a step further by founding the "*Circolo Arti e Mestieri*" (Circle of Arts and Trades) to cater to the social needs of its workers during their leisure time. This initiative aimed to foster a sense of community and camaraderie among the employees.

Throughout its existence, the philanthropy and paternalism of the company's executive management extended beyond the factory gates. The managing director, Adriano Galinie, was an active member of the Red Cross in Avigliana. He, along with other collaborators, participated in committees for regattas on Lake Grande and generously donated to local welfare institutions such as the Beato Umberto Hospital, the Infant Asylum, and the Mutual Aid Society. Galinie even served as the mayor of Avigliana from 1887 to 1894.

The dynamic relationship between the factory and the local community also extended to labour relations. The Dinamitificio Nobel showed interest in the welfare of its workforce by encouraging all workers to enroll in the local Mutual Aid Society. This move allowed the company to have direct control over the recruitment and organization of labour unions.

On 27 March 1888 Nobel filed the patent on smokeless explosive compounds in Paris and on 28 June of the same year the patent on granulated explosive compounds, while he began negotiations to produce them at the Piedmont factory. On 22 June 1892 the Aviglianese company obtained the prefectural decree for the production of ballistite. The text of the decree outlined a series of regulations and authorizations granted to the Dynamite

Nobel Company in Avigliana regarding the production of explosives. This includes some key aspects such as evolving the factory from scattered barracks to a well-organized facility, making renovations including enclosing denitration areas and regulating temperature, expanding separation areas and implementing specialized acid transfer systems, enhancing safety with protective structures, and adding a perimeter wall for increased security.

It is possible to understand the area occupied by the dynamite factory and the state of the places at the end of the nineteenth century from the text written by Enrico Trevisani[203] In summary, we obtain the following information from the initial and general part of the text:

The Dynamite Nobel factory was a vast complex covering 209.000 sqm enclosed by a three-kilometre perimeter wall. It housed 314 buildings interconnected by wide roads and storage areas. The facility's layout included acid containers, iron glycerine barrels, nitric acid jars, and extensive storage spaces. The site also featured large warehouses for raw materials like pyrites and nitrates, served by a railway connecting to Avigliana station. Chemical production, explosive manufacturing, and power generation were organized into three main sections. The power section used 700 steam horsepower, provided by four powerful compound engines and hydraulic turbines. Water was a crucial resource, with five pumps drawing from the Avigliana canal. Safety measures were extensive, including 90 strategically placed fire hydrants and 36 lightning rods. Compressed air played a key role in material transport through a network of pipes, driven by five compressors. The entire complex was illuminated by 580 incandescent lamps powered by three Thury dynamos. Additionally, three high-intensity lamps were reserved for emergencies or special tasks. The description also detailed areas dedicated to preparing raw materials like glycerine, nitric acid, and sulphuric acid, housed in 53 buildings covering 9.685 sqm.

The rest of the text contains more detailed information about each section of the factory. In summary;

-The sulphuric acid section utilizes pyrite from the Chialamberto mine, receiving around 32,000 tons since 1884. The material is processed in Marsden crushers, rich in copper sulphur and arsenic-free. It burns in 20 Malétra furnaces, yielding 24,000 kilograms of 50° B. sulphuric acid daily.

-Nitric acid production involves an extensive setup with 32 distillation furnaces and 284 condensation towers. Raw material is sourced from Chile, resulting in 11,000 kilograms of high-strength acid and 13,000 kilograms of weaker acid daily.

-Glycerine arrives raw from Italian stearin factories, processed in two specialized stills to produce 3,000 kg of

[203] Sacco and Richetto, *Il dinamitificio Nobel di Avigliana, 26.*

concentrated, chemically pure glycerine daily.

-The production of diverse products includes the creation of fertilizers in a large facility, utilizing excess sulphuric acid. This operation can yield up to 300 quintals of fertilizer per day.

-The explosives section encompasses 181 buildings, mainly wooden, spread over two-thirds of the factory grounds. This design aims to mitigate potential explosion effects by compartmentalizing explosive materials.

-The Nitro-glycerine and Dynamite unit produces 3,000 kg of nitro-glycerine daily, transformed into 70,000 cartridges of explosives.

-The Collodion Cotton and Fulmicoton facility, unique in Italy, processes cotton into explosives. The cycle involves several steps including nitration, extraction, and stabilization, producing 2,600 kg of collodion cotton and 1,400 kg of fulmicoton daily.

-The Balistite and Lanite section creates smokeless powders for firearms and hunting. Nitro-glycerine and collodion cotton combine to form a gelatinous substance, processed into sheets and cut into various grain sizes. The result is Ballistite, a malleable material suitable for various applications. Ballistite's properties range from a thick black slab to thin amber-coloured sheets, showcasing its versatility. However, it's highly sensitive to sparks and can combust rapidly.

Despite the company's philanthropic efforts and adherence to safety measures, the dangerous nature of explosives production led to a series of serious incidents. The factory faced grave accidents, often resulting in casualties. Within the first three decades of operation, nearly thirty deaths were recorded. Each tragic incident raised concerns from both the local community and authorities, questioning the necessity of maintaining explosives production in close proximity to residential areas.

The tension reached its peak in January 1900 when a major explosion occurred in the kneading department of the factory. The incident claimed the lives of fourteen workers and caused extensive damage to nearby buildings and the railway station in Avigliana. In response to the disaster, the Avigliana administration established a committee to provide assistance to the affected families.

The explosion reignited the debate over the factory's presence in the area, particularly in the neighbouring community of Sant'Ambrogio. Local residents, along with their mayor, petitioned the government to relocate the Dinamitificio Nobel to ensure their safety. On the other hand, the Avigliana administration defended the factory, emphasizing its safety protocols, compensation for damages, and the economic benefits it brought to the region.

The pragmatic approach taken by the authorities and the company

eventually led to the continuation of operations. The administration promised to work with the Dinamitificio Nobel to enhance safety measures, including reducing the quantity of stored explosives and separating storage areas to prevent chain reactions in case of accidents.

7.2.2. Between the two World Wars

Between 1900 and 1911, under the leadership of Modesto Abelli, the Dinamitificio Nobel experienced significant expansion, updating its production cycle to meet the increasing demands of military ministries. Notably, in 1908, a new powder factory was constructed in Allemandi, designed for smokeless powder production, and improvements were made in the nitration process for cotton used in plastic explosives. To connect the new Allemandi facility with the existing Valloja plant a few hundred meters away, the Decauville system, invented by the Frenchman Paul Decauville in the late 19th century, was a portable narrow-gauge railway (0.60 meters) used. It consisted of small bi-axle wagons pulled by a small steam locomotive. Special wagons, including ones with tanks and flatbeds for transporting people, could also be provided. This system, in comparison to the previous Corbin patent which was single-axle and operated manually or by animals, significantly improved transportation efficiency by allowing the handling of heavier loads due to its more refined and advanced technology.[204]

[204] Ludovici, *L'industria pensante,* 68-69.

Figure 50: View of the Allemandi factory[205]

The company flourished due to rising government contracts during the Libyan War (1911) and the Italian occupation of the Dodecanese Islands (1912). Despite increased production, accidents and explosions resulted in casualties, prompting safety improvements.

During World War I, Italy entered a period of significant industrial expansion, particularly for the Avigliana dynamite factory, which became the official supplier to the military and navy. This led to the need for substantial expansions of the various facilities. The company sought permission for two major expansions: one near the Valloja factories to the northeast, and the other towards Buttigliera Alta, adjacent to the Allemandi powder plant. However, negotiations with landowners proved challenging. The local administration contested the project for the Valloja area, citing concerns about its proximity to the nearby settlement.

[205] Colenghi, *Ipotesi per un progetto di riqualificazione.*

To address these issues, the Nobel company requested urgent public utility declarations, allowing the Prefect of Turin to issue emergency occupation decrees and subsequent forced expropriation. This was crucial for the timely execution of the new factory. Despite some opposition and bureaucratic hurdles, the expansions were eventually approved. However, due to ongoing disputes and logistical considerations, the Nobel company decided to abandon the expansion project near Valloja.

In response to concerns about the impact on public safety, medical and engineering experts were consulted, ultimately affirming the project's feasibility. The report provided by the engineer Ugo Ganna emphasized that the expansion would not pose a threat to public health or safety. The facility reached its peak development, and several new departments were added.[206]

As with previous expansions, a prefectural decree on April 6, 1916, authorized the emergency occupation of the Biancor territory. Shortly thereafter, engineer Ganna was once again tasked with conducting the necessary surveys. In June, he delivered a detailed report on the state and valuation of the buildings slated for urgent occupation by the Dynamite Nobel company for the construction of a new nitrocellulose production department in the Avigliana municipality. The report described the existing structures and the surrounding areas in great detail.[207]

Given the favourable conditions, on November 1, 1916, the Nobel Company revisited the issue of the canal derived from the Dora River to increase the driving force. They wrote directly to the Minister of War, informing him that immediate occupation of the canal area and commencement of the works were urgently needed. Shortly after, on November 20, 1916, the Ministry of War, Division General Military Engineering, approved the aforementioned emergency occupation of the canal area and the canal was constructed.[208]

After the conclusion of the significant military contracts during the Great War, the dynamite factory faced economically challenging times as the demand for military orders dwindled. The generous benefits and privileges that several major Italian industries had enjoyed during the global conflict were no longer available. The Nobel leadership sought new avenues to prevent the closure of the Valsusa facility. Recognizing that cellulose had potential beyond explosives, they ventured into producing pigmented paints based on cellulose. They signed a significant agreement with the American paint giant Du Pont for exclusive sales rights in Italy. In 1920, they experimented with producing artificial silk. Cellulose was dissolved in ether, and the resulting compound could be spun into thread. However, due to fierce competition from the Gualino family's Snia Viscosa in this sector, the endeavour did not progress beyond experimentation.

[206] Delpiano, *Viaggio intorno alla Dinamite Nobel,* 155.
[207] Ibidem, 156.
[208] Ibidem, 158.

Guido Donegani's Montecatini company gradually acquired the majority of shares of the Società Anonima Dinamite Nobel by 1925. Consequently, the latter became part of Montecatini's corporate structure while retaining its formal identity. Thus, until the dynamite factory's closure in November 1965, the Società Anonima Dinamite Nobel followed the fortunes of Italy's largest chemical industry in the first and second post-war periods.

Economically, a recession began in 1927 due to export collapses and a drop in domestic demand, exacerbated by the 1929 financial crisis.

Under the regime's autarkic policy, the Dinamitificio shifted to producing a new explosive, T4 or Exogene, which had been known since the late 19th century but never produced industrially. The main ingredient was urotropine, produced by reacting ammonia with formaldehyde. The T4 explosive was manufactured using accessible raw materials such as methyl alcohol and ammonia, provided by Montecatini's Merano and Novara facilities.

With T4 production, the possibility of moving Nobel's production from Avigliana to Carmignano, due to the 1929 international economic crisis, was averted. The T4 expansion ensured local employment, reaching 3,625 employees by 1945 due to increased demand during World War II.

To enhance production efficiency due to the substantial need for heat, a coal-powered thermoelectric power plant was constructed in the newly designated zone.

Figure 51: Thermoelectric power plan, the state of abandonment.[209]

At the end of the war years, on April 14, 1945, the Allemandi factory was destroyed by Allied air force and never rebuilt.

7.2.3. The recent past

After World War II, the Avigliana plant faced economic challenges, while the Carmignano facility was closed. The Valloja plant, under the direction of Leonildo Carrà, resumed dynamite production and materials for warfare after careful restructuring. The paint factory was reopened, and notable chemist Primo Levi was hired to address paint solidification issues.

During this time, the Avigliana plant evolved into a more modern industrial complex and underwent significant architectural transformations to enhance worker safety. Unlike the initial structures, which were

[209] Colenghi, *Ipotesi per un progetto di riqualificazione.*

predominantly constructed from wood, the other buildings in this zone were tailored to meet the wartime requirements of that era. Reinforced concrete became the primary construction material, addressing functional and architectural concerns. Narrow galleries with horseshoe-shaped sections connected various departments, and specially located bends diverted blast waves from potential explosions.

Figure 52: Horseshoe-shaped narrow galleries.[210]

In order to safeguard workers in close proximity to potential accident sites, various measures were implemented. This included the installation of barriers to mitigate the impact of shock waves, as well as walls against which they could dissipate. Ventilation chimneys were strategically placed to allow vertical wave dispersion. The "Swedish mixers" chamber, heavily fortified with thick concrete and earth, housed remotely operated mixing equipment monitored by operators.

In the 1950s, Dinamite Nobel came directly under Montecatini's control after. Despite efforts to recover losses from the costly Orbetello and Avigliana facilities, serious plans for closure were initiated.

A fatal explosion on November 14, 1961, raised concerns about factory safety and the costs of necessary renovation. Montecatini deemed these expenses excessive. Extensive discussions between local administration and the company's management spanned from 1961 to 1965. This ultimately paved the way for the definitive closure of the Avigliana facility by the end of 1965 and the subsequent transfer of production to Orbetello. On November 22, 1965, Director Carrà sent a telegram announcing the cessation of activities.[211]

Following the closure, the area was gradually sold off.

In contrast to other late nineteenth-century production facilities, there was never an establishment of a workers' village here. Even during its most prosperous period (1915-1920), only 50 administrative, technical, and accounting staff out of the total workforce occasionally lived in a

[210] Delpiano, *Viaggio intorno alla Dinamite Nobel,* 123.

[211] Ibidem, 234.

guesthouse, mostly of Franco-German origin.

The only families residing on the premises were those of the Director, Deputy Director, and guardians, who lived in individual villas. Given the nature of the Dynamite Factory's operations, every entrance was strictly controlled and regulated.

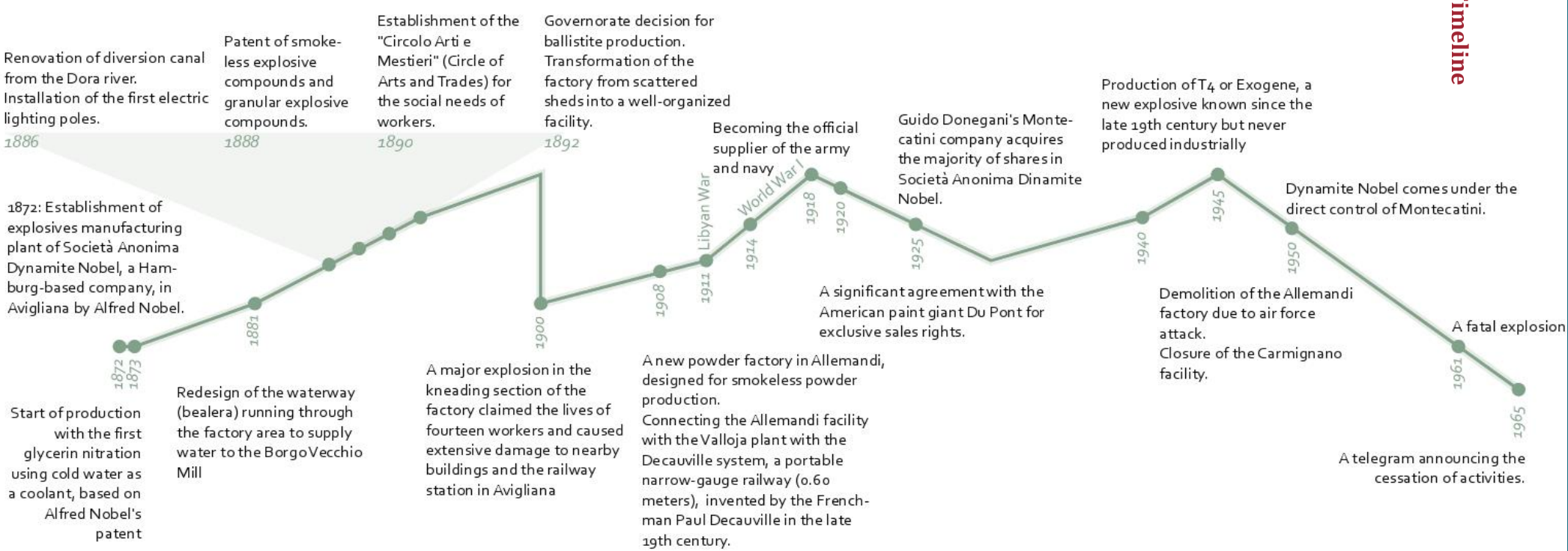
Workers continued to reside in their places of origin, primarily in Avigliana, Buttigliera, and Sant'Ambrogio.

This was primarily due to the close connection between the plant's production and wartime demands. During such periods, there was a surge in the need for labour, but a decrease in demand during non-war times.

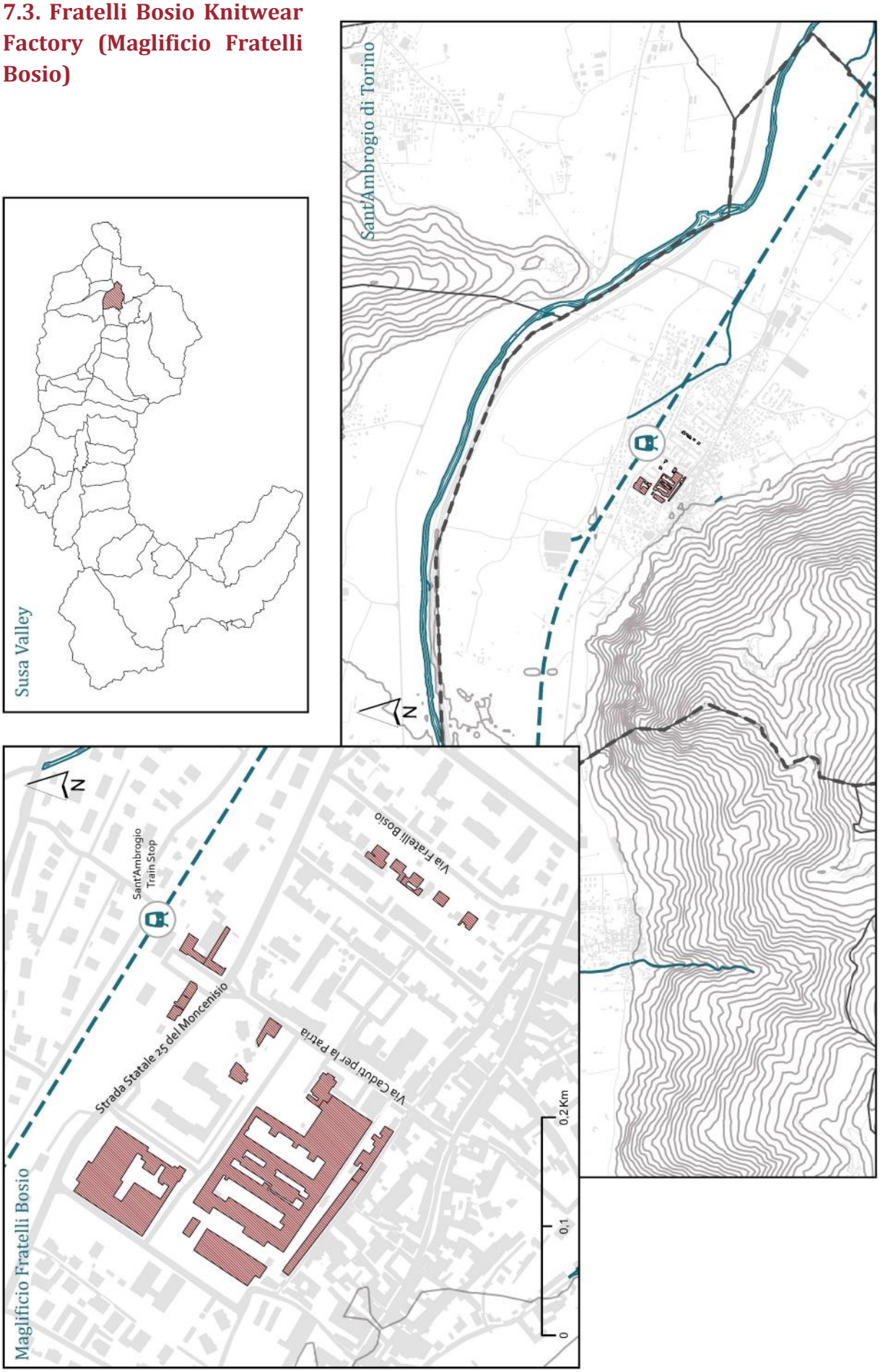
Despite the challenges and controversies, the Dinamitificio Nobel remained an important and innovative industrial establishment. Its contributions to explosives production and its dedication to worker welfare solidified its place as a key player in the region's economic and social landscape.

Today, the legacy of the Dinamitificio Nobel lives on, both in Avigliana's history and in the broader context of explosives production and industrial progress. The site has become a historical landmark, offering insights into the advancements in industrial technology and the complexities of managing a high-risk production process. It stands as a testament to the delicate balance between progress and responsibility, highlighting the importance of safety measures in industrial operations.

7.2.4. Historical Timeline



7.3. Fratelli Bosio Knitwear Factory (Maglificio Fratelli Bosio)



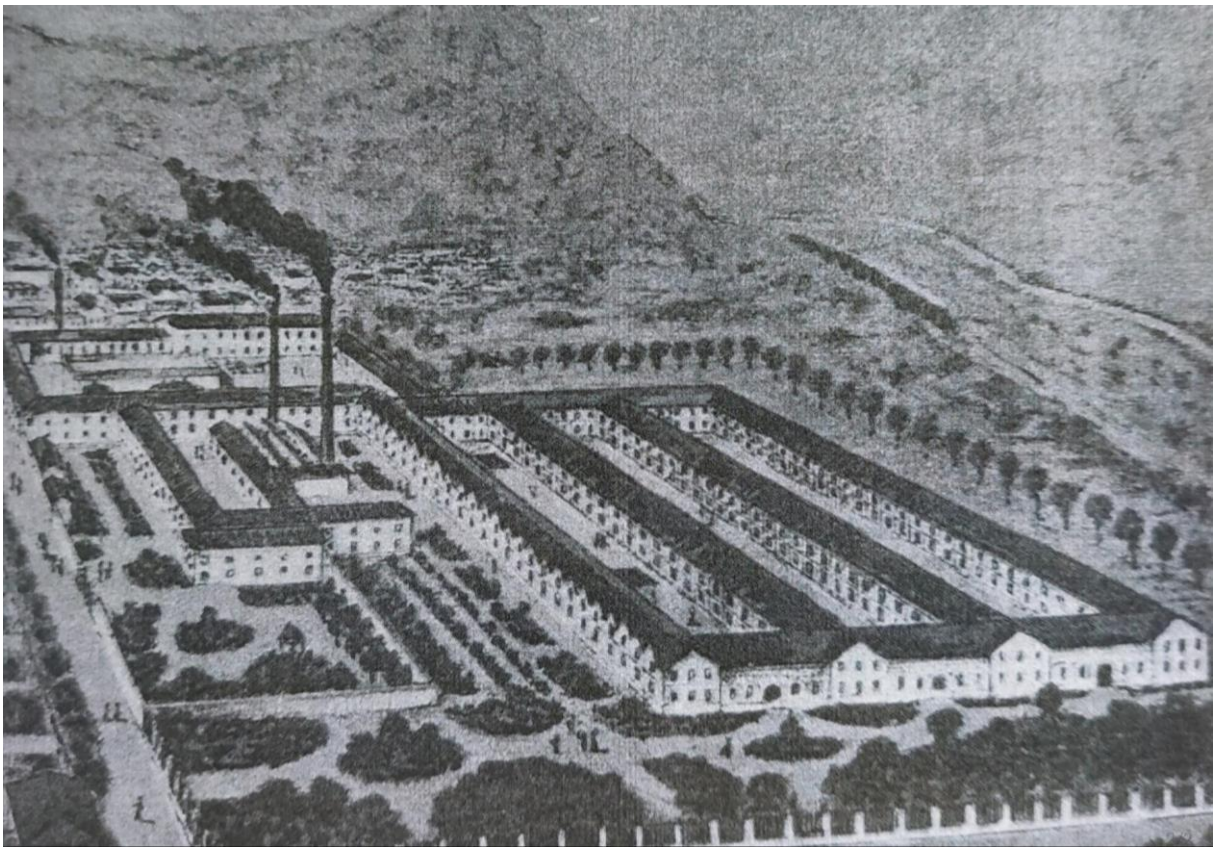


Figure 53: Bird's eye view of the Fratelli Bosio cotton mill[212].

Figure 54: View of the two main fronts.[213]

[212] Francesca Lopetuso, "L'ex Cotonificio Fratelli Bosio di Sant'Ambrogio di Torino : conoscenza, restauro,valorizzazione" (master's thesis, Polytechnic University of Turin, 2005).

[213] Antonio De Rossi, *La trasformazione del territorio alpino e la costruzione dello Stato: il secolo XIX e la contemporaneità in Valle di Susa* (S.I: Centro culturale diocesano, 2011).

Figure 55: Overall view of the eastern facade.[214]

7.3.1. Foundation and growth

The Bosio brothers established their presence near the medieval walls, utilizing the Cantarana canal to generate hydraulic power. Even today, the grand complex and its structure serve as a testament to its significance a century ago. This quadrilateral enclosure, encompassing an expanse of 10,000 square meters, marked the initial developed area adjacent to the train station exit, established in 1871 by Pietro and Augusto Bosio.

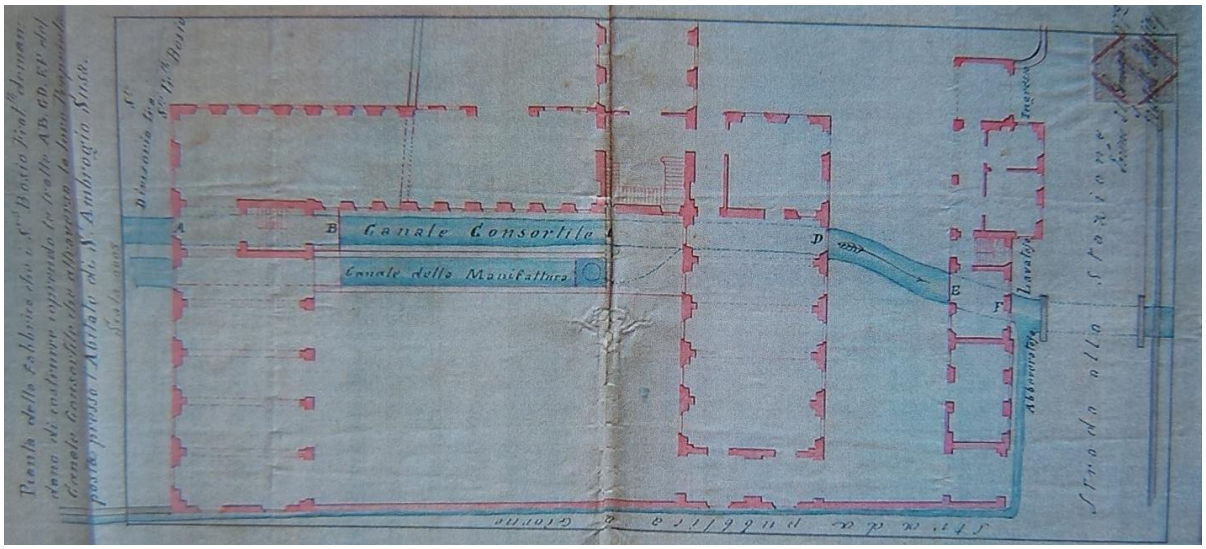


Figure 56: The first (unrealized) project of the manufacturing premises, with indications of the portions of bealera to be covered.[215]

[214] Lopetuso, *L'ex Cotonificio Fratelli Bosio.*
[215] Ibidem.

Figure 57: Southern elevation on the Cantarana bealera.[216]

The initial core of the Bosio cotton mill is recorded in a drawing from January 31, 1872. Subsequently, on February 11, 1872, the Bosio Brothers were granted authorization to utilize the Bealera for their forthcoming establishment. The production process commenced in 1872 with a workforce of sixty individuals.

The expansion of production at the plant was primarily driven by the utilization of cutting-edge machinery. As early as 1874, two hydraulic motors were in operation. Furthermore, the machinery, particularly the frames, were among the most advanced for that era, enabling a continuous growth and heightened processing speed. All the necessary equipment for processing was manufactured in-house. This encompassed various departments such as maintenance, printing, dyeing, and even a section dedicated to crafting the boxes essential for product shipment. Additionally, there was a specialized unit for frames, uniquely designed and patented by Alessandro Neveux. The only exception was the administrative management, which was headquartered not in Sant'Ambrogio but in Turin, at 26 Corso Siccardi.

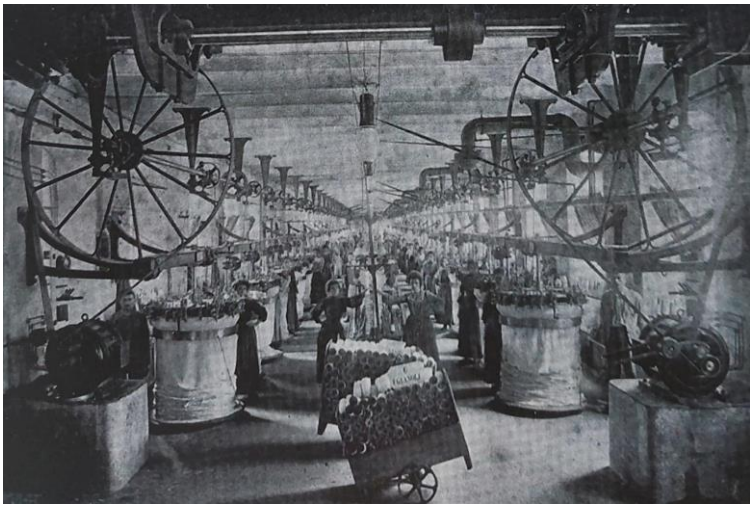


Figure 58: Spinning room.[217]

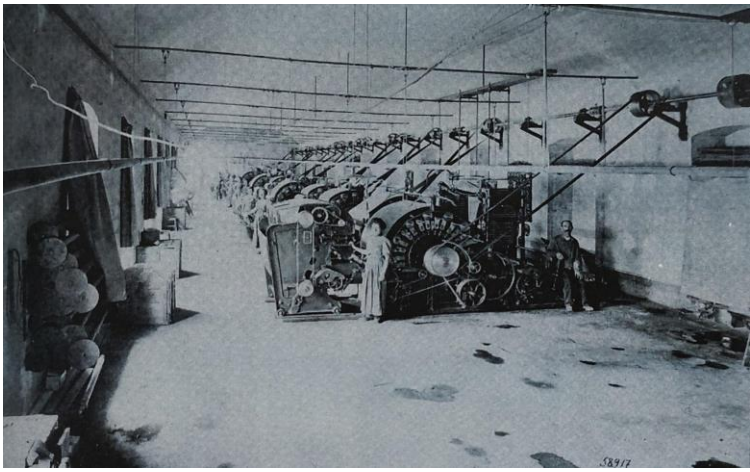


Figure 59: The spinning department, located on the second floor above ground.[218]

[216] Ibidem.

[217] Ibidem.

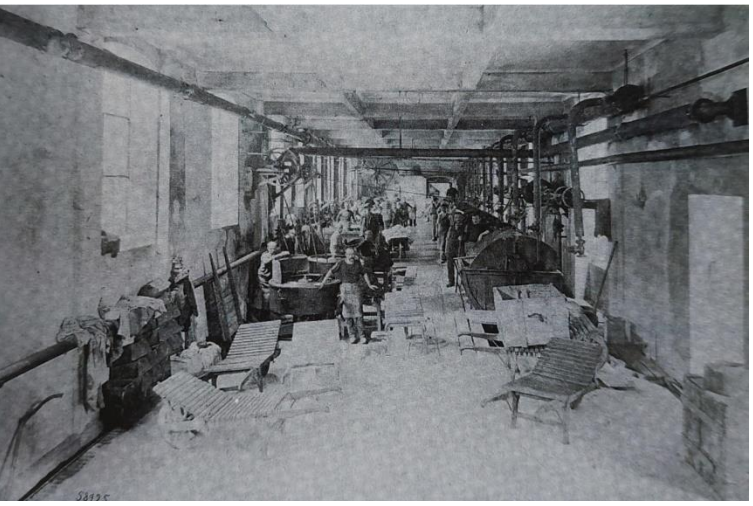


Figure 60: Washing department, located on the ground floor, in the sleeve bordering the Cantarana basin, for easier use of water.[219]

The production process encompassed a full cycle: starting from the arrival of cotton on trucks, it went through the stages of fibre spinning, followed by either weaving into knitwear or the creation of sewing threads. At one point, the facility also manufactured curtains for soldiers. Payment was determined based on the department, with some employees receiving compensation on a piecework basis, while others were paid per day. In 1889, the workforce consisted of 700 individuals, with 550 women and 150 men. They operated 130 mechanical looms and 20 manual ones, along with 2 steam boilers, 2 steam engines, and two plumbers, totalling 125 horsepower. The daily production amounted to 1500 kilograms of cotton sweaters, with half of them being exported. Three years later, the workforce increased to 720 employees, including 150 operating mechanical frames, as well as manual frames. Additionally, the company employed home workers. By 1896, in just seven years, the workforce expanded to 1000 individuals, and the engine strength was boosted to 300 horsepower with steam power. This allowed for the production of 1300 to 1500 dozen articles per day.[220]

In a brief span of time, the establishment outperformed its competition, largely due to the astute development strategies implemented by its director. This effort garnered multiple accolades. At the Turin exhibition in 1884, the Manufacturing Plant received two gold medals, one for its fabrics and another for advancements in knitting machine production. Additionally, a certificate of merit was awarded, along with a gold medal presented to director Alessandro Neveux, who held this position from 1872 to 1905. A bust in his honor now graces the public gardens of Via Caduti per la Patria. Furthermore, two more medals were conferred, a bronze one and a silver one, recognizing the contributions of his mechanic, Alessio Marengo. The presence of the factory held paramount importance for the town of Sant Ambrogio. This significance was underscored when the Bosio brothers were granted honorary citizenship on September 15, 1891, a gesture by the Municipality to acknowledge the substantial contributions made by these industrialists. Similarly, Alessandro Neveux received the same honor in 1895.

[218] Ibidem.
[219] Ibidem.

[220] Vanessa Attieh and Joe Algemayel, "Knowledge, reuse and enhancement of an industrial building: The former Cotonificio Fratelli Bosio in Sant'Ambrogio di Torino" (master's thesis, Polytechnic University of Turin, 2019), 89.

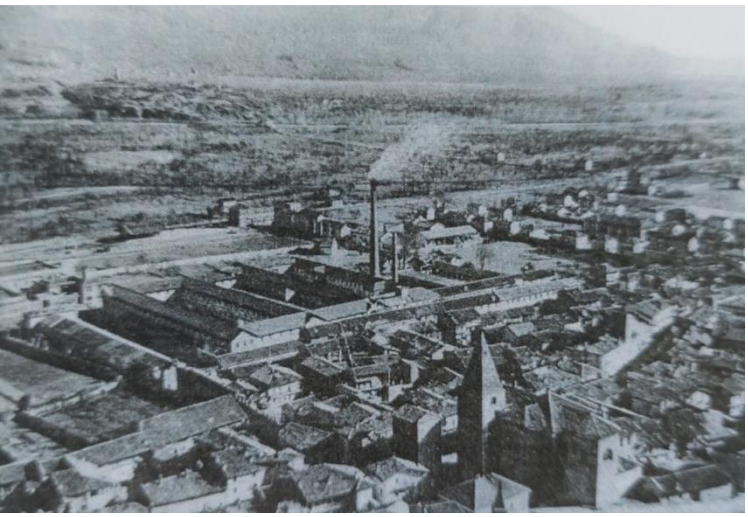


Figure 61: Aerial view of the city in a photograph from the first decades of the twentieth century. Note the size of the factory in relation to the urban context and the village of workers' houses to the east of the factory.[221]

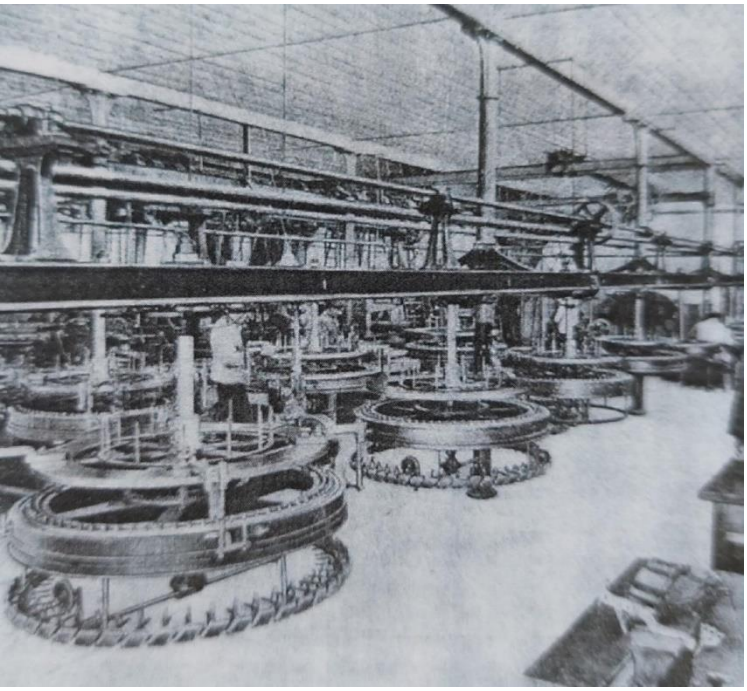


Figure 62: The mechanical department located in the building built in 1924.[222]

By approximately 1905, the knitwear company had a workforce of nearly 1400 employees, producing 5 million knitwear items annually, including bodices, shirts, swimsuits, socks, and more. The plant's expansion brought about significant changes in the town's urban layout. The original facility, located near the Cantarana canal, extended towards the railway, occupying an area of over four hectares encompassing present-day Via Neveux, Via Antiche Mura, Via I Maggio, and Corso Moncenisio. Additionally, in 1893, workers' residences were established, forming a new village. Its main thoroughfare was named after the Bosio Brothers on May 3rd, 1894. These homes belonged to department heads of the plant and, to this day, are primarily owned by their descendants. Moreover, adjacent to Via della Stazione, the residence of the plant's director Alessandro Neveux was constructed. This location is now recognized as the municipality of Sant'Ambrogio Di Torino.[223]

Figure 63: The villa of the director of the factory, Alessandro Neveux. Today the building is home to the Municipality of Sant'Ambrogio.[224]

[221] Lopetuso, *L'ex Cotonificio Fratelli Bosio.*
[222] Ibidem.
[223] Attieh and Algemayel, *Knowledge, reuse and enhancemen,* 90.
[224] Ibidem.

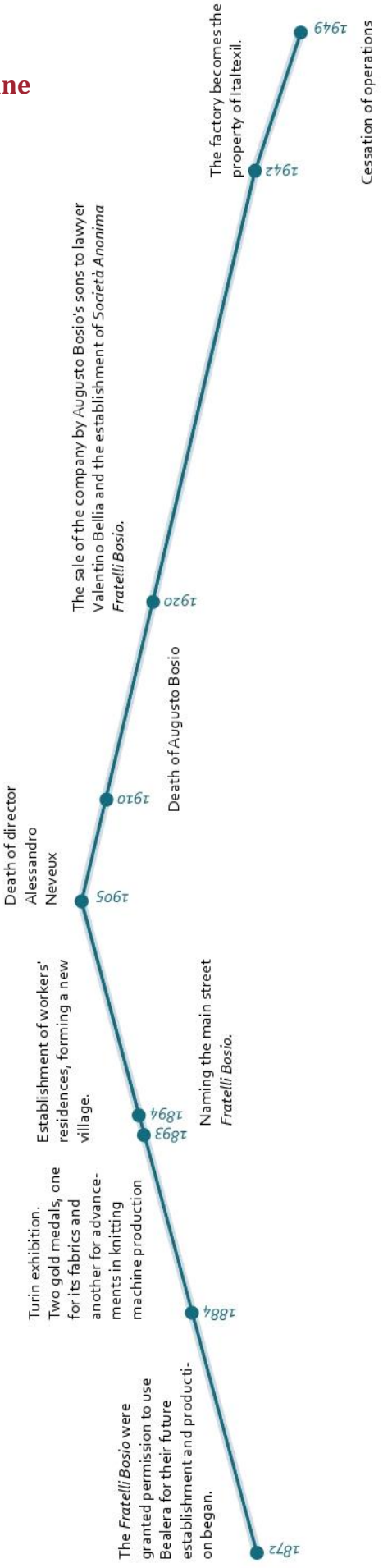
7.3.2. Decline and closure

The decline in production commenced with the passing of the director Alessandro Neveux in 1905, followed by the demise of Augusto Bosio in 1910. Subsequently, the factory entered a period of turmoil that would persist until its ultimate closure.

Fortunato, the son of Alessandro Neveux, assumed leadership after his father's passing, at least until 1920. Furthermore, ownership of the factory transferred to Vittorio and Alberto, the sons of Augusto Bosio.

However, between 1915 and 1920, the mechanical machinery operated at 350 horsepower, which then dropped to 225 during the First World War, impacting both working hours and the workforce. In 1915, there were 979 workers, reducing to 813 in 1920. During that same year, the sons of Augusto Bosio sold the company to lawyer Valentino Bellia, forming the *Società Anonima Fratelli Bosio.* In 1942, the factory came under the ownership of Italtexil and was subsequently compelled to cease operations in 1949, owing to internal disputes among employees and numerous incidents of knitwear theft within the company. In the 1960s, the process of dismantling various interiors of the old Bosio factory commenced. Additionally, the Municipality acquired the Neveux villa to relocate its offices.

7.3.3. Historical Timeline



7.4. Moncenisio Workshops (Officine Moncenisio - Anonima Bauchiero)

Figure 64: External representation of the plant (1910)[225]

Figure 65: Main facade with the entrance and offices (post-war period).[226]

7.4.1. Foundation and early years

Fortunato Bauchiero established a partnership that later transformed into an "*accomandita*" called "*Bauchiero Fortunato & C.*" This firm was primarily engaged in supplying civilian, military, and railway materials. It had its headquarters on Strada Circonvallazione 518 in Turin, featuring expansive laboratories dedicated to producing

[225] Jannon and Sarti, *La Monce,* 138.
[226] Ibidem, 28.

textiles and trimmings, especially for railway carriages. The operations also encompassed the tailoring of uniforms, leatherwork, foundry work, and lamp making.

With the prospects of significant opportunities in the railway rolling stock sector, given the government's assumption of control over the railways, Bauchiero boldly decided to orient production in that direction. He initiated the development of blueprints for the new mechanical facility in Condove, situated about 32 kilometres from Turin.

The decision to choose Condove as the site for their venture was underpinned by its strategic advantages, including its proximity to a railway station, the presence of the Gravio water stream with significant hydraulic potential for generating electricity, being one of the few towns in the valley without industries, and its densely populated mountain area lacked work opportunities beyond agriculture, therefore being a place where numerous unemployed or underemployed individuals lived, representing the possibility of abundant and low-cost labour.

These factors made Condove the optimal location to kick-start the operation of a new industrial establishment.

Bauchiero and his partners faced an array of challenges, ranging from bureaucratic hurdles and administrative complexities to economic difficulties. On the other hand, Bauchiero had several strong arguments to persuade the administration. He highlighted the economic hardship faced by many families, forcing them to migrate in search of better living conditions. Bauchiero envisioned a collective effort that would employ hundreds of workers, both men and women, young and old, and provide them with training not only in handicrafts but also in modern and diverse crafts.

Bauchiero sought permission to build various industrial branches including textiles, metalworking, and vehicle production. The firm indicated willingness to shoulder the expenses, in addition to their commitment to constructing a railway connection and a "special" bridge over the Dora river. The municipal administration's primary task was to convince landowners to sell their plots for the sake of the "undeniable general utility" that the industrial initiative promised.

Remarkably, the Condove municipality went beyond expectations. On February 21, 1905, the town council approved a subsidy of 60,000 lire, distributed in twelve annual instalments of 5,000 lire each, interest-free. For that year, they also waived all municipal taxes.[227]

In addition to the initial challenges, the industrial venture faced opposition due to concerns about local employment and financial risks, but construction continued and "Societa

[227] Giorgio Jannon and Emanuela Sarti. *La Monce: dai vagoni all'acciaio: storia di una fabbrica piemontese del'900 da Fortunato Bauchiero a Luigi Lucchini* (Condove: Editrice Morra, n.d), 29.

Anonima Bauchiero" was founded as a joint-stock company, which would later change to "Officine Moncenisio".

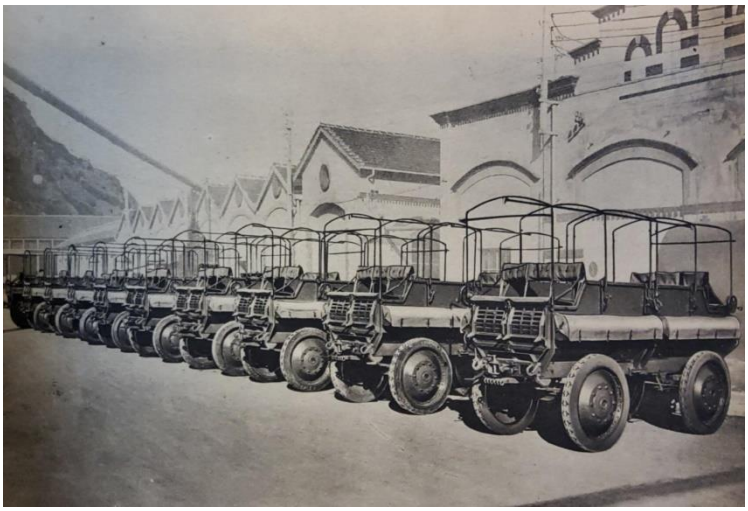


Figure 66: An external view from the factory.)[228]

Once the new Società Anonima Bauchiero was established, the pre-existing plans from the now-dissolved "Accomandita Bauchiero Fortunato & C." were put into action. In a short span, the Condove facility was completed. It included a mechanical workshop for producing and processing all railway carriage components, forges, a sawmill section, a wood drying plant, carpentry sections, assembly and painting departments, and administrative offices.

The land on which the factory was built in 1905 belonged to small local landowners who reluctantly ceded the fertile plots to Bauchiero in exchange for guaranteed employment under his wing. The initial land area covered 100,000 square meters, with 80,000 square meters of it under shelter. They could be divided into two major sectors: the production workshops and the construction and assembly workshops. The former featured a forging section equipped with coal and oil-fired furnaces, steam and atmospheric hammers, "berte" batteries, hydraulic and friction presses. In the first fiscal year, approximately 800 workers were employed.[229]

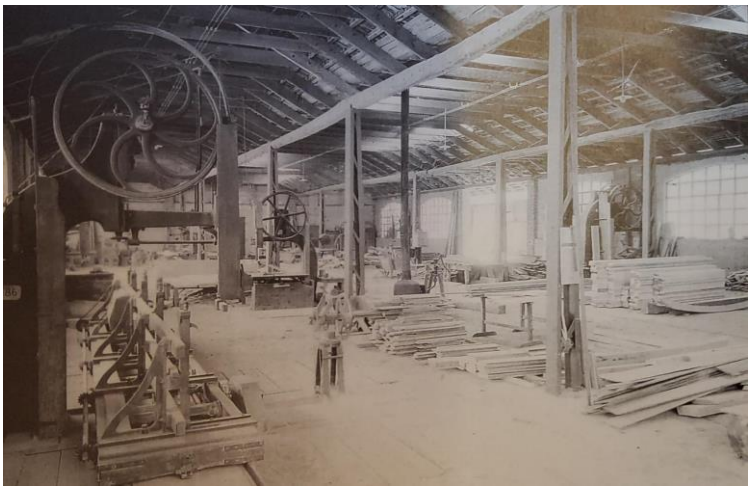


Figure 67: Sawmill department.[230]

Figure 68: Profile and laminated warehouse and carpentry department[231]

[228] Anonima Bauchiero, *Officine Moncenisio, già Anonima Bauchiero, Torino: Stabilimenti Torino e Condove* (Torino: Bona, n.d).

[229] *Cinquantenario della Società Officine Moncenisio* (Torino: Soc. Officine Moncenisio, 1956), 19.

[230] Jannon and Sarti, *La Monce,* 36.

[231] Anonima Bauchiero, *Officine Moncenisio.*

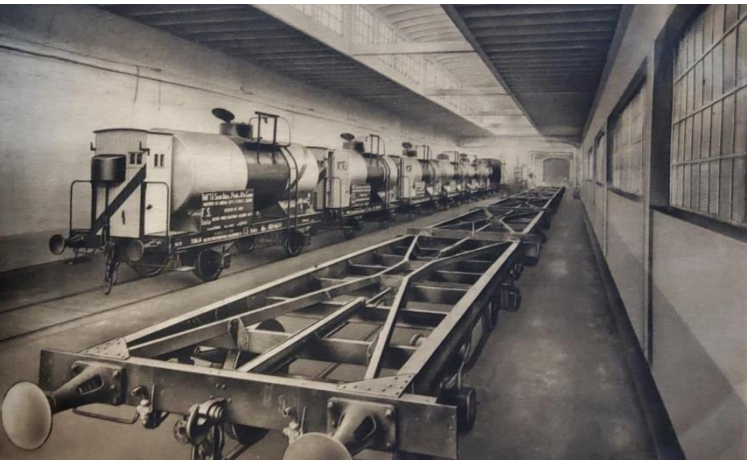


Figure 69: One of the assembly departments of the Condove plant. Tank truck frames for naphtha transport.[232]

Figure 70: Construction phase inside the department.[233]

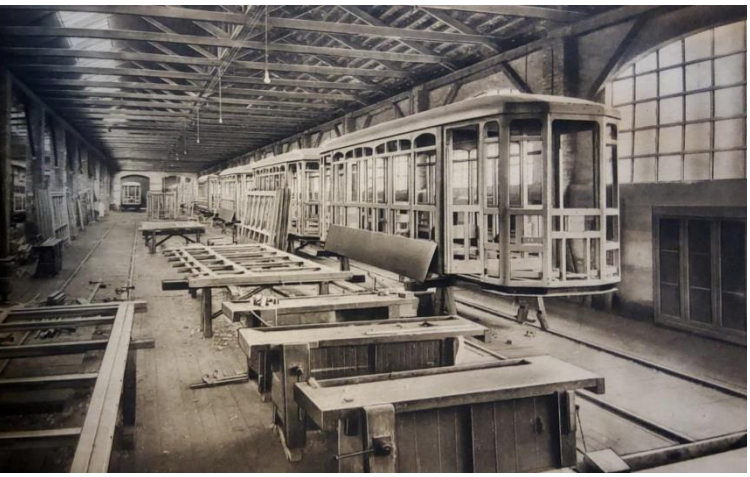


Figure 71: One of the vehicle construction departments of the condove plant. Crates for tram carriages.[234]

[232] Ibidem.
[233] Jannon and Sarti, *La Monce.*

To meet the increased demand for products, a small power plant was constructed, capable of producing 500 KWh, later upgraded to 1200 KWh, using the waters of the Gravio stream. This power plant was built by Cavalier Bauchiero, and it catalysed the rapid industrialization of Italy. Condove began to evolve around this newfound source of energy, becoming a centre of attraction for a diverse range of workers - from labourers and carpenters to accountants and blacksmiths - drawn from the entire lower valley, spanning from S.Ambrogio to Bussoleno. The years between 1901 and 1911 witnessed a remarkable surge in population, growing from 1,266 to 2,521 residents.[235]

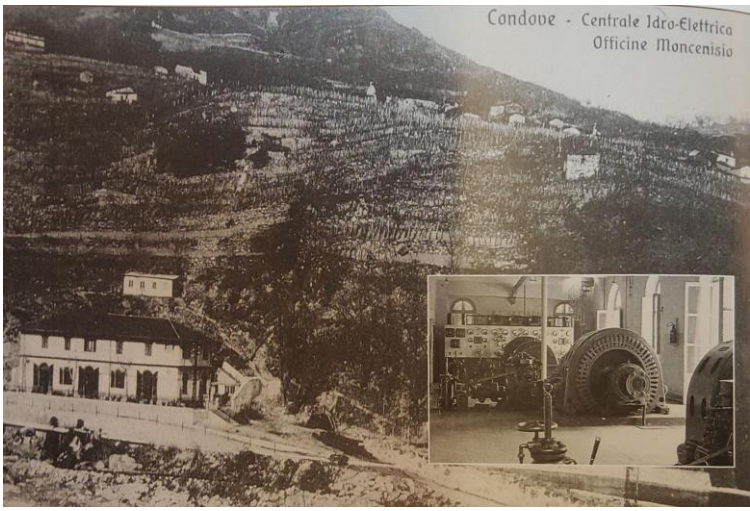


Figure 72: The hydroelectric plant on the Gravio torrent.[236]

As the dawn of the 20th century progressed, some mountain dwellers left behind traditional mountain homes and pastures, adapting their lives to the rhythms of the factory and residing in the "Ca' neire," or the six large public

[234] Anonima Bauchiero, *Officine Moncenisio.*
[235] Jannon and Sarti, *La Monce,* 84.
[236] Ibidem, 84.

apartment buildings featuring a total of 384 rooms. These structures, designed along English lines, included shared amenities such as external bathrooms for every two families, communal washing areas, and free lighting and water supplied for twelve hours daily by the Gravio power plant.[237]

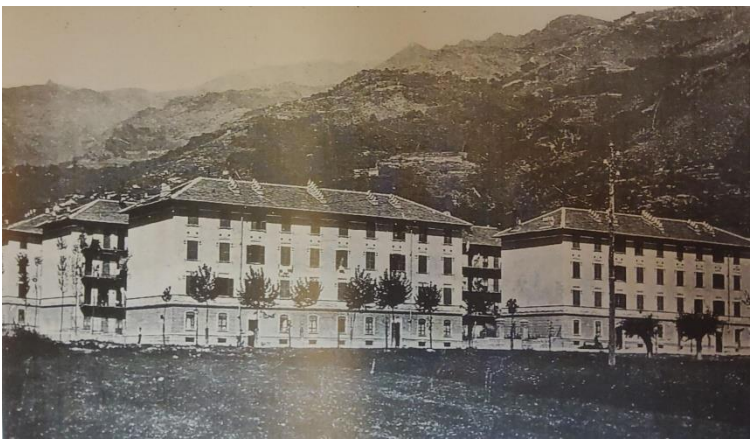


Figure 73: The Workers' Houses in a photo taken between the two wars. 180 families lived in the six large buildings, inaugurated in 1910.[238]

The advent of consistent electricity not only brightened the town but also powered the local cinema, which had previously struggled intermittently due to energy shortages. Close to the public housing, public baths were established, providing hot water and towels for a small fee, alongside accommodations for workers. Soon after, a Cooperative Consumer Store, known as the *"spaccio alimentare"* was established, acting as a price regulator for both workers' families and the general population.

Further infrastructural developments included a concrete bridge constructed by the company across the Dora River, allowing carriages to directly access the railway line to Turin. This railway connection was soon complemented by a train service facilitating the commute of workers to and from the station.

Figure 74: The connection between the plant and the Condove Chiusa di San Michele railway station. Visible, in the distance, the small engine used to transport the wagons and personnel.[239]

In the meantime, the company expanded its production to include leather processing, uniform tailoring, and the manufacture of leather goods. These leather products were intended for both the military and civilians, much like the uniforms. With the outbreak of World War I, the factory underwent the typical evolution of production in a warring nation: the focus shifted to military demand, which involved producing projectiles of various sizes, gun carriages, logistics equipment, and airplane components. New buildings were constructed to expand the mechanical workshop area.

[237] Ibidem, 84.
[238] Ibidem, 83.
[239] Ibidem.

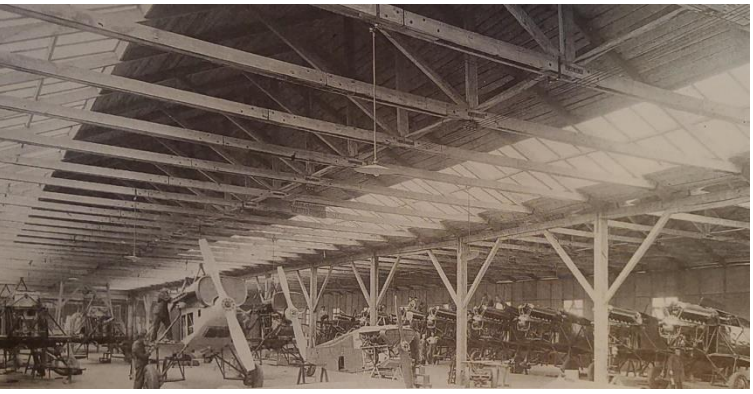


Figure 75: Aircraft assembly department.[240]

Figure 76: Interior of the aviation department (wings section). Rib deposit.[241]

Figure 77: The projectile production department.[242]

[240] Ibidem, 36.
[241] Ibidem, 36.
[242] Ibidem.

7.4.2. Between the two World Wars

With the acquisition of the *Società Industriale Stabilimenti Farina* of Turin on September 27, 1918, the company changed its name to *"Officine Moncenisio - Stabilimenti Riuniti Già Bauchiero Farina,"* which was subsequently shortened to the present *"Officine Moncenisio già Anonima Bauchiero"* in the following year.

In 1918, with the war's end, the factory, like many others in Italy, faced a severe crisis. Reconversion (returning to non-military production) was difficult due to the devaluation of the lira. Despite returning to the production of railway materials, the factory no longer found this activity profitable. Lack of funds had caused State Railways to reduce orders, and many small metalworking and carpentry industries, born during the wartime boom, adopted highly competitive pricing to stay afloat.

To address the challenges, the Monce company, the entity behind the Condove factory, underwent change. In around 1919, Senator Giorgio Enrico Falck and Grand Official Lodovico Goisis joined the board. With a new direction and organization, the company was able to overcome the crisis of 1926, largely thanks to the efforts of these two men.

From 1926 onward, Officine Moncenisio continued to consolidate its position through a continuous string of successes. The company undertook improvements and constructed new facilities in the Condove plant. These endeavours aimed to streamline

operations and reduce costs while renewing machinery.

In addition to its traditional railway rolling stock production, the company diversified into other sectors, including land transportation vehicles, wagon transporters, standard and special trailers, subaquatic weapons for the Navy, various devices, small and medium-caliber projectiles, hardware, and spare parts for railway and automotive vehicles. The company's portfolio expanded with the passing years.

Figure 78: Warehouse of iron works (years between the two wars).[243]

During the 1920s and 1930s, the former rural centre of Condove, took all the necessary steps to evolve into a small town. It's during this time that the unbreakable bond between the factory and the town solidifies.

In Piazza Vittorio Emanuele, which is intended to become a spacious gathering place during the Fascist period, the San Rocco chapel disappears first, followed by the removal of the old 18th-century arcades that used to host the fabric market. The old school is transformed into the town hall featuring a clock tower. Additionally, a new school building and a Carabinieri barracks are constructed, the cemetery is relocated, a medical centre and recreational facility are established, and plans are made for a summer camp for children.

Following the Workers' Housing, between 1937 and 1939, it's time for the Mussolini Village, a residential area for employees designed by Cesare Piazza. This village comprises twenty small houses with gardens and vegetable plots, each containing two separate apartments with independent entrances, bathrooms, and even garages.[244]

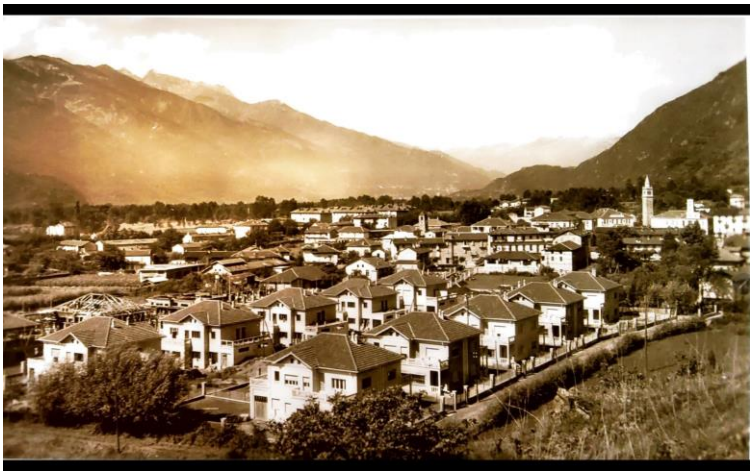


Figure 79: Mussolini Village.[245]

The conflict erupts on June 10, 1940. That very night, shortly after midnight, Condove experiences its first air raid alarm, leaving people uncertain about where to seek shelter.

During these years, Moncenisio relocated its Turin offices to Condove

[243] Ibidem, 52.

[244] Ibidem, 92.

[245] De Rossi, *La trasformazione del territorio.*

and heavily reorients towards wartime production. This involved the manufacture of projectiles and assembly lines for aircraft and marine engines. After a dip in employment, hiring picked up again, reaching 1,300 employees, and the factory expanded to cover 170,000 square meters. An air raid shelter is constructed on Via Conte Verde, equipped with lighting and seats. It's accessible to both employees through direct exits and the general population.[246]

There was another construction site of the canteen, scheduled for completion in 1941. This large building, situated just in front of the factory entrance, features a ground-floor warehouse for bicycles and a spacious cafeteria on the first floor with seating for 400 people. For a nominal sum, individuals can receive soup or eat their own meals brought from home.

Figure 80: The workers' refectory, completed in 1941: on the ground floor in the large space, the employees' bicycles were sheltered.[247]

[246] Jannon and Sarti, *La Monce,* 94.
[247] Ibidem, 90.

Figure 81: The dining hall of the refectory which could accommodate four hundred people.[248]

7.4.3. The recent past

After World War II, Officine Moncenisio emerged relatively unscathed, with only minor damage to its electrical transformation station due to aerial bombings on March 2 and 3, 1945. Furthermore, the company managed to maintain a strong economic and financial position. This initially seemed promising, as the production of railway rolling stock appeared to have ample development prospects, both domestically and internationally.

While waiting to resume production, a significant number of unemployed workers were made available to the Municipality to clear debris and war remnants and carry out restoration work on schools, the municipal building, the kindergarten, the former recreational facility, and the Carabinieri barracks. Organized into teams, the workers cleaned streets and squares to restore circulation, and collected bricks taken by the Germans

[248] Ibidem, 90.

from storage for the construction of the new parish church. The company distributed clothes and sheets left in storage by the Americans to needy families, and the canteen provided soup to the most disadvantaged households.

The company secured substantial orders from Italian State Railways and even a significant supply contract for carriages for post-war Germany, known as the "Bizona." However, this optimism was short-lived as the post-war years presented the unavoidable challenge of reorientation and the search for new avenues of activity.

To tackle this challenge, Officine Moncenisio leveraged its precise mechanical capabilities and the existence of a well-endowed research office within the plant. Beginning in 1947, they dedicated themselves to researching and developing cylindrical knitting machines for socks. These studies and related experiments spanned several years and culminated in the debut of the first Derby sock machine at the Mechanical Exhibition (*Mostra della Meccanica)* in Turin in the autumn of 1950. This revolutionary machine, characterized by its novelty, remarkable precision, and exceptional efficiency, garnered admiration from both Italian and foreign technical experts.[249]

Subsequently, the machine underwent further refinements and made its appearance at the Milan Fair in April 1951, where it achieved resounding success, building upon its previous accolades. The research and development efforts continued, yielding new types of sock machines. The "Tricolor" machine, featuring triple wire feed, was unveiled at the International Textile Exhibition in Brussels in June 1955, marking a ground-breaking international innovation in the field.[250]

However, the new production faced challenges, revealing the workshop's limitations. The factory struggled to utilize its production means, lacked a proper commercial network, and couldn't control the new market effectively.

Amidst this, in 1950, a hundred workers were laid off. By 1955, there were 1,200 employees. In 1956, fifty years after its founding, the factory covered an area of 146,561 square meters and included various sections such as vehicles, precision mechanics, stocking machines, large-capacity road transport, underwater weapons for the Italian Navy, small and medium calibre projectiles, hardware, and railway vehicle and automotive spare parts.[251]

The construction expansion resumed in the early 1950. Private individuals were building homes, and Moncenisio was also resuming efforts to accommodate its employees. The company purchased land that was once occupied by barracks and offered it for free to construct houses. This initiative was known as the *Ina-Case* plan. Four buildings, comprising a total of 16 apartments with five rooms each, were

[249] Ludovici, *L'industria pensante,* 104.

[250] Jannon and Sarti, *La Monce,* 102.

[251] Ibidem, 142.

constructed, complete with design and technical support.[252]

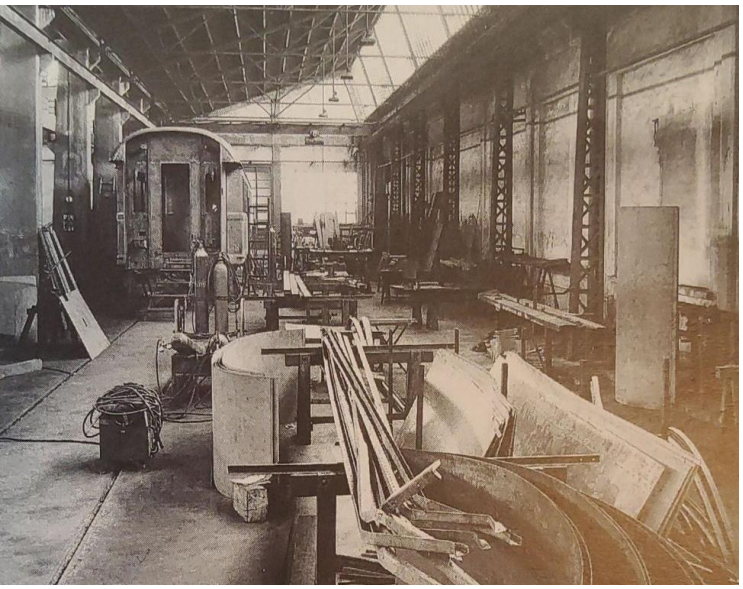


Figure 82: Interior of the railway carriage assembly department, 1955.[253]

Further housing developments occurred subsequently, leading to a total of 43 buildings and 760 rooms as part of the company's assets, not counting ownership of the medical centre, cinema, and canteen. Several employees built their own houses on Moncenisio land, and practically all of them, by the late 1960s, when the industrial crisis prompted the company to sell properties, managed to redeem their homes.[254]

Between 1961 and 1962, the company faced a crisis and explored new avenues for production, such as heavy road transport vehicles and cranes. Despite this, the production of stocking machines continued, while railway material production was abandoned due to diminishing profitability. In 1962, the turnover for stocking machine production decreased, and in 1963, Moncenisio became an S.P.A. majority-owned by the Falk group. In 1964, the Falk group sold the majority stake to the less economically solid industrialist Billi of Florence.[255]

Moncenisio lost credibility with banks due to uncertainty over ownership. Combined with the crisis in stocking machine production and the loss of third-world markets, the company's prospects further deteriorated.

Unable to control Moncenisio, Billi established a new factory in Scandicci, Florence. However, his various ventures, including airlines and an automobile racing team, were not profitable.

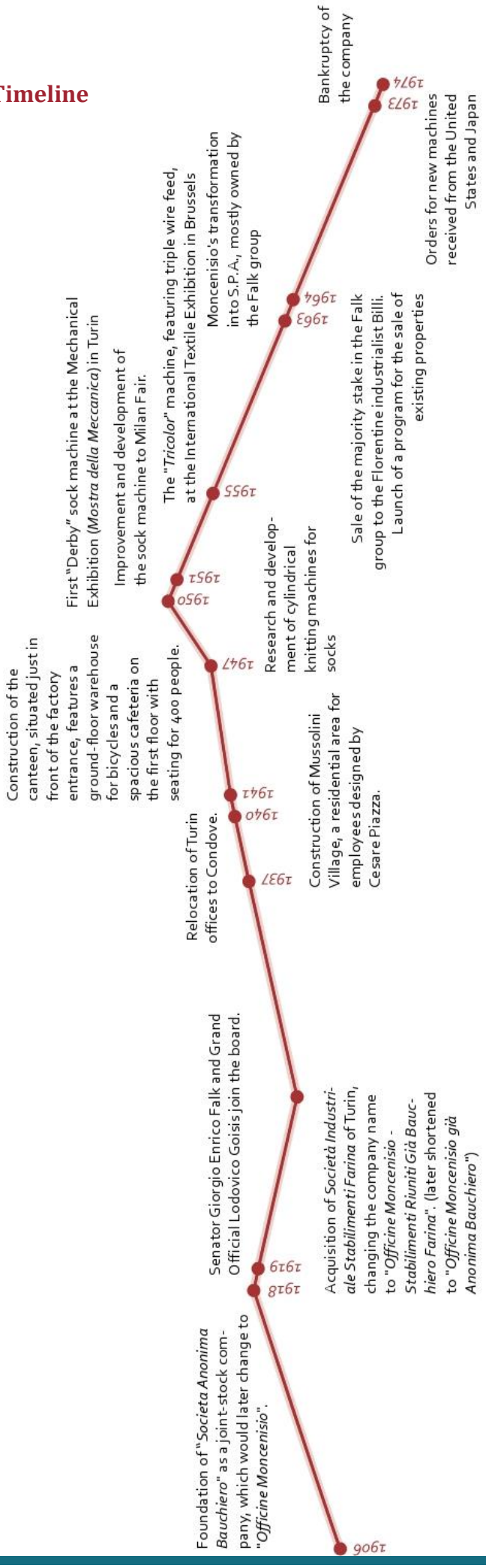
In 1964, shareholders received no dividends, and many banks, including the Banca Popolare di Milano, didn't renew credit lines. In the same year, a program to sell existing properties in Condove was initiated, except for factory buildings, the medical centre, the C.R.A.L. of Mocchie, and employee housing.[256]

In 1968, the company struggled to compete, leading to layoffs and efforts to maintain a market share by reducing profits.

In 1973, major orders from the United States and Japan for new machinery were secured, but they fell through due to labour actions and strikes. On June 28 1974, the company was declared bankrupt.

[252] Ibidem, 106.
[253] Ibidem, 115.
[254] Ibidem, 107.
[255] Ibidem, 142.
[256] Ibidem, 143.

7.4.4. Historical Timeline



7.5. Susa Valley Cotton Factory (Cotonificio Valle Susa – Wild & Abegg)

Figure 83: An old picture of the Wild and Abegg cotton mill in Borgone.[257]

Figure 84: View of the Chianocco factory, 1955.[258]

[257] Ibidem, 15.

[258] "Primo Itinerario di Archeologia Industriale: La Bassa Val di Susa, Parte Terza", Archeologia Industriale, accessed November 14, 2023. https://archeoindustria.blogspot.com/2009/01/primo-itinerario-di-archeologia_3044.html.

7.5.1. Foundation

The network of Wild and Abegg cotton mills, later named *"Cotonificio Valle di Susa,"* was one of the industries that played a central role in shaping the industrial landscape of the Susa Valley. It engaged a workforce from various towns in the lower valley and was notable for its physical presence in the area.

The initial private agreement between Augusto Abegg and Emilio Wild to establish the company was executed on November 18, 1880. The formal notarial document was created on February 22, 1881, in Cuggiono (Milan). Initially, the company's main offices and administrative centre were situated in Borgone, and they remained there until 1893.[259]

They chose the northern region of Italy, particularly around Turin, due to its logistical advantages and the abundant but unused hydraulic power.

The immediate years following see significant growth for the Wild and Abegg factories. The Susa Valley hosts three production facilities - those in Borgone, Chianocco-Bussoleno, and Sant'Antonino di Susa - producing a total of 34,400 spindles and employing 791 workers. The mills were strategically positioned along the Dora river, aiming to make optimal use of hydraulic power and ensure a practical supply of labour.[260]

7.5.2. Establishment of the Borgone facility

In September 1880, Borgone was chosen as the location for the new cotton industry due to its favourable site, available labour, and hydraulic power. The initial project included a 1500m canal generating 300 horsepower.[261]

On December 19, 1880, the regulations for "concession to Messrs. Wild and Abegg for water diversion for the Borgone factory" were issued, consisting of 55 units to produce 425 dynamic horsepower. The Royal Decree for water diversion for the Borgone cotton mill, with 5500 litres, a 4.79m fall, 425 horsepower, and an annual fee of 1700 Lire, was issued on June 12 of the following year.[262]

The Borgone spinning mill was constructed in 1881-82 on a rectangular plot between the provincial road Torino-Susa and the municipal Molino road, near the town centre. The initial layout had a C-shape open towards the Provincial road. The central two-story section housed the spinning mill (initially 20,000 spindles), while the side buildings contained warehouses and stables. Adjacent to the road stood a three-story building for administrative

[259] Matteo Alberti, "Memoria ed eredità materiale delle centrali idroelettriche e dei cotonifici 'Valle Susa': un 'percorso' tra salvaguardia e valorizzazione" (master's thesis, Polytechnic University of Turin, 2013), 67.

[260] Caione and Batsivari, *Il riuso dell'archeologia industriale*, 101.

[261] Alberti, *Memoria ed eredità materiale delle centrali idroelettriche,* 72.

[262] Ibidem, 72.

offices. The covered area was approximately 6,800 square meters.[263]

The structure followed the same models as the Bosio knitwear factory, predating it by 10 years: iron girders supported by cast-iron columns, brick vaults, load-bearing perimeter walls of conglomerate stones and bricks. A similar typology can be seen in the settlements of Chianocco and Sant'Antonino, with slight variations in structural mesh size.

Initially, the Borgone water diversion consisted of an intake structure with a dam in the Dora Riparia riverbed west of the Borgone town. It included an underground canal, hydraulic engines, and an outlet canal returning to the Dora west of the Giaconera bridge between Borgone and Villar Focchiardo. Initially, this diversion served for non-electric power production, transmitted to the machinery directly from the engine building using shafts and belts.

7.5.3. Establishment of the Chianocco facility

The establishment of the Chianocco facility by Wild and Abegg involved taking over water diversion practices previously initiated by the Colano company. In 1880 Gagneux, the director of Colano, applied for land concessions in Vernetti, Chianocco, and for the use of the communal bealera known as *"degli Achietti".* Following approvals from both Bussoleno and Chianocco municipalities, Engineer Cesare Meano was tasked with expanding the water canal to power industrial operations in both Bussoleno and Chianocco.

The water diversion concession, based on Meano's design, allowed for a flow of 2,575 m3 per minute, producing 107.14 dynamic horsepower. The concession was granted for 30 years starting from January 1, 1884. In 1886, Wild and Abegg acquired rights to Gagneux's water diversion, securing their position against potential upstream diversions.[264]

Wild and Abegg commissioned Engineer Cesare Meano to design the canal and the Chianocco facility. The water intake structure was constructed below the Bussoleno bridge, including a dam to regulate the Dora Riparia's flow. The water was channelled at 7,315 litres per minute, expanding the bealera degli Achietti. Initially, the water was returned to the Dora stream just downstream from the Chianocco facility.[265]

Construction of the initial part of the facility began in 1886 and concluded in October 1887. The structure, located about 1 km from Bussoleno, adjacent to the provincial road Torino-Susa and the Dora, was straightforward. It consisted of two parallel buildings—one, a single-story large spinning area with a turbine shed, and the other, a two-story building for administration, offices, and

[263] Ibidem, 72-73.

[264] Ibidem, 77-78.

[265] Ibidem, 79.

warehouses. The total covered area was 2,700 square meters.[266]

In the mid-1890s, a substantial expansion altered the original layout, extending the existing buildings parallel to the road. This expansion drastically changed the facility's appearance, creating a much longer structure. New buildings were also added for spinning and storage, resulting in an L-shaped layout. This expansion involved burying the pre-existing Rio Chianocco, perpendicular to the bealera degli Achietti. Consequently, the facility took on a more enclosed configuration, and the covered area increased to 9,000 square meters by 1898.[267]

The volumes used for the different processes were built in separate bodies whose dislocation certainly followed the sequence of activities.

7.5.4. Other developments

In the late 19th century, Wild and Abegg began negotiations to establish a third facility in the municipality of Sant'Antonino. This new spinning mill would distinguish itself from previous ones by relying more on electrical power. Unlike the earlier mills, its location was determined primarily by proximity to the railway station, as electrical energy would be supplied from existing hydroelectric plants.

On April 30, 1907, through a notarial deed by Teppati, the firm "Wild and Abegg" was dissolved and entirely replaced by the *"Cotonificio Valle di Susa Società Anonima,"* headquartered in Turin, with a paid-up capital of 10,000,000 lire. Augusto Abegg was appointed managing director of the newly formed company, which had its capital divided into 40,000 shares. The new shareholders included the founders Emilio Wild and Augusto Abegg.[268]

In 1907, the net profit of the company amounted to 914,702.87 lire. Meanwhile, expansions were underway in the Susa Valley: Borgone saw the addition of two parallel two-story buildings to the original structure, Chianocco received new departments on two levels, and Sant'Antonino adopted its characteristic C-shape which it maintained until its recent almost complete demolition.[269]

The Cotonificio Valle di Susa emerged unscathed from the cotton industry crisis of 1907-1910 and even absorbed some struggling smaller industries.

Only seven years later, on June 17, 1914, through another deed by Notary Teppati, the *"Società Anonima Cotonificio Valle di Susa"* was transformed into the *"Società in accomandita semplice Cotonificio Valle di Susa A. Abegg & C."*[270]

On June 14, 1923, the *"Società Anonima Cotonificio Valle di Susa"* was reestablished with a paid-up capital of

[266] Ibidem, 79.
[267] Ibidem, 80.
[268] Ibidem, 92.
[269] Ibidem, 93.
[270] Ibidem, 93.

20,000,000 lire. Augusto Abegg served as the legal representative and chairman of the board of directors. [271]

In 1925, the production was distributed across the various Susa Valley facilities. At the time, the mills in the valley employed approximately 3,500 workers.[272]

7.5.5. The recent past

Starting in the twenties, the Cotonificio Valle di Susa company began expanding its properties by absorbing smaller cotton mills in the Piedmont region and establishing new facilities themselves. After World War II, in 1946, it was reported that the Cotonificio Valle di Susa had gained control of about thirty factories, and the capital was "almost entirely Swiss-owned." Werner Abegg served as the general director..

In 1947, among the newly elected board members was Giulio Riva; in 1954, he took over the management of Valle Susa.

The Valle Susa cotton mills (which, during this period, started being referred to by the abbreviation CVS) became the largest non-mechanical company in the province of Turin, with 14 facilities in locations including Pessinetto, Lanzo, Mathi, Rivarolo, San Giorgio, Caluso, Strambino, Susa, Bussoleno, Borgone, Sant'Antonino, Pianezza, Collegno, and Perosa Argentina. The mills produced yarn for embroidery, basting, and various other uses. From the yarn, the weavers produced both classic and patterned articles: cuts for linens and shirts, tablecloths, sheets, towels, handkerchiefs, and fabrics for women's apparel. In 1954, there were approximately 12,000 employees, with about 75% being women.[273]

The already substantial "Cotonificio Valle di Susa" complex was further strengthened, with additional acquisitions of factories. The group also included around forty commercial and financial companies in Italy and abroad. The influence of "Valle Susa" extended internationally.

By 1963, the Cotonificio Val di Susa, with its 18 establishments, including others in different parts of Piedmont, 400,000 spinning spindles, 120,000 twisting spindles, 5,000 looms, 2 finishing plants, 21 power stations, and 1 thermo-electric plant, along with a staff of 10,000 employees, constituted one of the largest cotton complexes in Europe.[274]

Despite the euphoria, the company was already on a dangerous course.

The *Cotonificio Valle Susa*, aging machinery, continuous management changes, the absence of precise revival plans, or their failure to materialize, coupled with the genuine challenges of conversion in the face of overwhelming competition from newly industrialized countries with extremely low wages, led

[271] Ibidem, 93.
[272] Ibidem, 94.
[273] Ibidem, 96.
[274] Ibidem, 98.

to the decline of the industry and its supply chain.

The ETI took over the management of the Valle Susa group's companies from March 1966 onwards, playing down the value of this extensive cotton mill, purchasing it for less than 3 billion and renting the facilities for 600 million annually.[275]

Under ETI's management, the first factories to be abandoned by the end of 1966 were those of Bussoleno and Pianezza, which did not have lease agreements. These two spinning mills, where machinery was partly modernized, became economically unsustainable due to the production of lower-grade yarns.

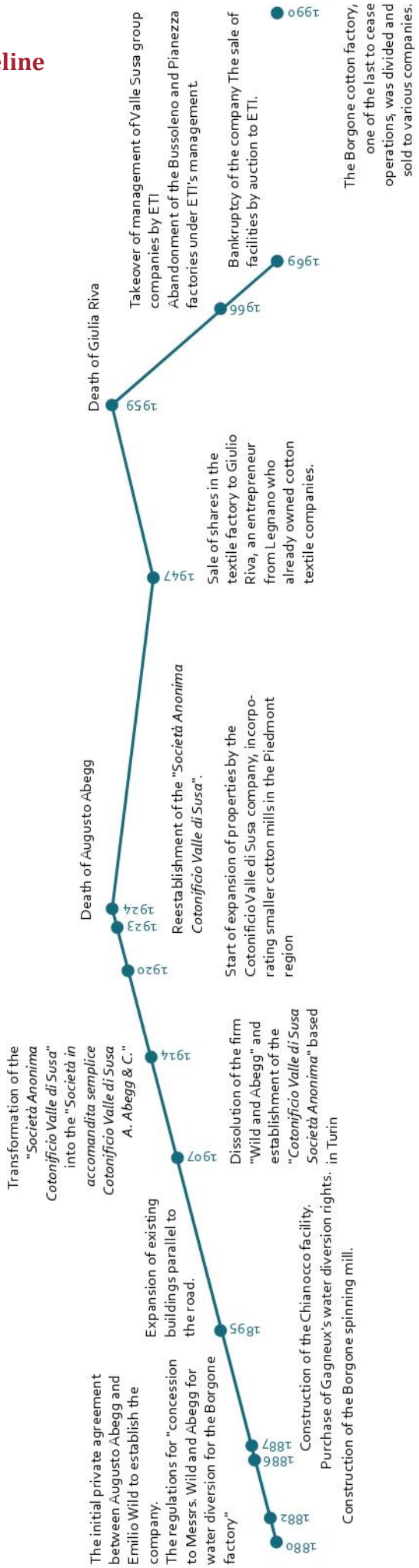
On December 13, 1969, the facilities were put up for sale and were awarded to ETI in a non-standard auction, purchased for 13 billion when its actual value was around 34 billion. [276]

Between the late 1970s and early 1980s, the ETI sold off the facilities to various entities, resulting in the fragmentation of the complexes.

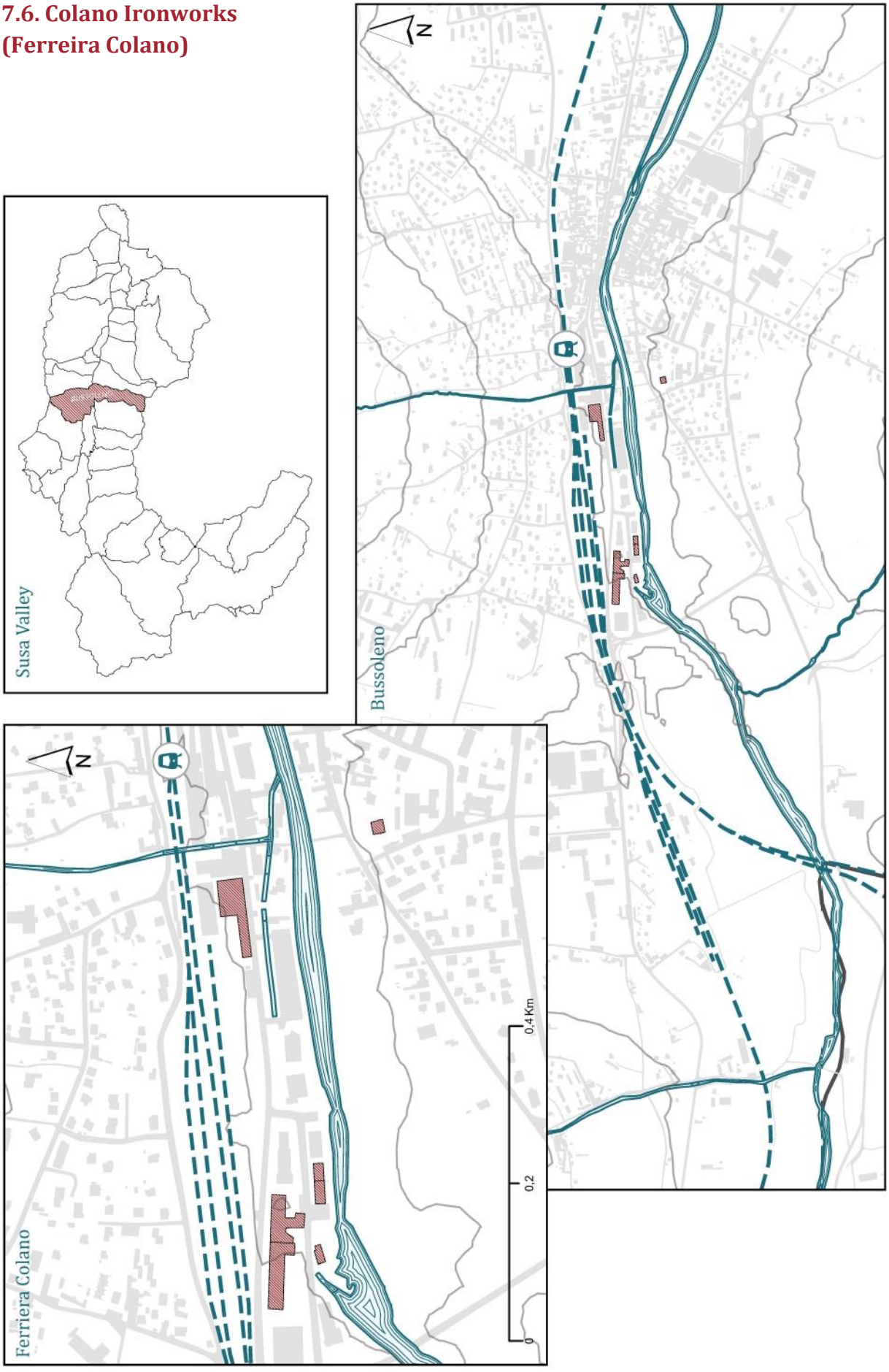
The Borgone cotton mill, one of the last to cease activity, was divided and sold to various companies in the 1990s.

[275] Ibidem, 102.
[276] Ibidem, 103.

7.5.6. Historical Timeline



7.6. Colano Ironworks (Ferreira Colano)



7.6.1. Foundation and early years

The intention to establish an industrial iron processing factory in Bussoleno, located in the Dora Spansata region, was communicated by the company Colano to the Municipality on January 23, 1875. In a petition submitted by the notary Grange of Susa, representing Alessandro Colano (1812-1887) - an entrepreneur of Genoese origin who had made "work and honour" his motto - they requested assistance and incentives from the Municipality. On February 6 of the same year, the Council, in an extraordinary session, unanimously granted these requests.[277]

The council members granted the necessary land for the water conduit canal for the factory, extending from the entry point near the railway bridge to the property of the Carnino brothers. They reserved the right to acquire various properties from the Municipality of Foresto and private individuals, with the condition that the Company provide unrestricted access for extracting and transporting sand from the Dora river. The compensation to landowners during canal construction was to be borne by the Company. Additionally, they agreed to pay the Company an annual compensation of five thousand lire in equal instalments over ten years, beginning from the year following the regular operation of the Factory with no less than a hundred workers.

The Factory, named *"Stabilimento Metallurgico di Bussoleno A. Colano & C.,"* commenced operations in 1876, focusing on iron processing. The factory was described in a short essay titled *"Ricordi del Moncenisio"* by Giuseppe Orsi around 1880.[278] Orsi detailed the factory's inner workings, with two turbines powered by water derived from the Dora River propelling all the machinery within the establishment. There were thirty-eight machines dedicated to cutting wire, eighty-two autonomous mechanical bobbins, and ten wheel-equipped boxes where finished tips were moved for polishing. Various sections of the factory focused on producing different items, such as elastic bands for paglericci, chains for agricultural purposes, and galvanization of iron wires for telegraphy. The establishment was extensive, spanning around five hundred meters in length and approximately one hundred meters in depth. Its direct railway connection facilitated the transportation of raw materials and finished products. The factory employed around 180 workers under the supervision of Engineer Gagneux, contributing commendably to the industry's success.

A more detailed description of the factory, penned by Colano himself, appeared in the monograph "Lo stato dell'industria del Circondario di Susa al 1883," drafted by the local administrative body during the 1884 General Italian Exhibition in Turin.[279] This monograph highlighted the factory's layout, the source of its power

[277] Sergio Sacco, *La Fabrica da Fer: Cent'anni d'attività della ferriera Ferro di Bussoleno* (Borgone Susa: Edizioni del Graffio, 2005), 11.

[278] Sacco, *La Fabrica da Fer,* 11-13.

[279] Ibidem, 14.

from the Dora Riparia, and the specific machinery employed. The factory produced various iron products, including small, round, and square iron pieces up to 30 millimetres, along with other elements.

This facility's significance extended to Susa, where a smaller branch for producing high-quality iron items, including nails, was established in 1878. The director of the Bussoleno factory, Eugenio Gagneux, was instrumental in leasing the Argentera mill from the Municipality of Susa in 1878. The mill was utilized for industrial purposes.

The Bussoleno factory, due to the modernity of its equipment, the type and variety of its production, was at the forefront of national industries at that time.

In 1887, 272 workers worked at the ironworks; it is equipped with 4 hydraulic motors with a total power of 450 dynamic horsepower and annually produces 3,600 t of rolled iron, 700 of wire and 2,500 of Paris points.[280]

In 1887 Alessandro Colano died. His son Giuseppe succeeds him in the management of the factory and continues successfully the entrepreneurial activity inherited from his father. However, after entering politics he gradually lost interest in the existing one and did not set up any new factories in the valley. At the end of 1896 he decided to sell it to the Ferro family.

The factory took the name of *Stabilimento Metallurgico G. Ferro & C.* and in 1897 it was enlarged with the purchase of the adjoining workshop for the manufacture of pipes, hollow, shaped and similar rods, owned by the *Lottero e Gatti* company, which became the tube department of the ironworks.

That workshop, founded by Lottero in 1892, had failed to develop and have regular production, despite the contribution of Gatti, who became his partner in 1895.

In 1898, the Ferro company participated in the General Exhibition in Turin and was awarded a gold medal (previously obtaining a silver medal in 1884). The event was highlighted by lawyer Edoardo Barraja in *"L'Indipendente"* on November 6, 1898, through an article rich in data and information about the factory.[281]

"(...)Stabilimento Metallurgico G. Ferro & C., formerly Stabilimento Metallurgico di Bussoleno A. Colano & C., stands about three hundred meters from the town, on the left bank of the Dora, and is connected to the railway by a siding.

It has twenty-two years of flourishing existence, with the exception of the tubery, which has only five, and which was planted to increase the sale of the production of the large rolling mill. The area occupied by the entire building is 29,600 square meters, of which 8,240 covered by canopies. An average of about 550 workers are employed there.

[280] Ibidem, 17.

[281] Ibidem, 24-29.

Figure 85: Siding with the Turin-Modane railway. It led to the shearing department and ended with a revolving platform.[282]

Normally the driving force used is exclusively hydraulic, in 700 horsepower, and is produced by five turbines which use the water of the Dora, deriving it by means of a transversal dam to the river itself. To partially compensate for any water shortage in lean periods, the plant is also equipped with a steam engine of 120 horsepower, powered by two boilers, which use the heat lost from the reheating furnaces.

[282] Ibidem.

Figure 86: A walk along the banks of the Dora by some ladies of the Ferro family: in the background the ironworks dam.[283]

Figure 87: On the right of the photo is the unloader of the channel; above it the turbine building; to the side of this the chimney of the pickling boiler and the office building.[284]

The establishment works in general without interruption day and night, and is lighted electrically. Its total annual production ranges from nine thousand to ten thousand tons; however, it could be increased up to twelve thousand.

With the exception of mineral fuel, all the raw materials used in the ironworks,

[283] Ibidem, 33.
[284] Ibidem.

charcoal and scrap iron and steel, mostly come from the Italian market.

The strips and the rolled irons are produced by two rolling mills, one of which is small, with a diameter of 2.30 meters, with a speed of 400 revolutions per minute, the other larger, with a diameter of 4.30 meters and a speed of 100 revolutions per minute. These rolling mills are driven by independent turbines, and their total annual production is about 4,500 tons, six tenths of which are represented by strips, and the remaining four tenths by squares, rounds, half rounds, flats, wire rod, etc.

The processing of the moietta in this factory is undoubtedly worthy of note and praise, both for the accurate accuracy of the profile, as for the variety of the assortment in length and thickness up to 200 millimetres of width above 17 decimillimeters of minimum thickness: the latter dimensions that up to now no other Italian ironworks managed to imitate in the tenuousness of the thickness compared to the considerable width.

In the drawing and tappet section, the wire rod, or rod, produced in the small rolling mill and rounded into skeins, is cold drawn into iron wire of all diameters, which in part goes on sale, in a polished, annealed, coppered, galvanized, etc.; while the greater quantity is cut into points of Paris, employing this work 125 special machines of different power, according to the size and type.

The assortment of this article is one of the most complete in terms of the diameter of the head and the tips, as well as their length. The annual production, which is 3,500 tons, far exceeds that of any other national tappet, and the Bussoleno plant alone could easily cater for the needs of all Italian consumers.

In order to increase the production of drill bits, and in order to keep the workers employed, even in times of lower demand, exports to the East and especially to Greece and Turkey have been undertaken for two years, and with excellent results.

Finally, in the tubing section, part of the moiette produced at the large rolling mill, reduced to pieces of 4.50-5 meters, is transformed into pipes for water and gas and into pipes - with hollow iron - for the construction of furniture. The workmanship is, also in this article, extremely accurate, and the assortment of the most complete. The good quality of the pipe material is maintained with extreme diligence; in fact, the cold folding tests, on relatively small diameters, always gave excellent results. (...)."

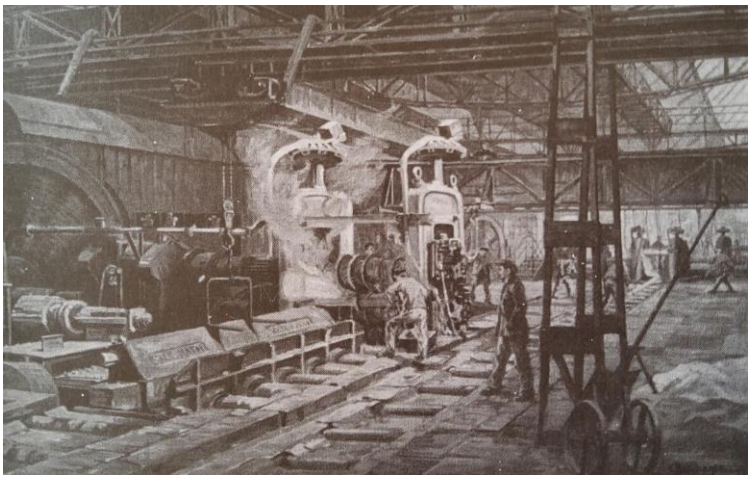


Figure 88: Interior of a late 19th century ironworks. Rolling mill: roughing stand.[285]

[285] Ibidem, 19.

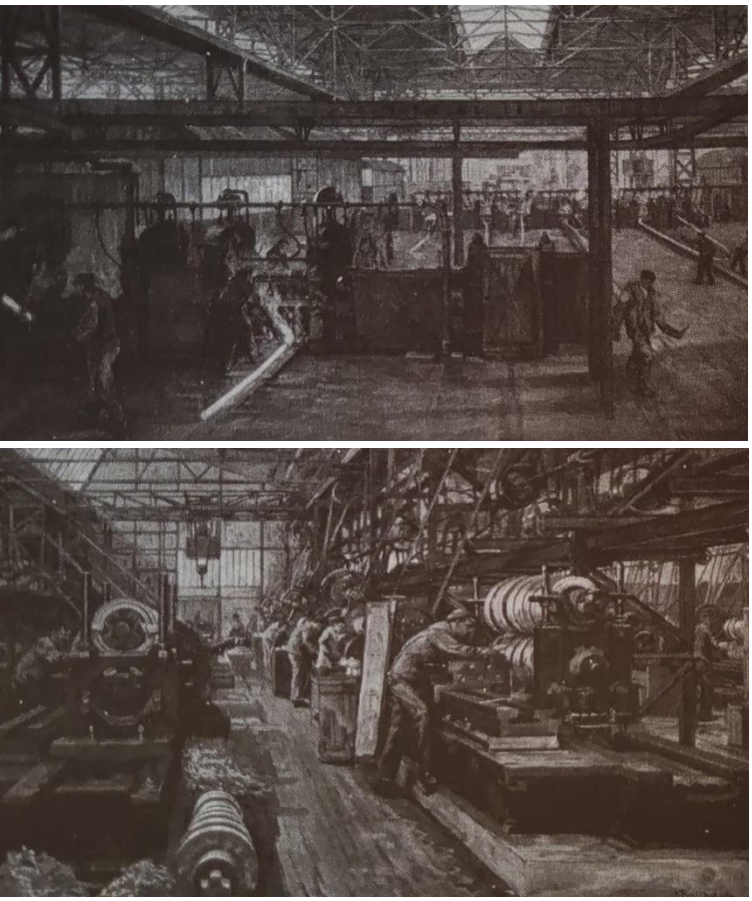


Figure 89: Interior of a late 19th century ironworks. Above, rolling train: on the left, the "grappling hook" used to support the blocks. Below, mechanical workshop: turning of cylinders.[286]

In 1902, the Ferro family, succeeding the Colano legacy, sold the nail-making factory to *Garrone and Arigo*, an enterprise responsible for Susa's public illumination. It was repurposed into a power station, setting the stage for *UNES* to take over in 1920, continuing the production of electrical energy. This transition marked the factory's evolution from iron processing to an electricity-producing entity.

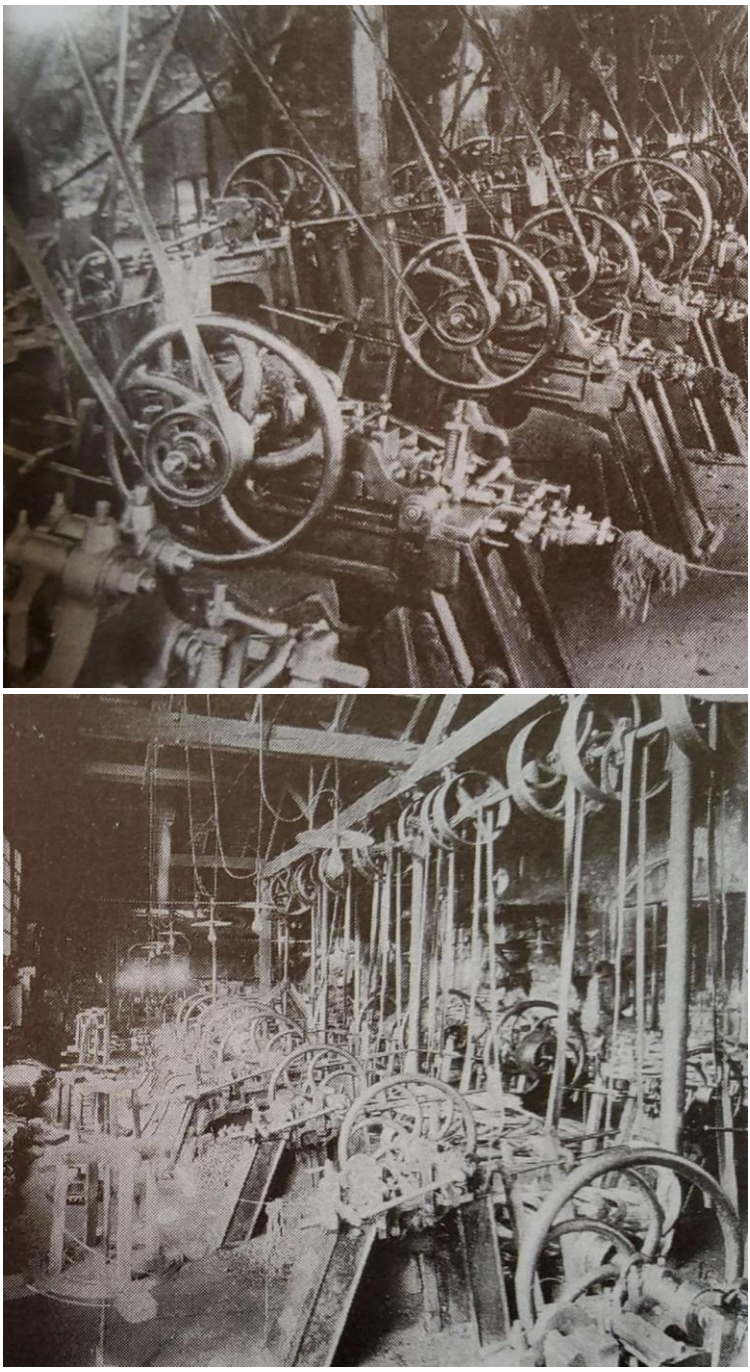


Figure 90: Nailing department: a complicated system of belts connected the various machines in the workshop to a single drive shaft. It is interesting to note that the spring of the punch which traced the head of the nails is made of wood.[287]

In 1902, the Ferro family, succeeding the Colano legacy, sold the nail-making factory to *Garrone and Arigo*, an enterprise responsible for

[286] Ibidem, 22.

[287] Ibidem, 17.

Susa's public illumination. It was repurposed into a power station, setting the stage for *UNES* to take over in 1920, continuing the production of electrical energy. This transition marked the factory's evolution from iron processing to an electricity-producing entity.

7.6.2. The recent past

It is possible to find some information about the building organization of the ironworks from the memoirs of Giovanni Combetto[288], who was one of those who started working at the ironworks before the end of World War II:

"At the beginning, towards Bussoleno, there was the tubery with a small mechanical workshop inside, which made it autonomous as regards ordinary maintenance. The galvanizing plant, the tube drawing plant, the welding department, the turbine room of the electric generator and the technical office were located in the following building; the changing rooms and the canteen were also housed in the same body of the building. Opposite this building was the porter's lodge, with an entrance on state road 25; behind, the mechanical workshop, the nail tools and the office of Luigi Favro ("barba Luis") head of the adjustment. Next to it are the nails, drawing and annealing and pickling departments.

In another building behind the nail factory there were the forge with the mallet and the forges, the room reserved for the tinsmiths, the one with the machines for polishing the nails (tarai) and the warehouse of the nail factory. To the right of the reception, in the direction of Susa, the sheds of the small train (tren cit) and the big train (tren gros) were lined up in order. Further on was the square, with warehouses, stables, the driveway entrance and, sheltered along the boundary wall, the shears. Immediately after the point of derivation of the canal from the Dora, still in the area of the square, there was a small building which housed the foundry and carpentry.

The factory exploited the energy produced by water, derived from the Dora through a dam and a canal. (...)"

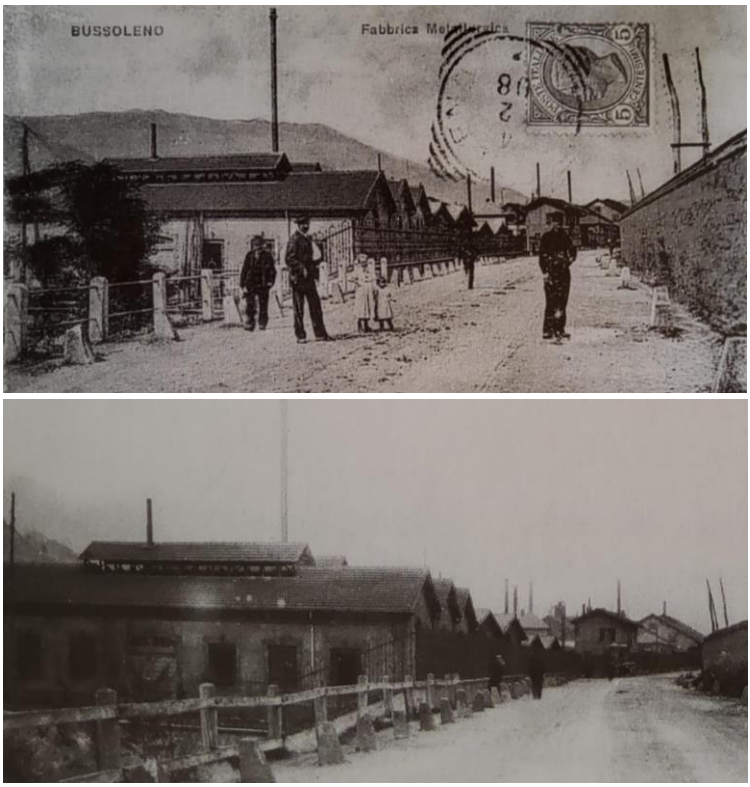


Figure 91: Early 1900s. Two images of the factory.[289]

[288] Ibidem, 79-82.

[289] Ibidem, 12.

Figure 92: 1920s. Another view of the factory with the dam on the Dora in the background.[290]

Figure 93: On the left of the photo is the tubing department; two large flywheels, placed on the external wall of the building, connected with cables to the hydraulic motor, transmitted motion to all the machines in the workshop.[291]

In the late 1970s, the ironworks faced potential closure due to a bypass road construction splitting its area into two parts, negatively affecting the rail connection's vitality.

As a result of a hiring freeze, production takes a sharp hit, plummeting from 19,000 tons in 1980 to 15,300 in 1981. By October of that year, the progressive reduction in personnel leads to the elimination of the third shift. The workforce, which numbered 83 in the years 1976/77, dwindles to 56 in 1982.[292]

This situation arises from the five-year plan ('81/'85) formulated by Villadossola Sisma executives, forecasting a significant drop in employment from 1,916 to 1,000 employees. The rationale for this drastic downsizing, as cited by the management, includes the crisis in the steel market, the company's difficulties, and the 40% production cuts mandated by the European Coal and Steel Community (ECSC).[293]

In Bussoleno, the manufacturing process involved hot rolling to produce low-value rectangular steel bars and saw blades (band saws), either in rolls or cut-to-size and then calendared. While steel bars had limited commercial value, saw blades, which Sisma succeeded in promoting to the market due to the characteristics of the rolling process, found its main application in construction. However, this alone cannot sustain the Bussoleno facility, even though there is potential to produce finished blades for cutting marble and granite, ready for mounting on frames.

The Bussoleno plant survived because it could fulfil requests for small quantities of materials in various dimensions.

At the end of September 1984, after the early retirements, 30 workers,

[290] Ibidem.
[291] Ibidem.
[292] Ibidem, 136.
[293] Ibidem, 136.

4 employees and a manager remained at the ironworks. The management had decided to permanently close the plant on October 30, declining all orders received after that date. The factory would be dismantled, unless a potential buyer comes forward.

From that moment on there was a succession of meetings aimed at analysing the situation and deciding on what to do, in an attempt to save the only industry still present in the Bussoleno area. Finally, an agenda was approved in which the Sisma management was invited to postpone the closure of the factory and to seek solutions to maintain employment.

After a few months, it was officially announced that the ironworks had been handed over to Eng. Perfect owner of Marmi e lame (a company with six employees) in Massa. The new buyer puts it back into operation by hiring the 29 remaining employees. 18 are immediately called back to work, the others remain in layoffs. They will be reabsorbed on the basis of production and market needs.[294]

A first draft of the restructuring and investment plan is presented for the production and employment relaunch of the company and subsequently everything will be quantified on the basis of market trends.

Unfortunately, despite this solution, which had revived some hope, in March 1986, Eng. Perfetti announced the definitive closure of the factory.

[294] Ibidem, 140.

Figure 94: Late 80s. The rolling mill shed now emptied of its machinery[295]

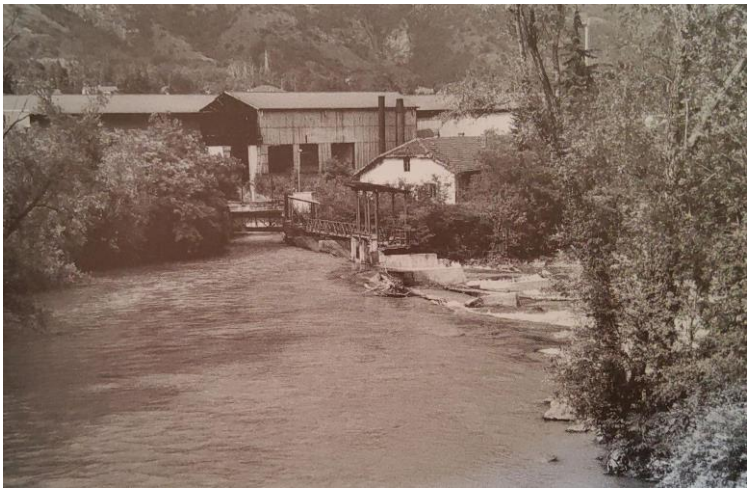


Figure 95: the dam on the Dora and the rolling mill shed built, after the demolition of the original one, in the early 1960s[296]

7.6.3. The Villa (Villa Ferro)

Unlike industrial complexes of other kinds, such as cotton mills for example, the ironworks are free from aesthetic pretensions; the type of production requires, in fact, buildings with large openings towards the outside, responding to the needs of the specific processing departments. The lightness and elementary construction of the buildings are aimed at allowing

[295] Ibidem, 145.
[296] Ibidem, 135.

flexibility in the internal layout and the possibility of possible extensions.

The search for image, through the architectural configuration, is transferred to structures not directly linked to production, such as the company buildings and homes, in the case of Vandel, or the manor house, in the case of the Ferro industrialists.

Villa Ferro, which stands in an elevated position on the bank of the Dora opposite to that of the factory, was not built from scratch, but is the result of the renovation of a pre-existing building. Cadastral documents indicate that as soon as they arrived in Bussoleno in Ferro they bought a two-storey house, with a courtyard and garden, in *via Della Fiera*, now *via Carlo Trattenero*. The villa, with the physiognomy that still identifies it today, originates from the expansion works of that house, completed in 1906.

The house was connected to *via Traforo (Strada Statale 25 del Moncenisio)* by a special walkway, the construction of which had been authorized by the Municipality in 1899. The project was developed by ing. Maruti, director of the ironworks and being a private bridge, it was closed by gates at both ends. Free transit was authorized by the owners in 1920, following an agreement stipulated with the Municipality which in exchange granted the Ferros the right to erect a perpetual tomb in the cemetery. The bridge, with the land beside it (now public gardens), was purchased by the Municipality of Bussoleno in 1953, at the price of 3 million lire.[297]

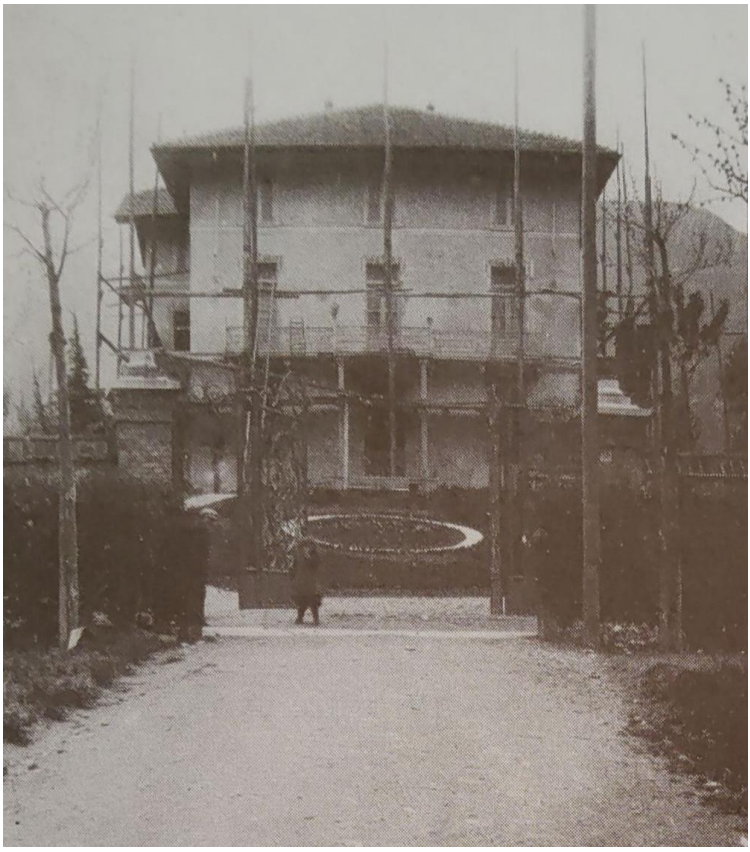


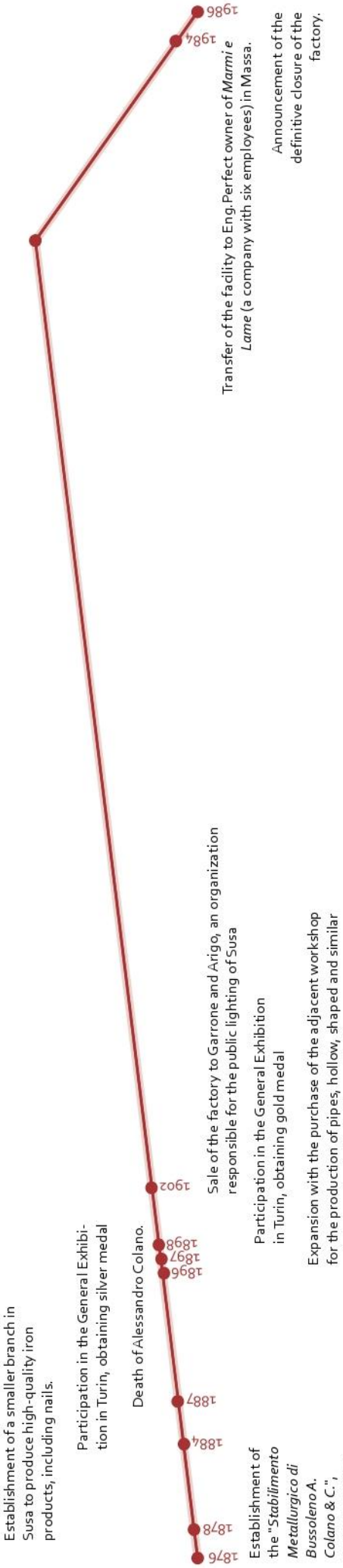
Figure 96: Villa Ferro in the course of renovation[298]

Figure 97: The bridge under construction: supported by wooden beams, later replaced with iron beams.[299]

[297] Ibidem, 38.
[298] Ibidem, 37.
[299] Ibidem, 39.

After having been the family home for over fifty years, during the Second World War, the villa was commandeered by German troops as their command centre. After their departure in 1945, French *"maquis"* occupied the villa, later followed by Jews who survived concentration camps. Villa Ferro then was divided into small apartments which were then rented out to private individuals. Subsequently, in the 1960s, it became the seat of the state middle school. Having exhausted its function as a temporary school building, it remained uninhabited for several years.

7.6.4. Historical Timeline



PART IV:

EXPERIENCE OF THE SUSA VALLEY AS AN INDUSTRIAL ROUTE

8. Importance of Creating an Industrial Heritage Route for Susa Valley

In the previous section, the most prominent common feature of the industries mentioned was their dependence on hydro energy, leading to the establishment of these industries near the Dora River. Additionally, due to the need for ease of transportation, they were also located near the railway and principal roads. However, these six industries mentioned can actually be grouped under a common umbrella in many more aspects.

Firstly, it can be discussed how all these industries contributed to the development of the regions where they settled. While the Susa Valley had an economy entirely dependent on agriculture, which was not sufficient to sustain the valley's population, resulting in constant migration and population loss, the industries that arrived in the region from 1870 to the early years of 1900 became a significant source of income, providing employment to hundreds of people and fundamentally changing the dynamics of the region.

Simultaneously, the birth of the first industries brought new and large architectural characters to the region, radically transforming the appearance of many lowland villages. This also triggered significant urban expansion to accommodate the resulting demographic growth.

Many companies built worker villages, offered alternative forms of living to the valley residents, prioritized social lives, and established facilities accordingly.

The arrival and establishment of these companies in the valley coincided with an unfortunate century, notably marked by two world wars. Fortunately, many of them managed to turn the wartime conditions to their advantage. Additionally, Italy's numerous political transformations caused fluctuations in the country's economy, even surviving severe economic crises like the 1929 depression. In the post-war period, labour movements increased, and continuous strikes and conflicts were faced.

Despite all these challenges, each of these companies managed to survive for nearly a century, leaving significant traces in the regions, to the extent that streets in their localities were named after them.

Research and written books about these late 19th-century industries that initiated industrialization in the Susa Valley can be found separately. Academic studies have highlighted some of these structures with adaptive reuse projects, especially those with high aesthetic value, such as the *Fratelli Bosio*. Some studies also evaluate

companies in the same sector collectively.

As a result of some research, it has been noticed that there is a lack of a comprehensive approach looking at all these structures together and emphasizing this critical period for the valley.

This thesis proposes designing an industrial route to experience six companies, that completely changed the character of the Susa Valley, contributing to the economic, demographic, and sociological development of the region, under the same umbrella.

9. Remnants of the First Industrialization of the Susa Valley

9.1. Current status of the Buttigliera Alta Ironworks (*Ferriera di Buttigliera Alta – Vandel*)

Firstly, to talk about the factory itself, as can be easily seen from the map below (*Fig. 98*), the original state of the factory in its early years has completely disappeared. The reason for this is the technological obsolescence problem that the factory struggled with after the World War II. Within the framework of modernization and expansion efforts, the initial structures built by the Vandel family were gradually demolished, and modern production departments were constructed by FIAT until approximately the 1960s. Therefore, it is not possible to observe these structures today. On the other hand, a

Figure 98: Superposition of the factory's layout plan drawing and the current map

portion of the massive new structure seen on the map, located above the old production buildings, still stands near the SS25 Moncenisio state road as a result of FIAT's modernization efforts. It is currently in operation today under the management of the company PrimoTecs, which specializes in cold & hot forging production (*Fig. 99*).

Figure 99: Current view of the factory.

Vandel village, structured along an axis perpendicular to the factory layout, on the opposite side of the main road, continues to stand today with all its components which are 6 three-story worker houses, three villas, a school and a church in Via Ferdinando Gatta. However, it is not possible to visit the houses as they still maintain their original functions.

Vandel village incorporates two types of residences for workers and executives. The duplex-style houses for executives follow a Central European cottage tradition with symmetrical vegetable gardens. In contrast, the worker houses resemble three-story row houses with double staircases, originally featuring 72 units with two to three rooms each, dual exposure, and balconies on the secondary facade with private latrines. This housing type provided better hygienic conditions, ventilation, and sunlight, as well as greater cost-effectiveness due to the standardization of cell types and urban planning flexibility, avoiding challenges related to land ownership and road margins. An area with communal gardens was established alongside the settlement along the railway, and these communal gardens still exist today (*Fig. 100*).[300]

The function of entrance-hallway is absent, with rooms interconnected and shared passageways; access is directly into the kitchen-living area, and the other rooms open onto it. The balcony serves as a sort of passageway. The average housing density accommodated 4-5 people in a one-bedroom and kitchen unit, while a two-bedroom and kitchen unit housed 6-7 people. [301]

Architectural features and facade treatment display a simpler language for worker houses and a more elaborate composition for executive residences, with decorations in rough brick, arches at windows, and perforations in balcony railings.[302]

In addition, although there are also residences on Via Cesare Roma built by FIAT in the following years, it is not possible to visit them for the same reason.

[300] *Riuso e progetto ambiti di fondivalle*.
[301] *Riuso e progetto ambiti di fondivalle*.
[302] Ibidem.

Another building located on Via Cesare Rome and used as "*dopolavoro*" at the time of FIAT, serves as a club today. Although the form of the building remained unchanged, some parts such as window openings were intervened (*Fig. 101*)

Figure 100: Vandel village current and former views.

Figure 101: "*dopolavoro*" building former and current views.

9.2. Current status of the Nobel Dynamite Factory (Dinamitificio Nobel)

The dynamite factory boasted a complex structure, necessitated by the inherent risks it posed. Owing to the handling of hazardous materials and the imperative to store them safely, the facility comprised numerous warehouse structures, many of which were either built into hillsides or constructed as lightweight wooden edifices. Unfortunately,

accessing most of these structures today is implausible due to both past explosions and the passage of time.

Nevertheless, several facilities concrete or masonry within the compound are accessible for visits, serving various purposes such as workshops or storage spaces for different enterprises.

Owing to its disorderly and perilous composition, the industrial complex lacks worker housing and features only a handful of residential buildings presumed to have belonged to administrators in the past. Given its current residential use, observation is restricted to exterior views.

Figure 102: Buildings with historical photographes or drawings, numbered on the map.

Among the structures that still exist today in the *Dinamitificio* land, those for which there are historical photographs or drawings marked with numbers on the map which is on page 120, are listed below;

1) The building was used as a dining hall in the past. Today it serves as a workshop (*Fig. 103*).

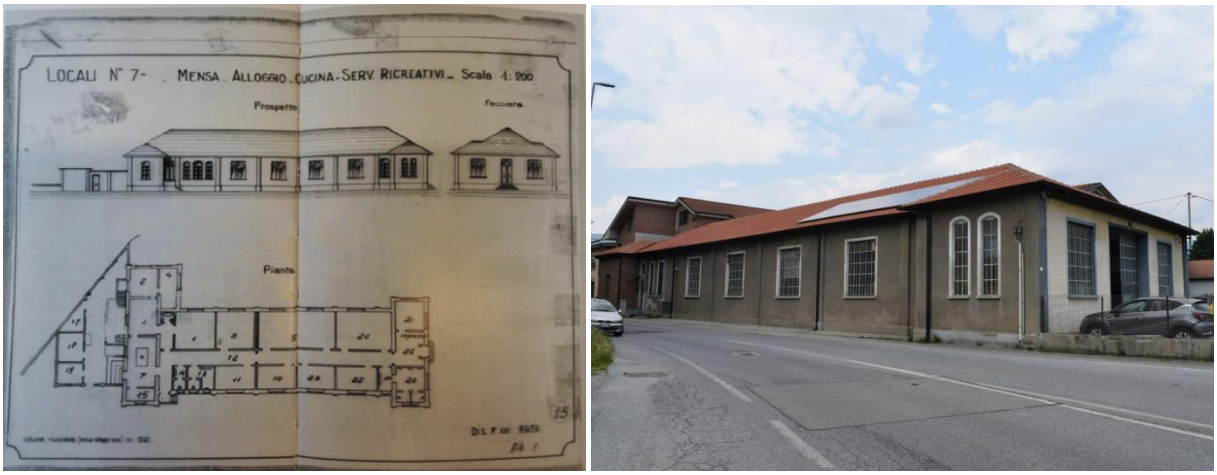


Figure 103: Technical drawings[303] and current view of the Dining Hall.

2) The building was used as a guest house in the past. It continues to be used as a residence today (*Fig. 104*).

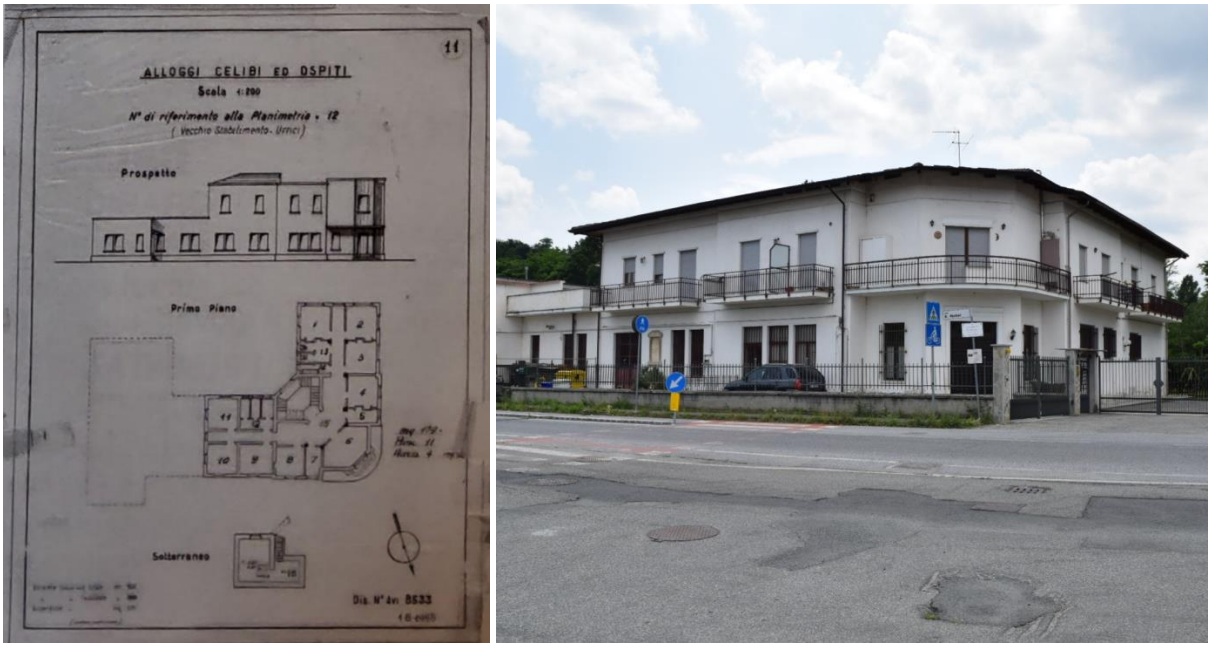


Figure 104: Technical drawings[304] and current view of the Guest House.

3) The building named *Casa Bianca* was formerly used as an executive residence and continues to function as a residence today (*Fig. 105-106*).

[303] Delpiano, *Viaggio intorno alla Dinamite Nobel.*
[304] Ibidem.

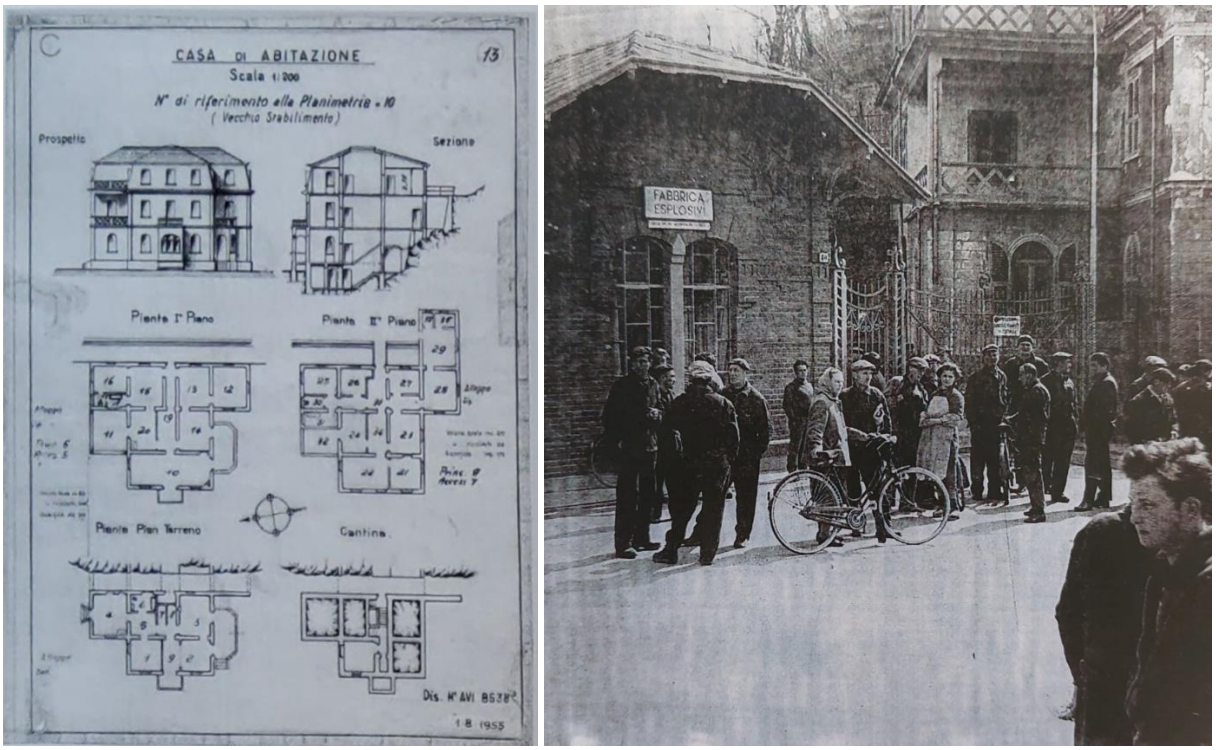


Figure 105: Technical drawings[305] and an historical photograph of the *Casa Bianca.*

Figure 106: Current view of the *Casa Bianca.*

[305] Ibidem.

4) A fraction of the land, representing the original site of the 19th-century dynamite factory near "*Trucco di San Martino*," is currently owned by the municipal administration. Since 1998, it has been open to the public as an Eco-Museum. Although the museum is closed for renovations today, guided tours are provided by appointment on the second Sunday of every month (*Fig. 107*).

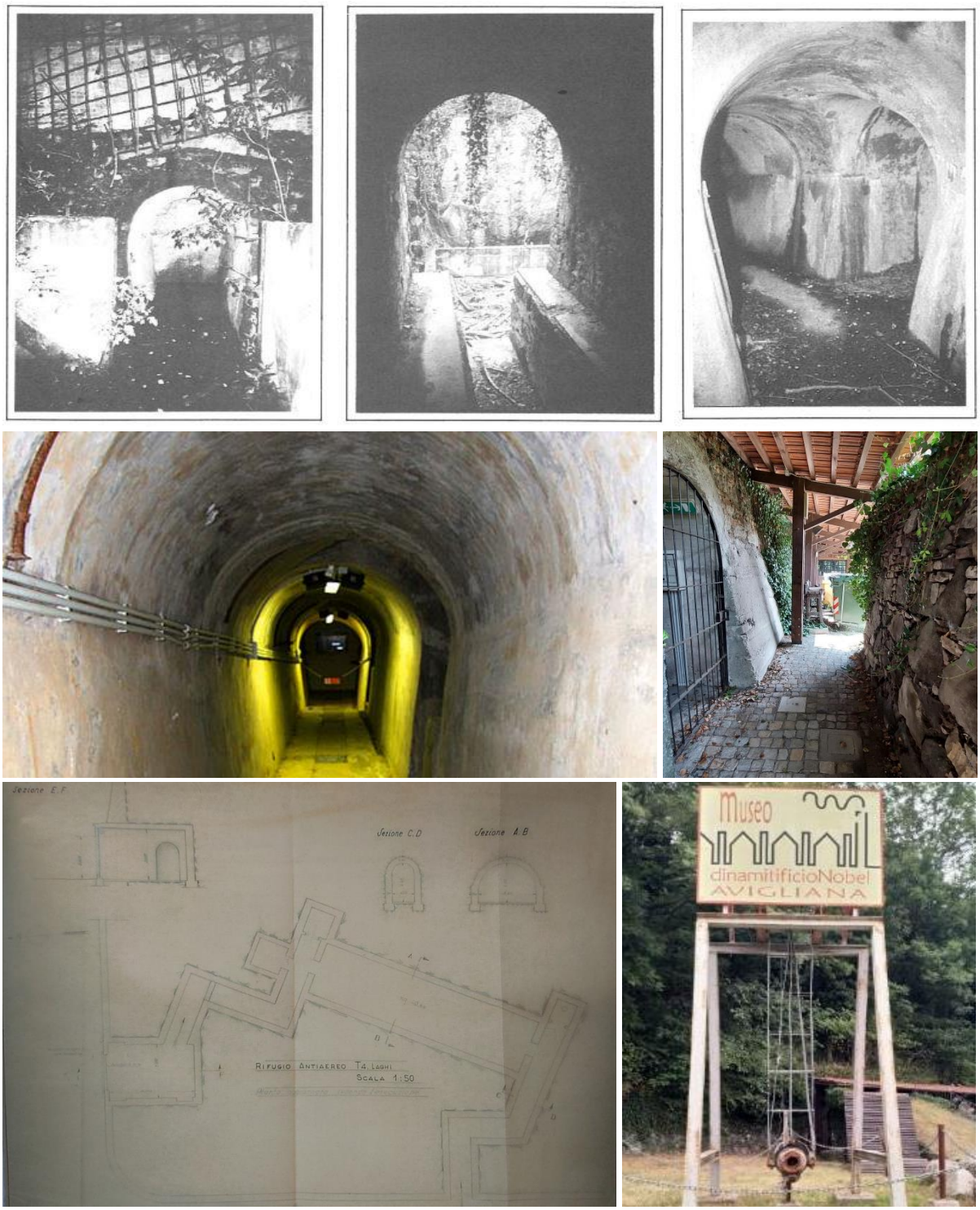


Figure 107: The section of the dynamite factory used as an eco-museum.[306]

[306] Ibidem.

5) The building is one of the factory buildings the company built in later years. Currently, it is still used as a factory by another company (*Fig. 108-109*).

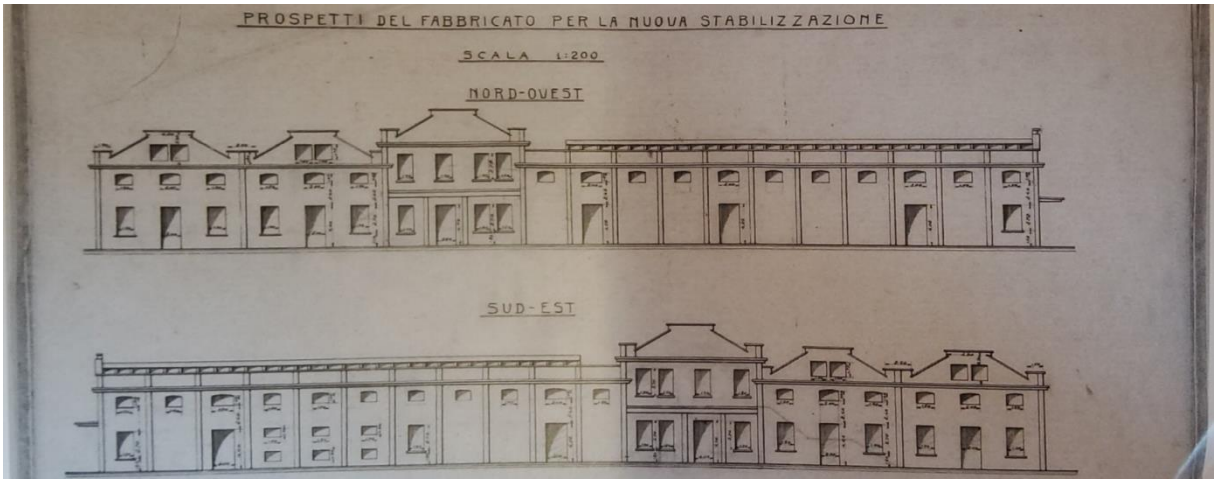


Figure 108: Technical drawings of the factory.[307]

Figure 109: Current view of the factory.

6) The building was used as a service building in the past. According to what was written on the technical drawing, the building served as a changing room, refectory and showers. Today it is used as a workshop by other companies (*Fig. 110*).

Figure 110: Technical drawings[308] **and current view of the service buildings.**

[307] Ibidem.

7) The building which is one of the residential buildings is today completely abandoned and in a bad condition (*Fig. 111*).

Figure 111: Technical drawings[309] and current view of the residential building.

8) The building, which is one of the factories built after the modernization period of the company, is abandoned today and not accessible (*Fig.112*).

[308] Ibidem.
[309] Ibidem.

Figure 112: Current view of the factory building.[310]

9) The building was used as thermoelectric power plant. Today it is abandoned (*Fig. 113*).

Figure 113: Current view of the thermoelectric power plant.[311]

9.3. Current status of the Fratelli Bosio Knitwear Factory (*Maglificio Fratelli Bosio*)

Maglificio Fratelli Bosio has the highest level of protection among other industries. Its high aesthetic value is definitely one of the factors contributing to this situation.

The architecture draws inspiration from Romanesque elements, influenced by Central European architectural manuals. This reflects a broader trend in Italy at the time, aiming to re-evaluate the national medieval experience.[312]

Structurally, the Maglificio Bosio employed a supporting masonry framework and a roof consisting of simple iron beams resting on two lateral walls, spanning the entire width at very short intervals. This design allowed for the creation of a diverse and eclectic facade. The continuity of the load-bearing masonry provided a compelling foundation for composing these facades, underscoring the industrialists' deliberate

[310] Tubere and Zampella, *Il Parco Diffuso Dinamitificio,* 79.
[311] Colenghi, *Ipotesi per un progetto di riqualificazione.*
[312] Paolo Giardino, "Trasformazione e recupero fisico- territoriale del patrimonio edilizio legato alle varie fasi della industrializzazione in Valle di Susa," (master's thesis, Polytechnic University of Turin, 1980).

effort to harmonize modern architectural inventiveness with traditional, time-tested practices.[313]

The facade consists of specific architectural elements such as arched doorways, decorative cornices, and distinctive window designs. The use of materials like brick and textured plaster also contributes to the factory's distinctive appearance. The factory's layout is unique, with production areas surrounding small internal courtyards.

This factory has a contrast between the detailed design of the main facades facing the railway and access road, and the rustic character of the remaining sides facing the valley and town.

Today, a portion of the factory building is operated by *Birrificio San Michele*, continuing its production function. The remaining part hosts numerous different shops. The linear residential block located just behind the factory is still used for housing, so visits inside are not possible.

Figure 114: The facade of the factory with abundant ornaments.

Figure 115: Unadorned facade of the factory.

[313] Matteo Alberti, *Memoria ed eredità materiale delle centrali.*

Figure 116: Residential block.

Although the state of preservation is high, the parts of the factory inside cannot be said to be well preserved. These parts have not been renovated recently, so they look quite worn out.

Figure 117: A view of the poorly preserved parts of the factory

It is possible to observe the workers' lodgings established in 1893 as residences today. These houses belonged to the department heads of the factory and to this day are mainly owned by their grandchildren. The name of the street where the buildings are located has been Via Fratelli Bosio since 1894.

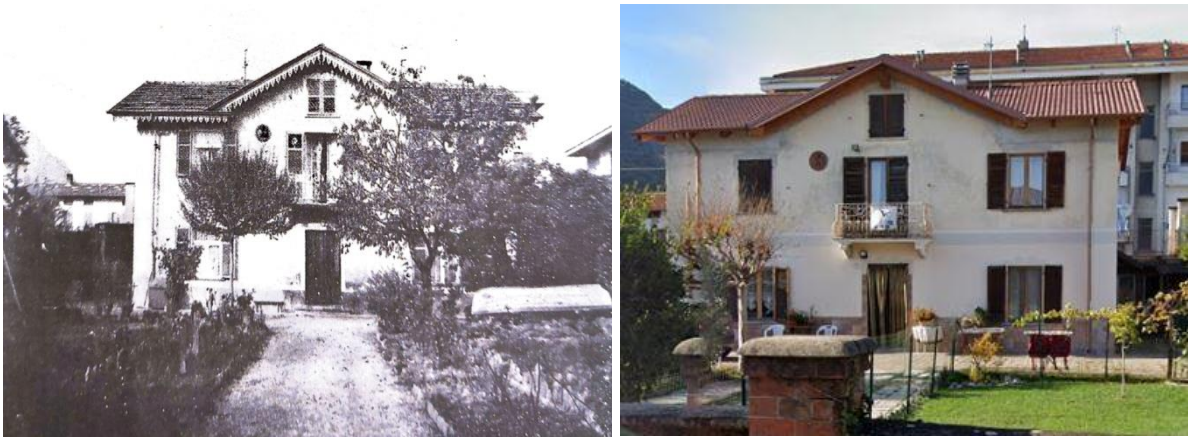


Figure 118: Past[314] and current view of the residential buildings in Via Fratelli Bosio.

The residence of Alessandro Neveux, the manager of the facility, which was also built in 1983, is today used as the municipality of Sant'Ambrogio Di Torino in a well-preserved state.

[314] Malvicino and Peirano, *Fattori di localizzazione ed aree omogenee*.

Figure 119: Current view of the residence of Alessandro Neveux

9.4. Current status of the Moncenisio Workshops (*Officine Moncenisio – Anonima Bauchiero*)

Officine Moncenisio is another industry with a very well-preserved condition. The structure has lost very little from its original complex.

The section forming the main entrance facade of the factory facing Via Torino continues to stand almost as it did on the first day. However, this part is not currently in use (*Fig. 120*).

The majority of the portion behind the entrance structure of the factory has not reached the present day. However, it is possible to observe a fragment representing that part. Unfortunately, this section is not in use and has been abandoned, falling into a state of disrepair.

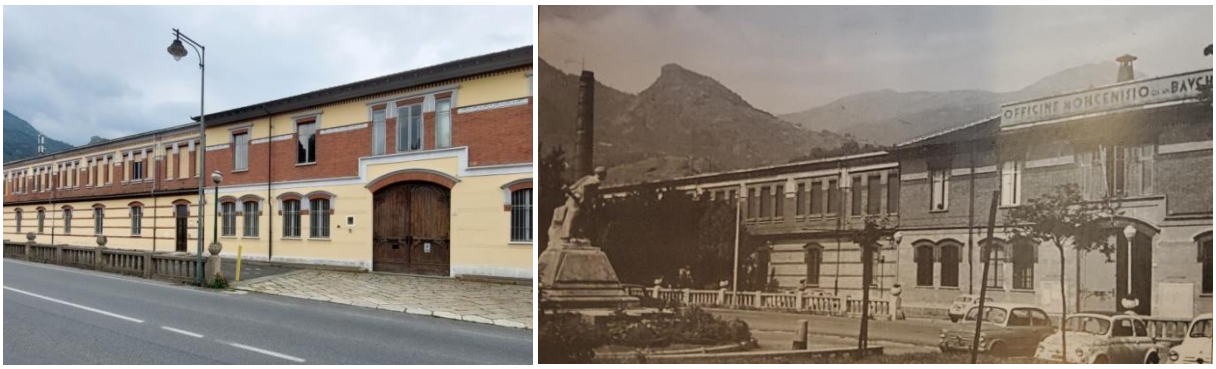


Figure 120: Current and past view of the main façade.[315]

As for the worker residences, all the known housing units constructed by the company and the bath are in excellent condition and continue to be used as residences.

[315] Jannon and Sarti, *La Monce,* 28.

The health centre near the residence blocks are still used as health centre. (*Fig. 121-124*).

Figure 121: First constructed blocks of residences near Viale Bauchiero.

Figure 122: Current and past[316] view of the residences of Mussolini village on Via Antonio Gramsci.

Figure 123: Current and past[317] view of the health centre.

[316] *Cinquantenario della Società Officine Moncenisio*, 42.
[317] Ibidem, 38.

Figure 124: Current situation of the bath.

The building located right across from the factory on Via Torino, which once served as a dining hall and bicycle storage, exists today in a well-preserved condition. Although it was used as a museum at one point, it currently does not serve any function.

Figure 125: Current and past[318] view of the Dining hall and bicycle deposit.

9.5. Current status of the Susa Valley Cotton Factory (*Cotonificio Valle Susa - Wild & Abegg*)

Information about the worker residences of *Cotonificio Valle Susa* could not be found, so it is only possible to comment on the facilities. Although the production

[318] Ibidem, 40.

facilities are fragmented for different departments, they are compactly arranged together. Wild and Abegg spinning mills were characterized by an essential architectural layout, with minimal aesthetic embellishments, except for the office area in Borgone and window decoration using a simple brick molding. Their architecture is essentially close to modern industrial design. Common elements across the factories include brick pilasters standing out against plastered walls and brick marcapiano details.

The Borgone facility, which completely ceased operations in 1990, is largely well-preserved today, but it lacks a current function and awaits leasing. Only a small part of the facility hosts a few shops.

Figure 126: Current views of the Borgone factory.

The office building, part of the Borgone facility, currently serves a residential function.

Figure 127: Current view of the office building.

On the other hand, the Chianocco facility, despite being in worse condition than the Borgone facility, is more lively. Some buildings undertake functions like markets and stores, while the rear parts facing the river are completely abandoned and in a deteriorating state. Looking at the facade renovation in the only used part of the linear structure parallel to the main road, it can be said that the fate of the building depends on whether it will be leased or not.

Figure 128: Partially used linear building parallel to the principal road.

Figure 129: One of the abandoned buildings.

Figure 130: One of the parts of the Chianocco complex currently used and in good condition.

9.6. Current status of the Colano Ironworks (*Ferriera Colano*)

Ferriera Colano does not have an operational production facility today. Only a small workshop that remains from the company, which had a multi-part structure when it was founded, is used by another business today, all other buildings are abandoned, either waiting to be rescued, or have already decayed or have completely disappeared.

Figure 131: The factory right across from the Villa Ferro.

Figure 132: Current and past[319] view of the only building identified in usable condition.

Figure 133: Current and past[320] view of one of the abandoned workshops.

Figure 134: The rolling mill shed.[321] Currently it is almost completely demolished.

Another legacy left from the company is the residence of its managers which is called Villa Ferro located on the other side of the river and connected to the factory with a bridge. Villa Ferro was not built from scratch, but is the result of the renovation of a pre-existing building. The villa completed in 1906.

[319] Sacco, *La Fabrica da Fer.*
[320] Ibidem.
[321] Ibidem.

Figure 135: Villa Ferro. Current and the under construction view[322].

After having been the family home for over fifty years, during the Second World War, the villa was commandeered by German troops as their command centre. After their departure in 1945, French *"maquis"* occupied the villa, later followed by Jews who survived concentration camps. Villa Ferro then was divided into small apartments which were then rented out to private individuals. Subsequently, in the 1960s, it became the seat of the state middle school. Having exhausted its function as a temporary school building, it remained uninhabited for several years.

Today the building is owned by Susa Valley Mountain Union.

10. Processing of the route

10.1. Aims and Objectives

The route aims to highlight the industries that catalysed the industrialization of the Susa Valley, contributing to the transformation of the region into modern cities. It serves as a guide for local residents or professionals interested in exploring the industrial development of the Valley.

The objectives of the project can be summarized under 4 main items;

-Identification of the locations of the mentioned industries on the Susa Valley,

-Highlighting other historical structures in the Susa valley to increase visitor potential,

-Defining the possibility and time of transportation to the location of each industry by rail and automobile,

-Preparation of individual maps of each industry and identification of surviving structures.

[322] Ibidem.

10.2. Method

10.2.1. Software

The design of this route was made with ArcGIS Pro which is a desktop GIS software developed by Esri, that replaces their ArcMap software generation.

10.2.2. Data

To achieve the mentioned objectives, a few basic data are needed;

-Shapefile of the building blocks of the Susa Valley to show the surviving structures of the industries,

-Road network shapefile of the entire Piemonte region to analyse transportation possibilities to industries by car,

-Railway network shapefile to analyse transportation possibilities to industries by rail,

-Shapefile of Susa valley water resources to emphasize the close relationship of industries with water,

-Digital Terrain Model (DTM) to emphasize the relationship of industries with land,

-Locations of historical and must-see monuments in the Susa Valley.

The required data was obtained from *Geoportale Piemonte* which is Piedmont region geoportal, and *OpenStreetMap* which is an editable map of the whole world that is being built by volunteers largely from scratch and released with an open content license.

10.2.3. Data Processing and Tools

The initial objective was to establish a framework for all maps to be prepared by processing Digital Terrain Model (DTM).

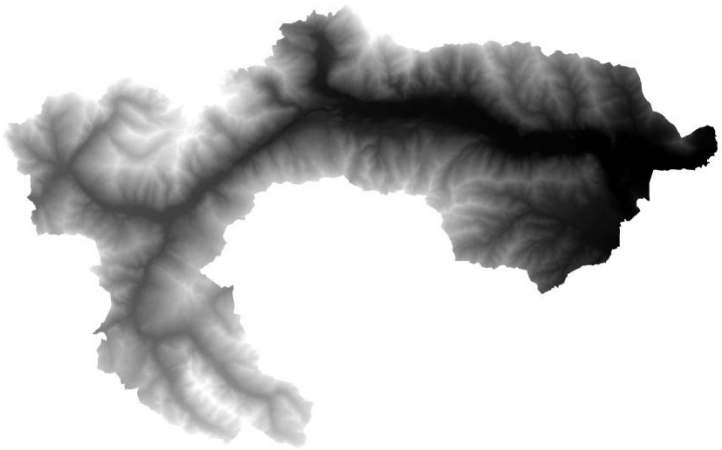


Figure 136: DTM data of the Susa Valley

To derive meaningful data from DTM, three different analyst tools, namely Hillshade, Slope, and Contour, were employed. The hillshade analysis involved determining illumination values for each cell in the raster DTM data, providing a hypothetical representation of surface illumination.

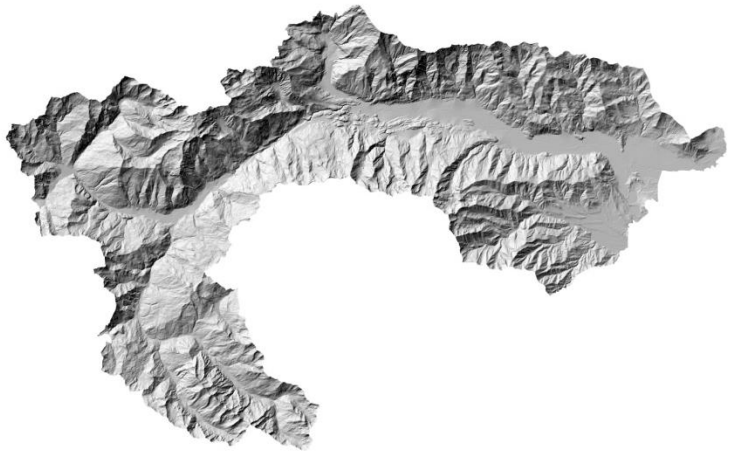


Figure 137: Hillshade analysis.

Slope analysis was utilized to identify the steepest downhill slopes on the surfaces, offering insights into the mountainous structure of the region.

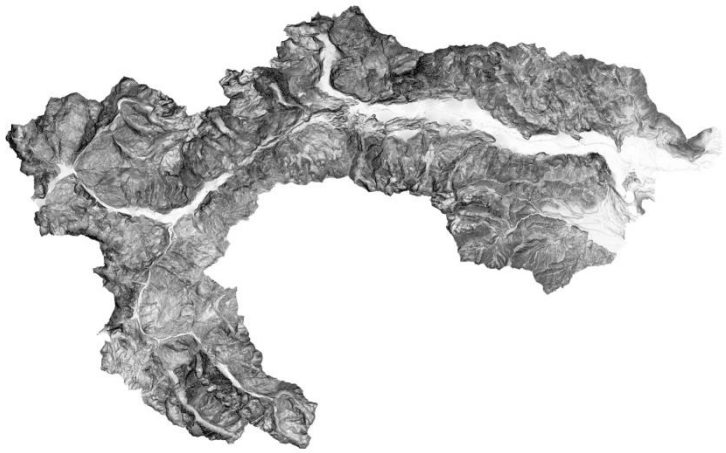


Figure 138: Slope analysis.

Additionally, the contour analysis tool was employed to comprehend the elevation values of the terrain.

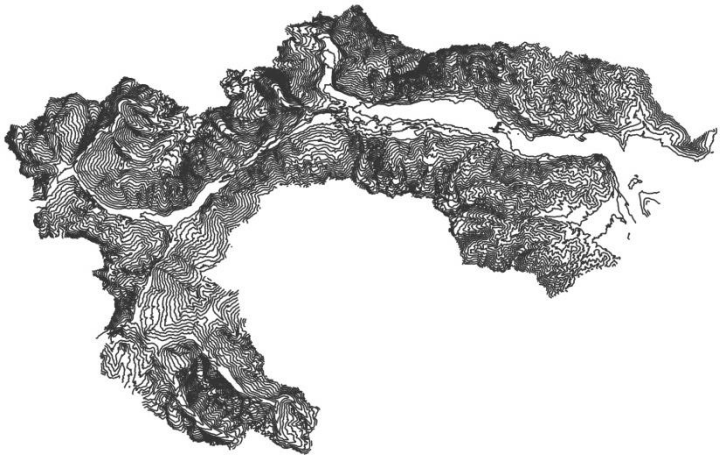


Figure 139: Slope analysis.

The data for building blocks, water sources, and historical points was utilized in its original form. Subsequently, the necessary location information for network analyses was extracted from these datasets. Only the surviving structures to be included in the route were highlighted using distinct colour coding.

The data required for all transportation analyses were road network and rail network datasets. For the upcoming analyses, missing attribute information in both datasets was processed.

In the road network, information on the length of roads and speed limits was available. A new attribute field was added, and time information was incorporated using the formula time = distance/speed. Subsequently, a network dataset was created from this road network shapefile. A network dataset is a fundamental requirement for the software to perceive a shapefile consisting only of lines as a transportation network.

Similarly, in the rail network, missing speed and time information were added as new attribute fields, and another network dataset was created. This dataset was utilized for analyses related to the railway.

Figure 140: Network dataset of roads

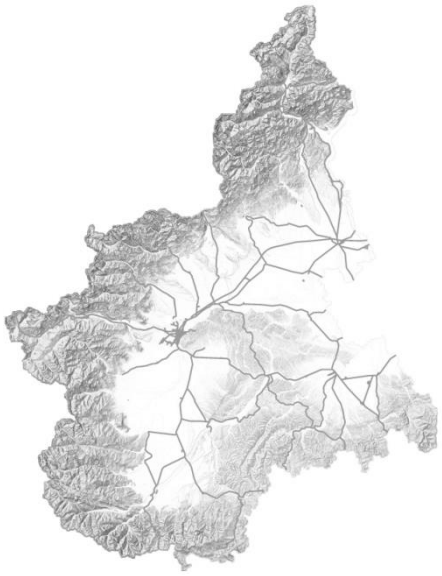


Figure 141: Network dataset of railways.

With the obtained network datasets, three different types of network analyses were conducted: Closest Facility, Service Area, and Route.

The closest facility analysis was utilized to determine the arrival routes and durations from all provinces in Piedmont and Turin Airport to the Susa Valley. Instead of the typical analysis used to find the nearest location to a point, this study utilized the tool to find the shortest route to be followed from numerous points which are centre of the provinces to a single point which is the Susa Valley. The analysis considered both personal automobile and train transportation from provinces to the Valley (*Fig. 142-143*).

The closest facility analysis was also employed to showcase transportation to other historical points in the Susa Valley. It illustrated the accessible locations from each industrial stop (*Fig. 144*). Historical points with durations exceeding 5 km were eliminated from the analysis.

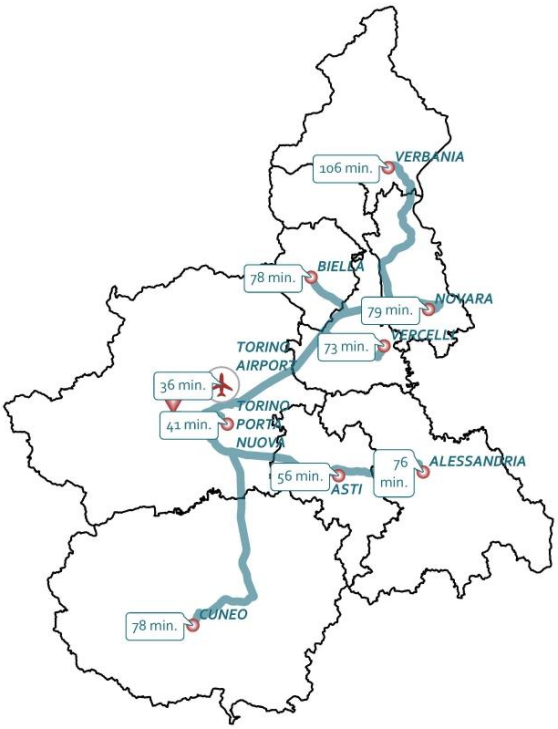


Figure 142: Closest facility analysis that shows the driving routes and time.

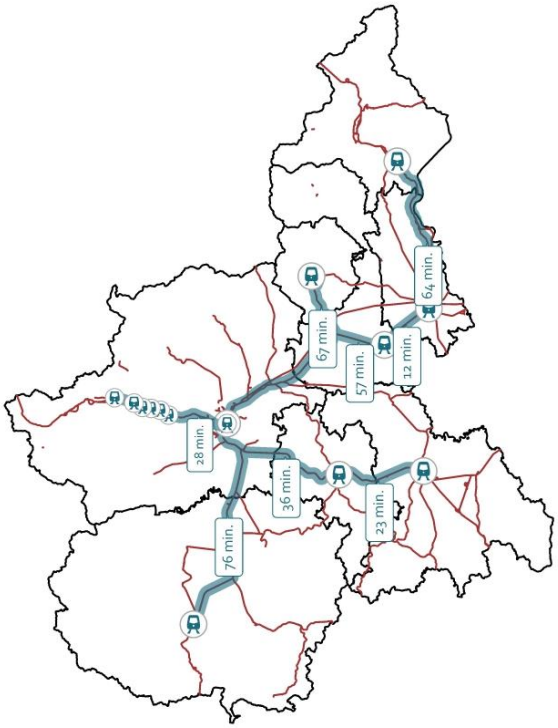


Figure 143: Closest facility analysis that shows the train transportation routes and time.

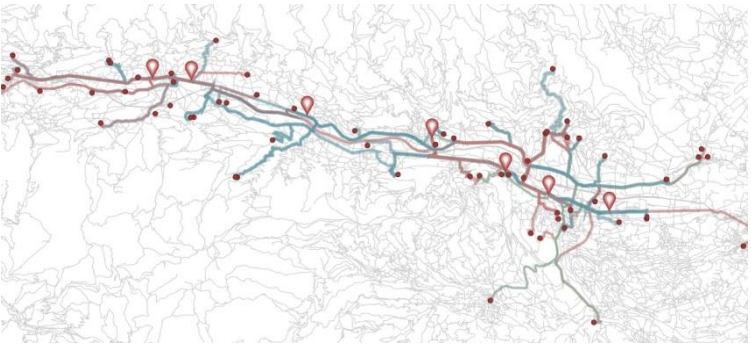


Figure 144: Closest facility analysis that shows the routes for historical landmarks.

The second network analysis tool used was the Service Area. With Service Area analysis, it is possible to obtain boundaries for a specific distance or time from a point. In this study, a 1500m distance limit was drawn for each industrial visit (*Fig. 145*). The aim was to identify other historical structures worth visiting within easily walkable distances.

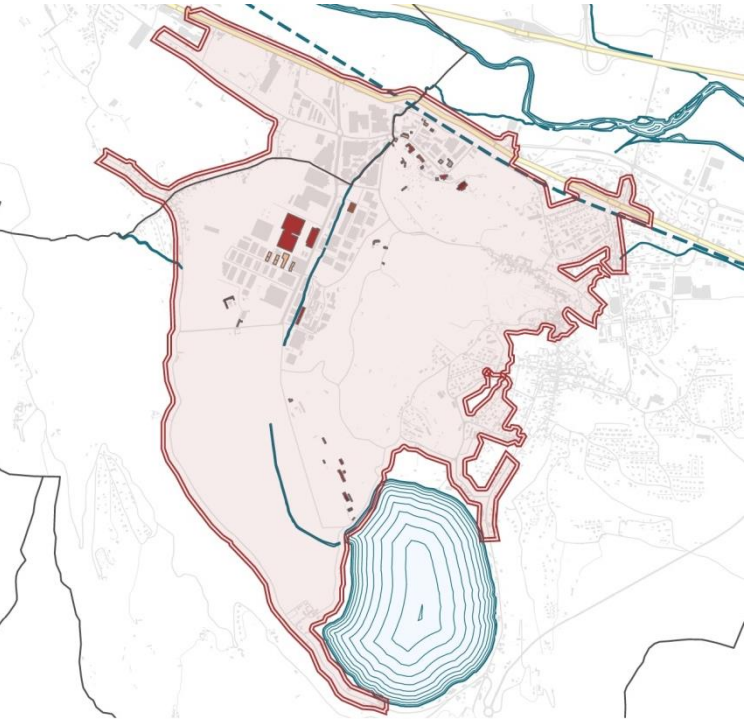


Figure 145: Service Area analysis that shows 1500m distance.

The final network analysis tool used was the Route analysis. This analysis was employed to determine the time it would take to walk from start to finish for dispersed industries like *Dinamitificio Nobel* that have survived to the present day (*Fig. 146*). The estimated time spent at each industrial stop was added based on factors such as the visitability, size, and quality of the structure. This information was then incorporated into the overall map and presented to visitors, providing an estimate of the total time to be spent at each industrial stop.

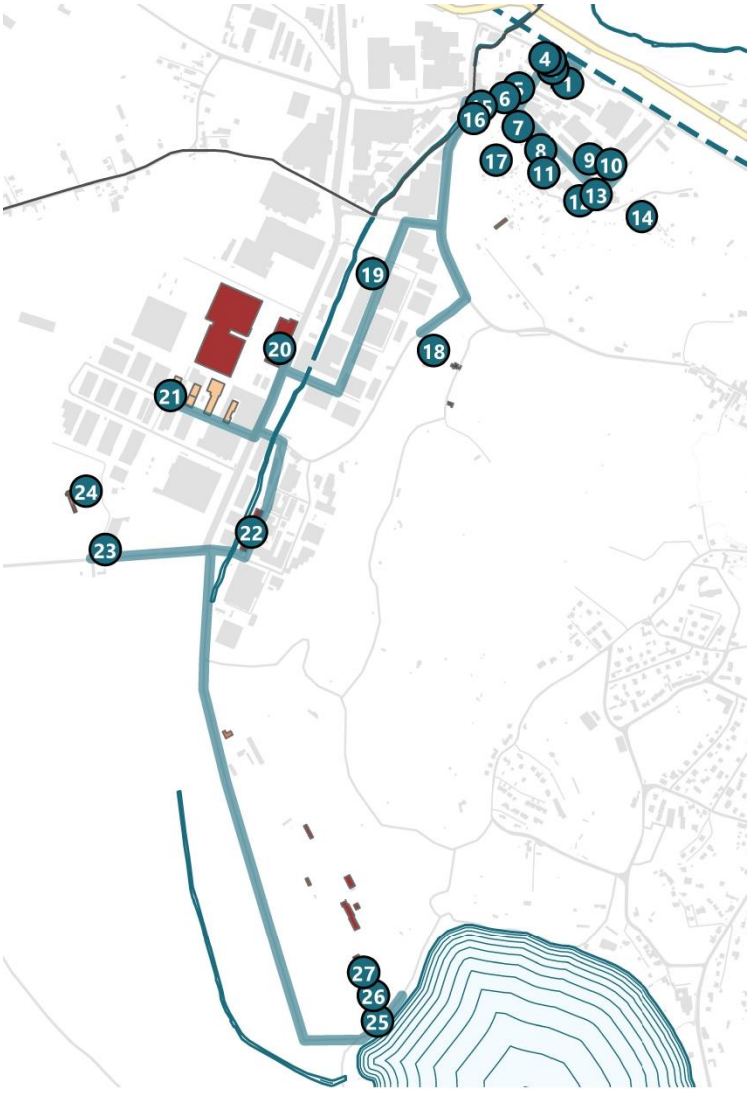
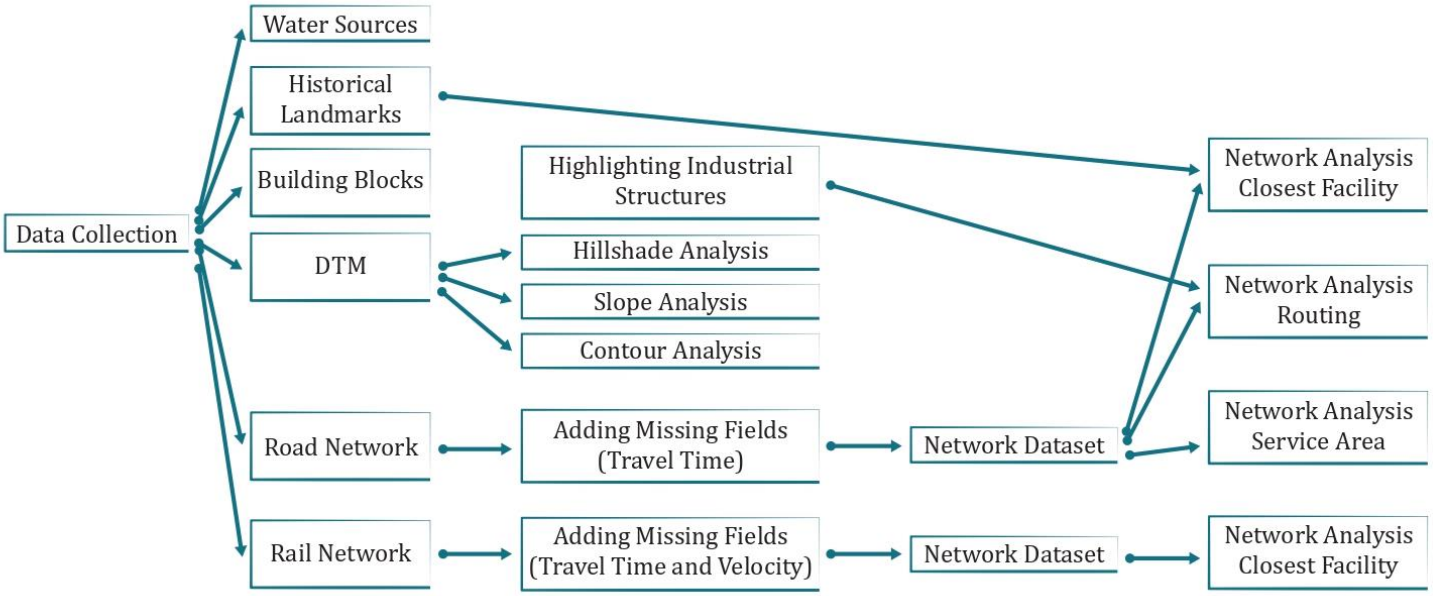


Figure 146: Route analysis.

10.2.4. Workflow

The workflow of the study is summarized as follows.



10.3. Outputs

The maps obtained as a result of all analyzes are listed below and given on the following pages;

-Locations of Industries

-Transportation Routes and Times to Susa Valley by Car

-Transportation Routes and Times to Susa Valley by Train

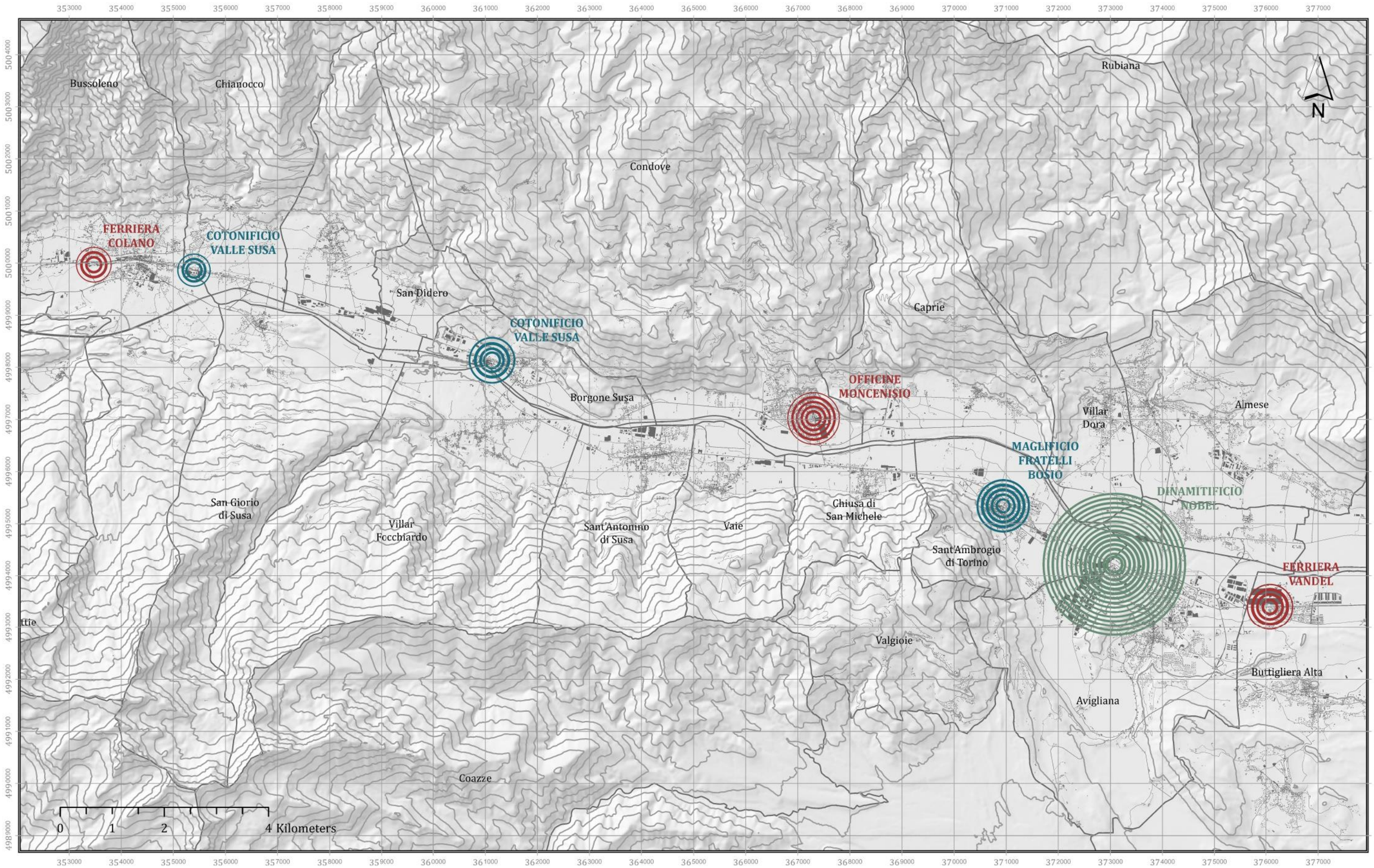
-Transportation Routes and Times in the Susa Valley Industrial Route by Car

-Transportation Routes and Times in the Susa Valley Industrial Route by Train

-Historical and Natural Landmarks within 5km of the Susa Valley Industrial Route

-6 Individual Maps of Each Industry of the Routes

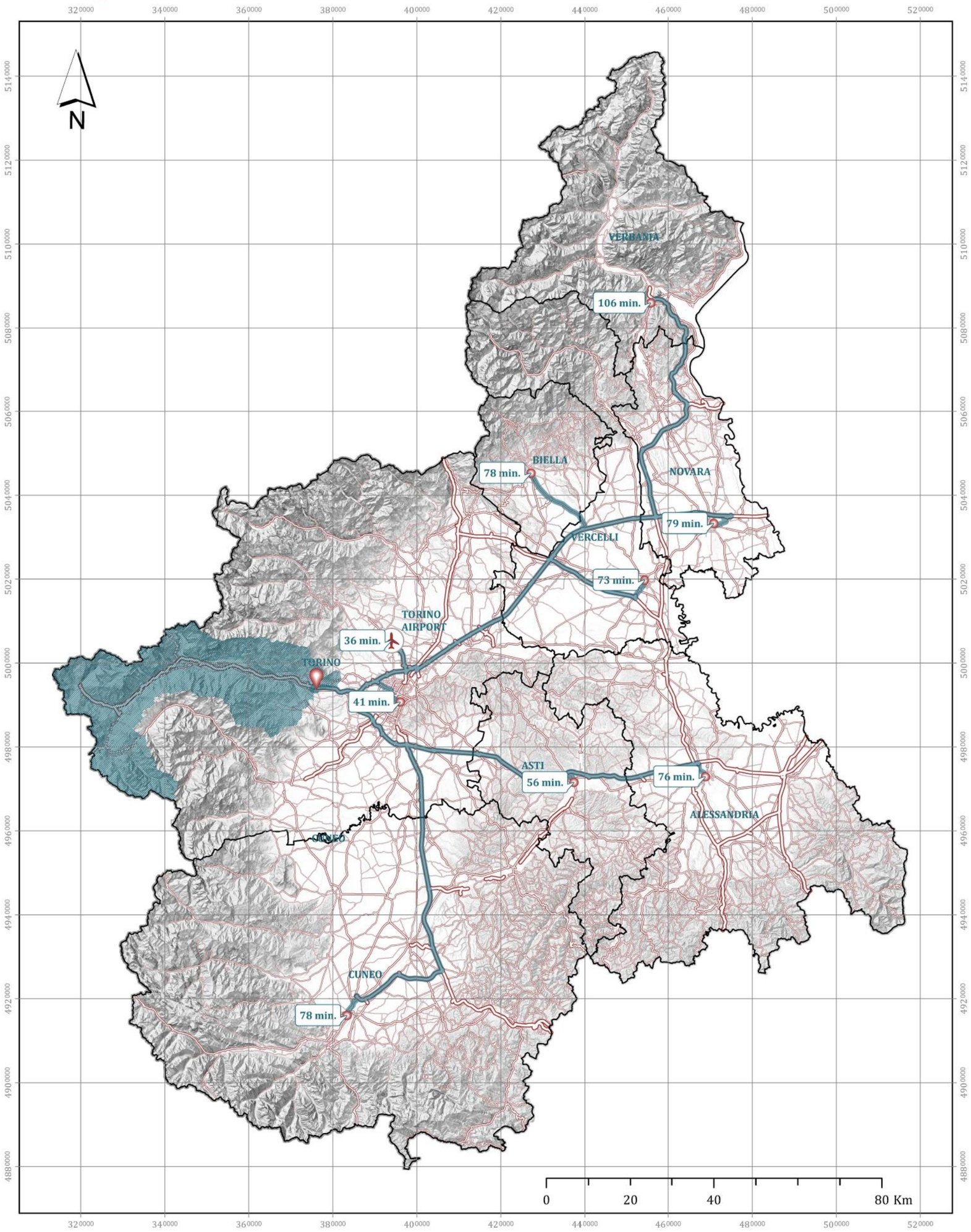
Locations of Industries



*Different colours represents the sector: Textile Metal Chemical

**Outline of the point indicates time to spent. It is determined by estimating the walking time between existing structures at each industrial stop and the estimated visit time for each structure. Each ring represents 20 minutes.

Transportation Routes and Times to Susa Valley by Car



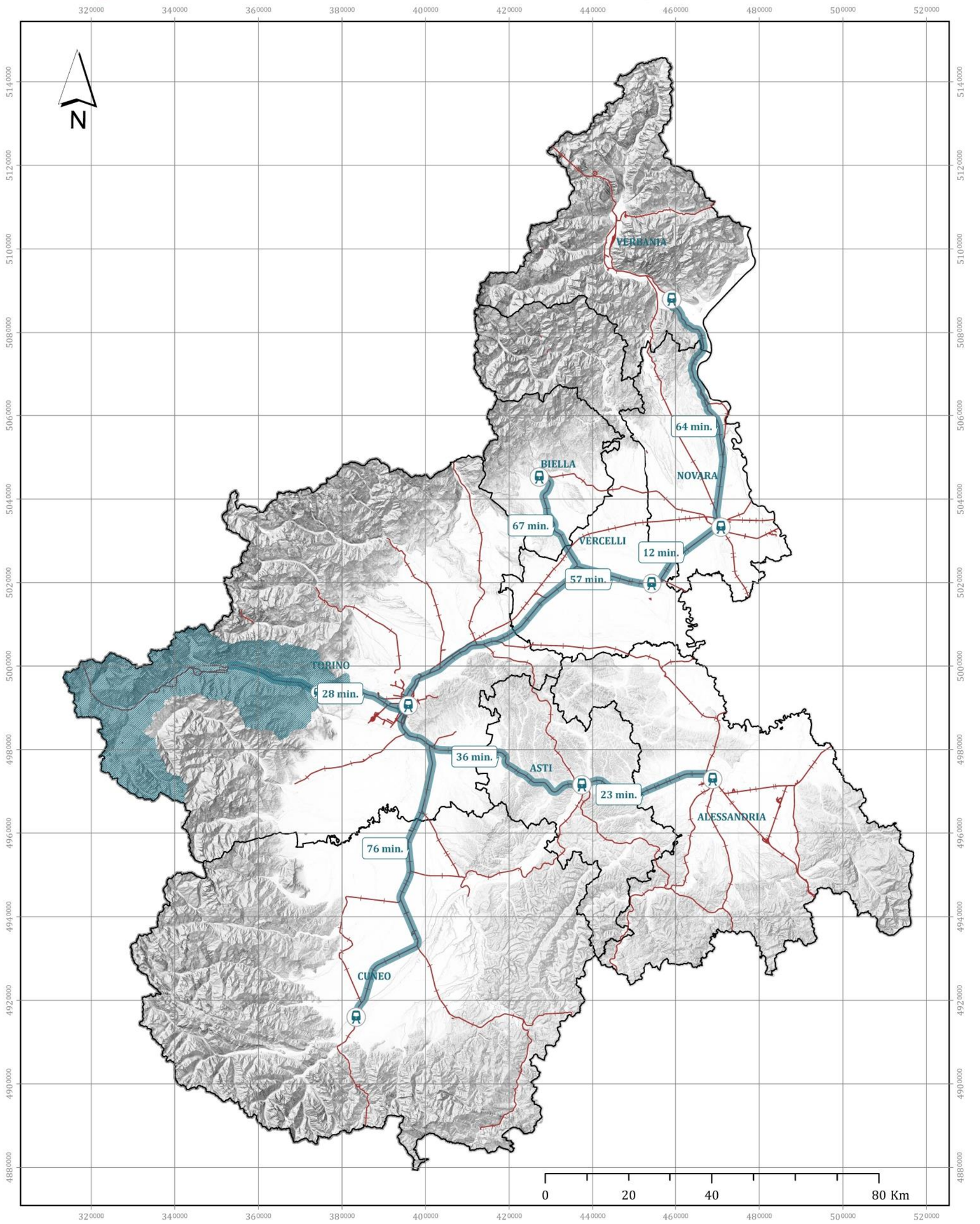
Legend

- Centre Points of Provinces
- Torino Airport
- Starting Point of the Susa Valley Route
- Province Borders
- Susa Valley
- Transportation Routes
- motorway
- primary road
- secondary road
- tertiary road

HillShade
Value
254
0

Slope
Value
82
0

Transportation Routes and Times to Susa Valley by Train



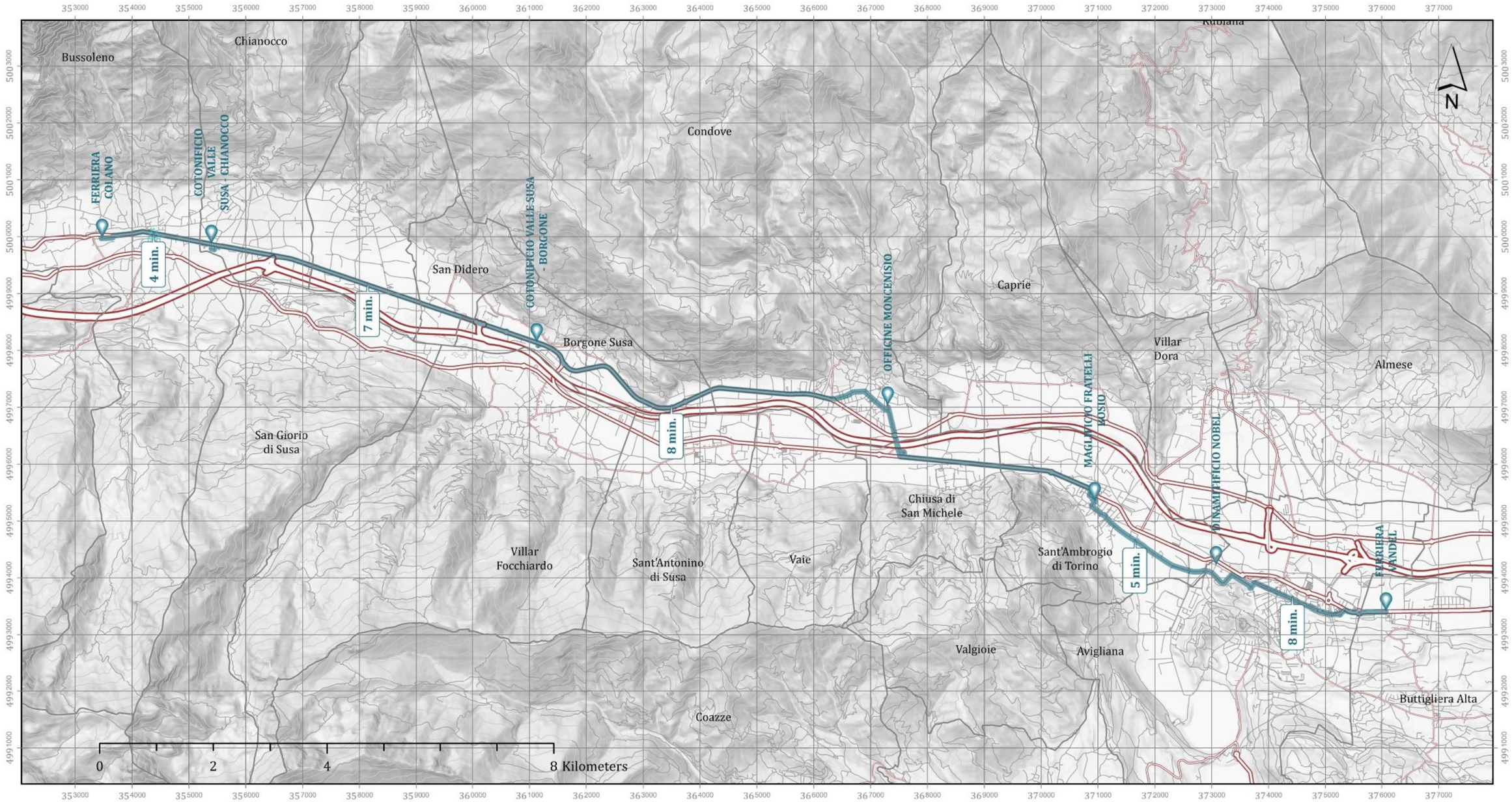
Legend

- Province Borders
- Susa Valley
- Train Stations
- Transportation Routes
- Railway

HillShade Value: 254 / 0

Slope Value: 82 / 0

Transportation Routes and Times in Susa Valley Industrial Route by Car



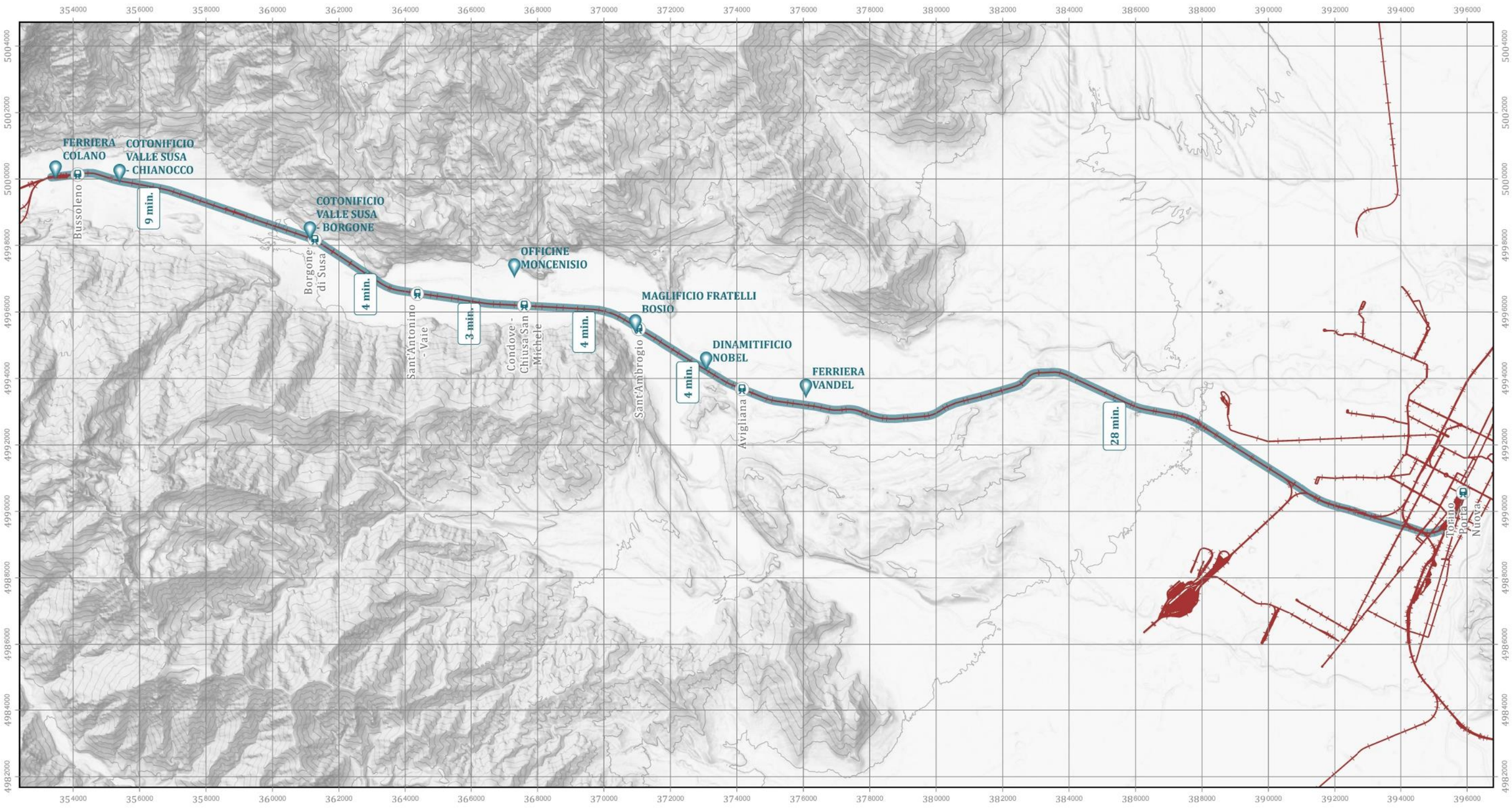
Legend

- Stops of the Susa Valley Industrial Route
- Transportation Routes
- Municipality Borders
- motorway
- primary road
- secondary road
- tertiary road

Slope
Value
80
0

HillShade
Value
254
0

Transportation Routes and Times in Susa Valley Industrial Route by Train



Legend

- Stops of the Susa Valley Industrial Route
- Railway Stops
- Railway
- Transportation Route

Slope

Value

82

0

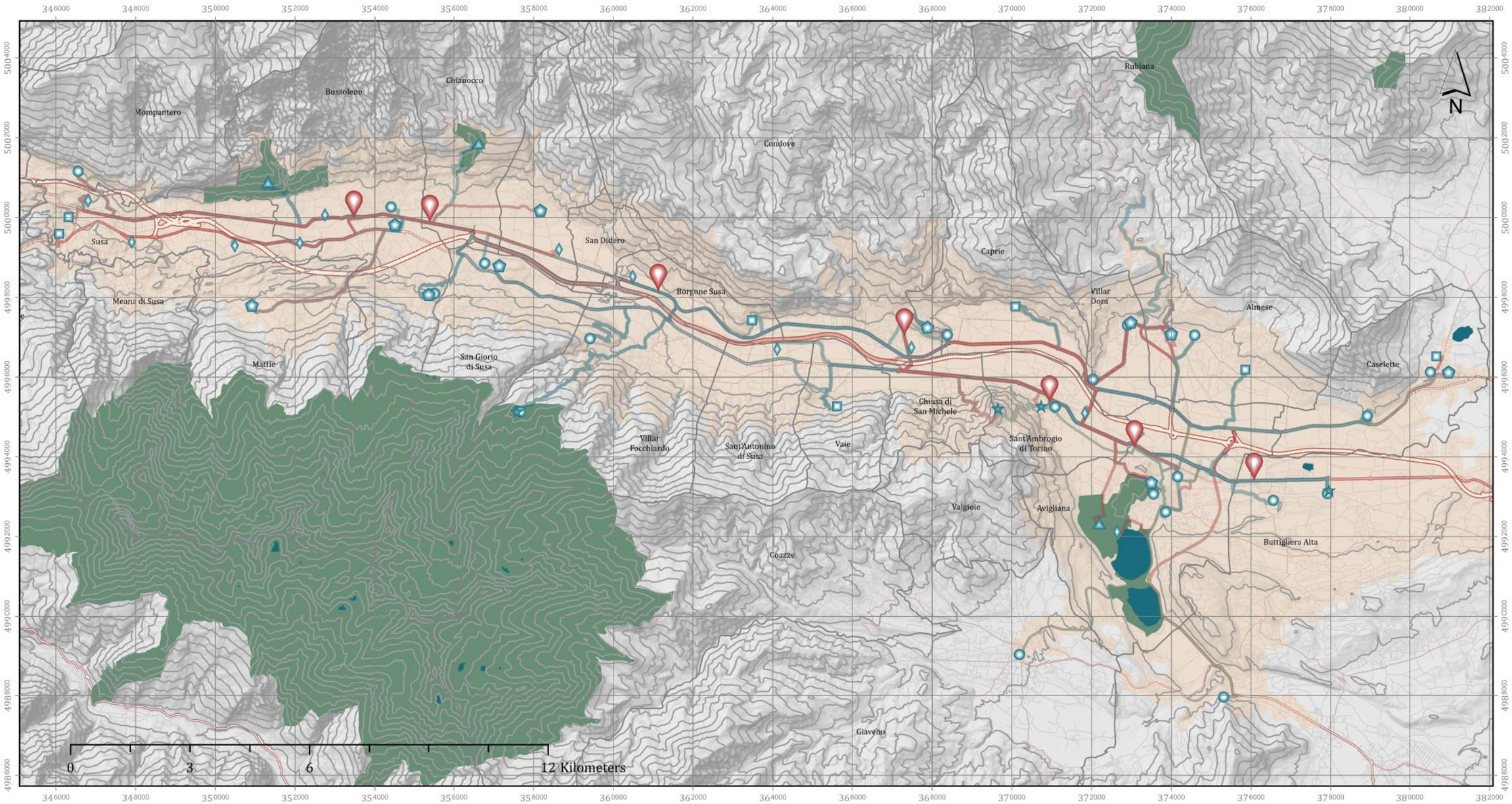
HillShade

Value

254

0

Historical and Natural Landmarks within 5km of the Susa Valley Industrial Route



Legend

- Stops of the Susa Valley Industrial Route
- Municipality Borders
- Archaeological permanence
- Castle
- Industrial Heritage
- Medieval Finds
- Protected Natural Areas
- Religious Structures
- motorway
- primary road
- secondary road
- tertiary road
- Transportation Routes
- Lakes
- Protected Natural Areas
- 5 km Distance Border

Slope
Value
80
0

HillShade
Value
254
0

Ferriera Vandel *was a company in the metal industry that existed in Buttigliera Alta between 1896 and 1992. It continued to be operated by FIAT in 1917 and was taken out of the hands of the Vandels. Although the first buildings built by the Vandel family have not survived to the present day, Vandel Village, consisting of workers' residences, is still standing today almost as it was in the past.*

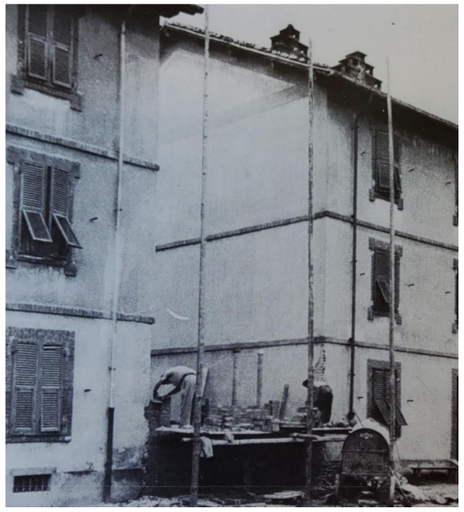
***(1)** The school of the “Regina Elena”.

(2) The Vandel village project included six three-story houses with basements along the internal road, originally intended for specialized French workers. (In 1955, 4 of the 6 blocks were combined into 2 blocks.)

The worker houses in Vandel follow a linear layout, providing better sanitary conditions (ventilation with double airflow, ample sunlight) and greater practicality compared to the block-style model.

The regular sequence of garden-house-garden follows traditional patterns of worker villages.

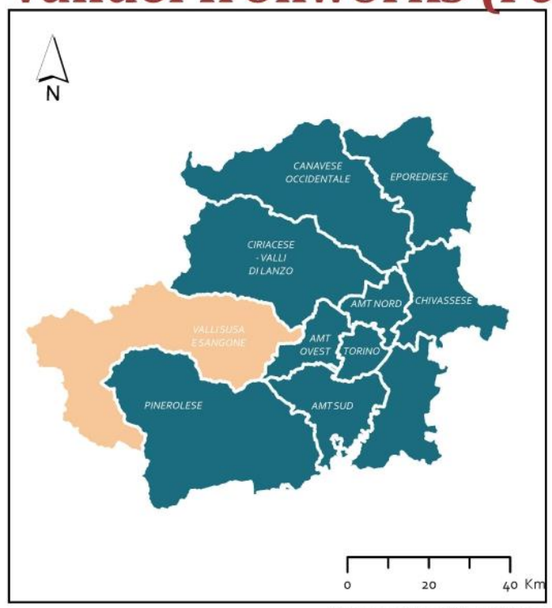
According to the 1891 census of houses and inhabitants, a one-room apartment with a kitchen housed four to five people, while a two-room apartment with a kitchen accommodated six to seven people.



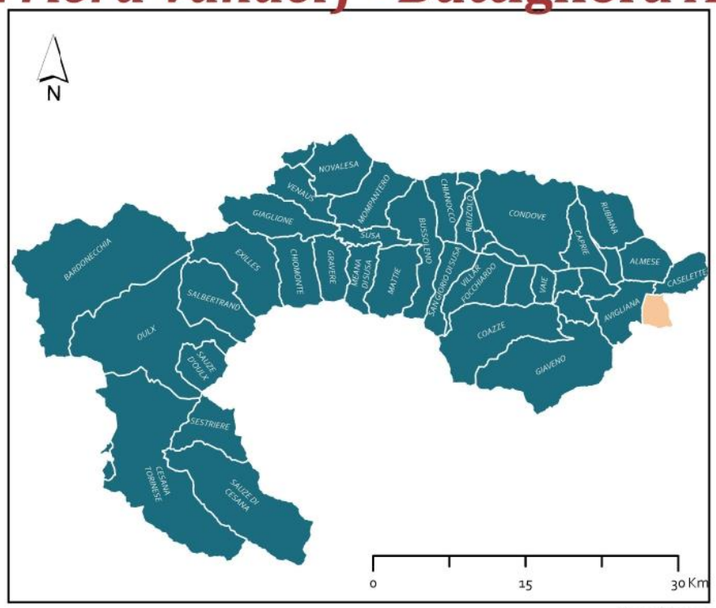
(3) The houses designated for the managers were semi-detached houses, two stories above ground, along the provincial road. They follow a symmetrical quadrangular layout with lateral staircases, reminiscent of the cottage-style model with a focus on family use, rooted in Central European tradition.

* Locations related to numbers are marked on the map.

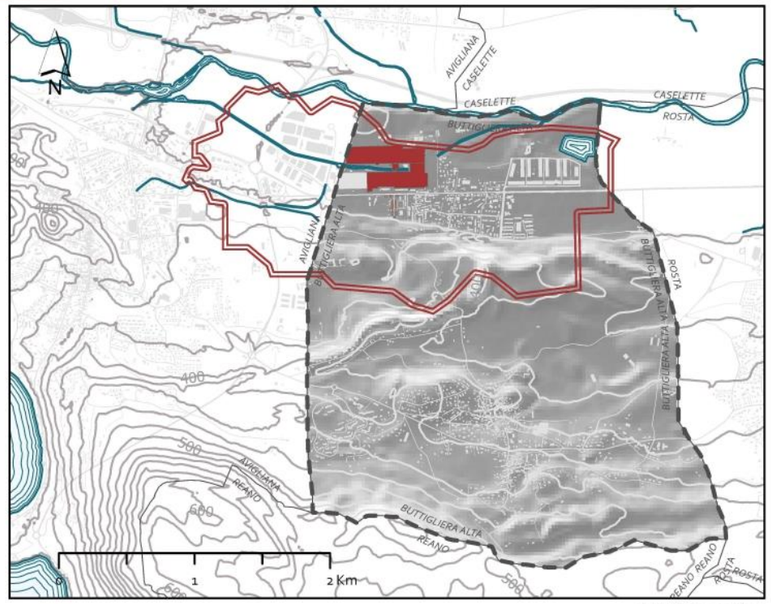
Vandel Ironworks (*Ferriera Vandel*) - Buttigliera Alta



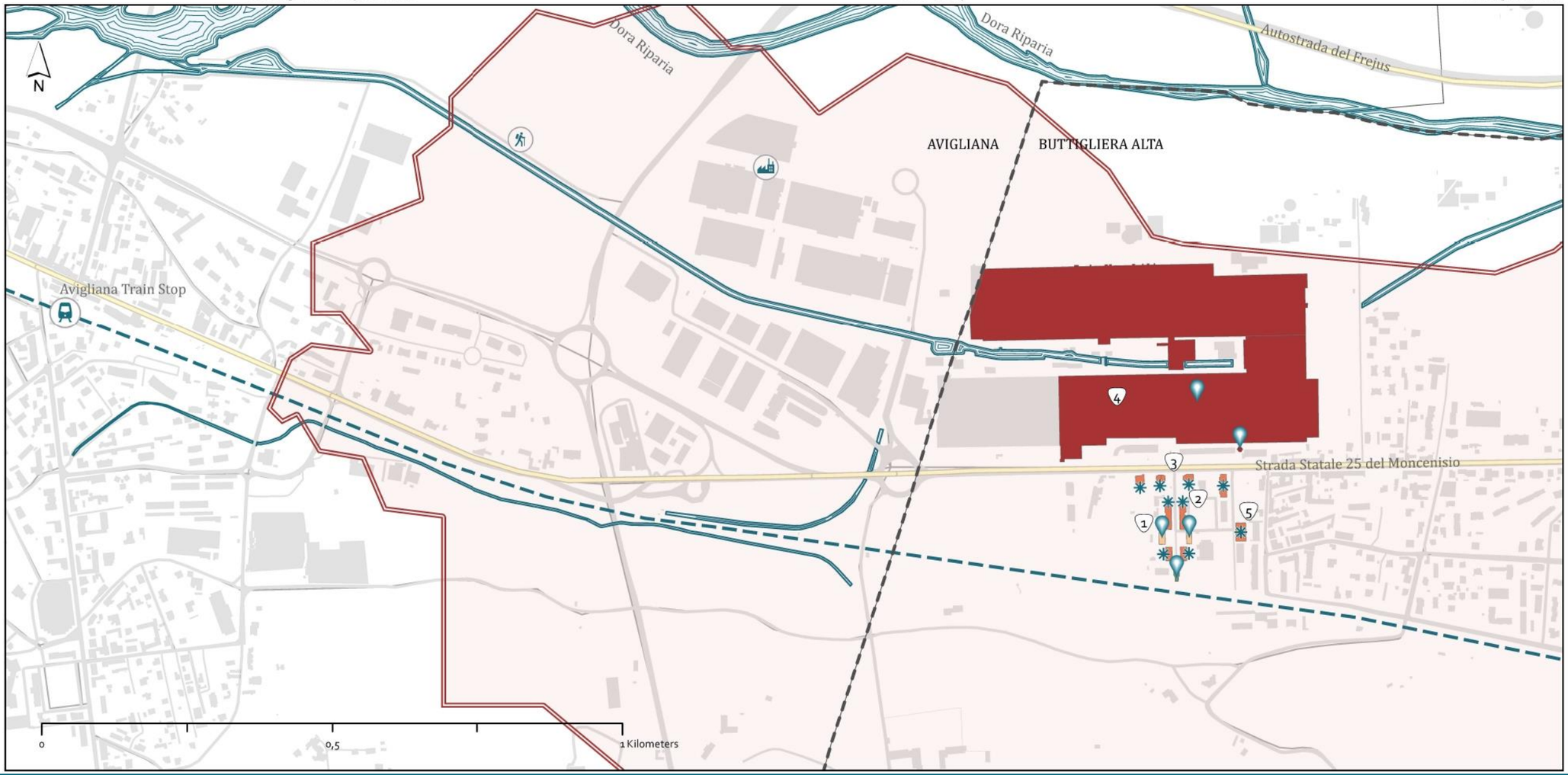
Metropolitan City of Turin



Susa Valley



Buttigliera Alta



Legend

Historical Function

- factory
- resident
- church
- public service

Visitability and Condition

- enterance is not possible (private) / good condition
- enterance is possible / good condition

- Hiking Area
- Industrial Heritage
- Train Stop

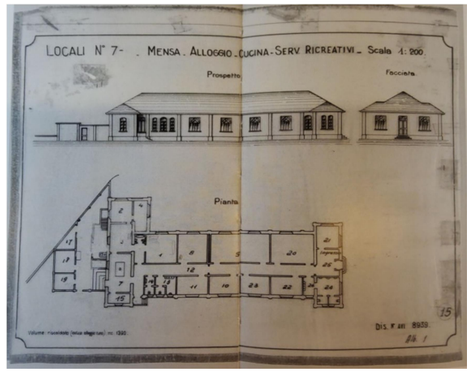
- Water Bodies
- Roads
- Buildings

- Municipality Border
- 1500 m distance border
- Main Road
- Railway

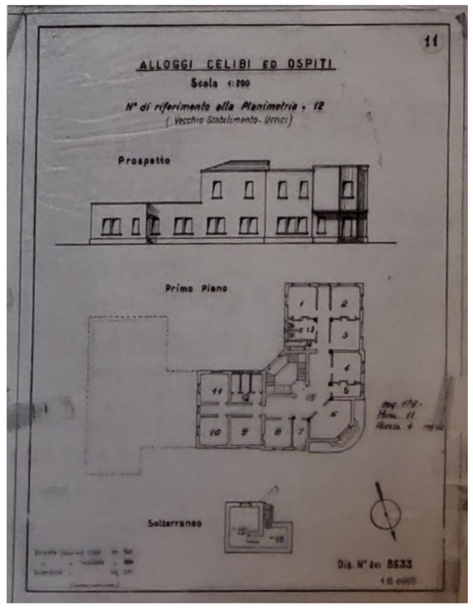
- Contour 20m

Dinamitificio Nobel *is a Hamburg-based company that existed in Avigliana between 1872 and 1965. He has signed many explosive patents. Although there are few remains from the early years of the company, which has a dispersed building complex due to its dangerous nature, the reinforced concrete structures it built in its last years are still standing and functioning.*

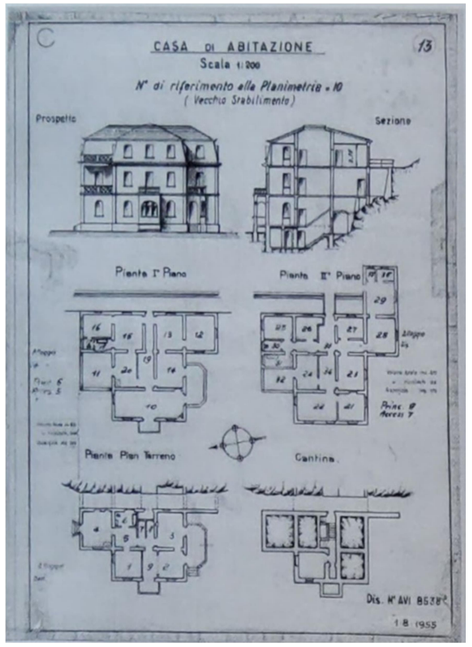
(1) Dining Hall



(2) Guest House



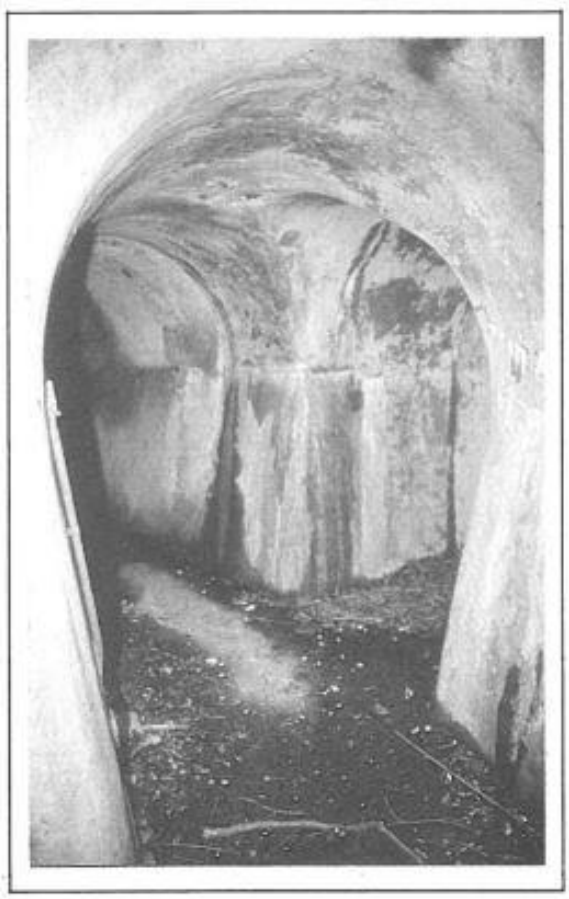
(3) Casa Bianca



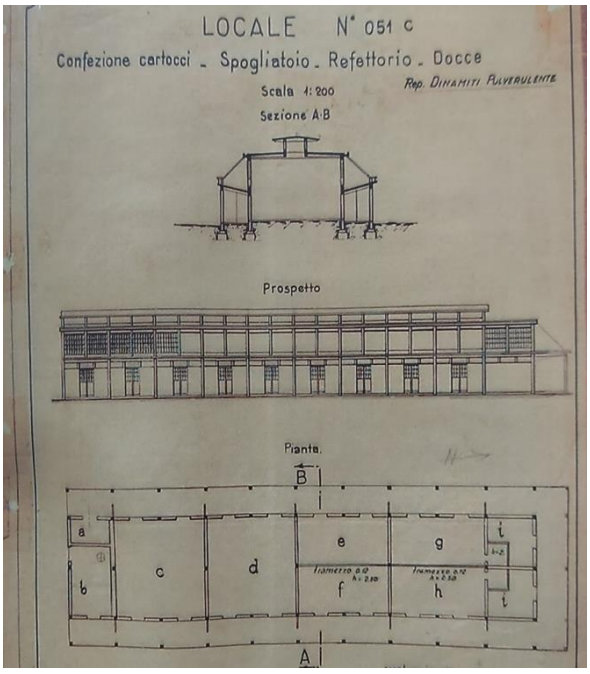
(4) Since 1998, a small portion of the settlement of the dynamite factory had been accessible to the public as an Eco-Museum within the Material Culture circuit of the Province of Turin, making it the first of its kind in Italy.

Although it is currently closed for a major renovation plan, guided tours are

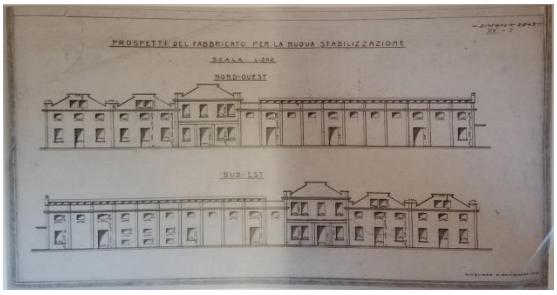
offered on the second Sunday of each month.



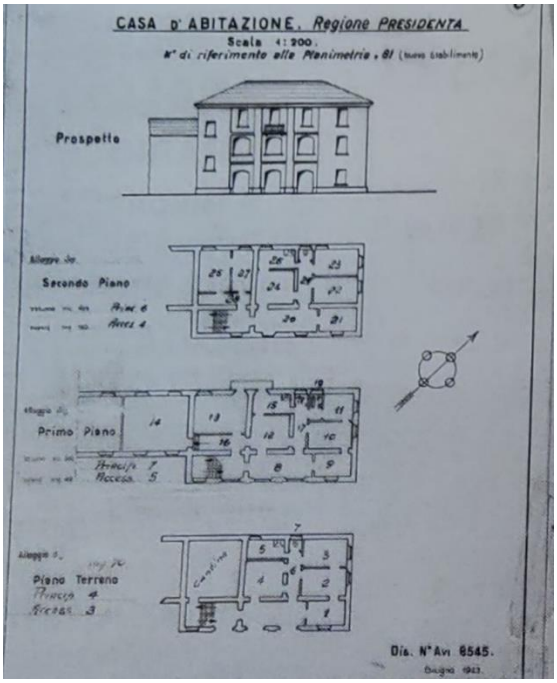
(6) Service Building: Changing room, refectory, showers.



(5)



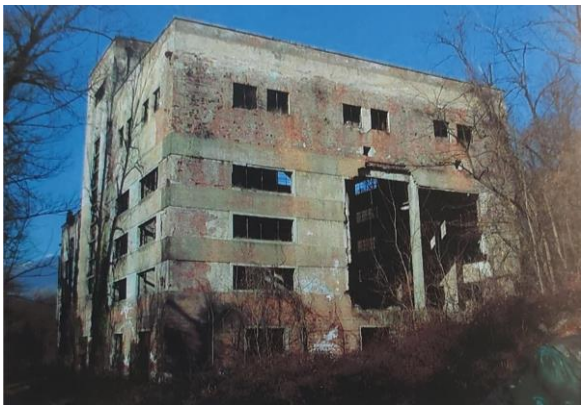
(7)

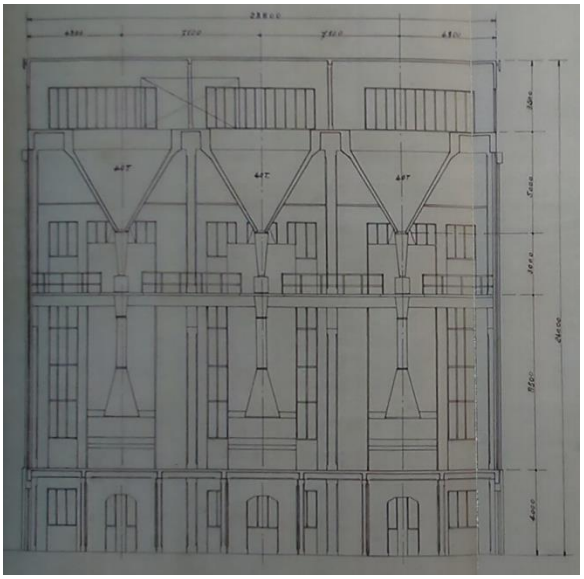


(8) In the 1930s, Dinamitificio turned to producing T4, or Exogene, produced using accessible raw materials such as methyl alcohol and ammonia. Due to the intense heat need arising from this production, a coal-fired thermoelectric power plant was built in the newly determined region in order to increase production efficiency.

The thermoelectric power plant is the largest building in the region in terms of both height and size.

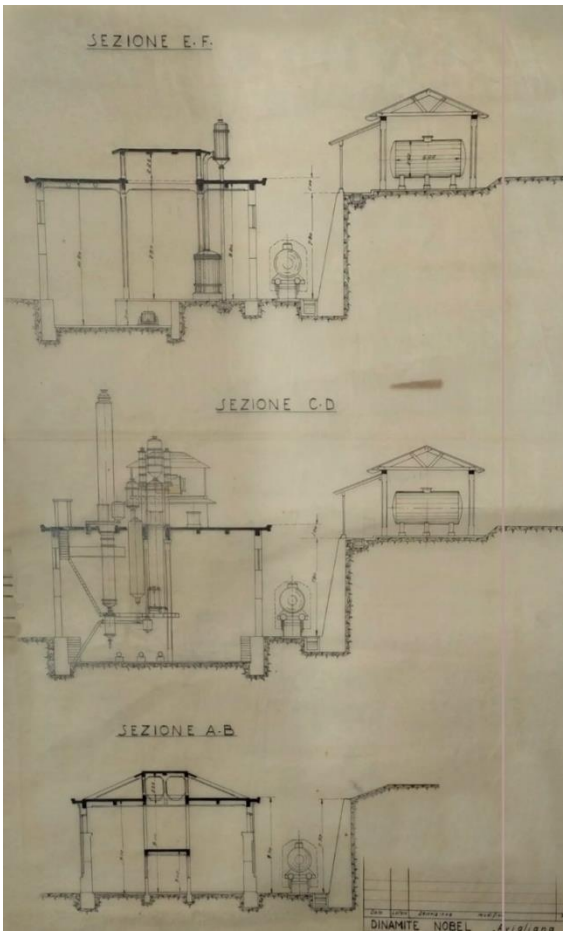
The building is abandoned and mostly demolished.





(9) The building consists of two blocks side by side, one at the bottom and one at the top. The facade with low arch openings is brick cladding. In addition to the side openings, both blocks have skylights.

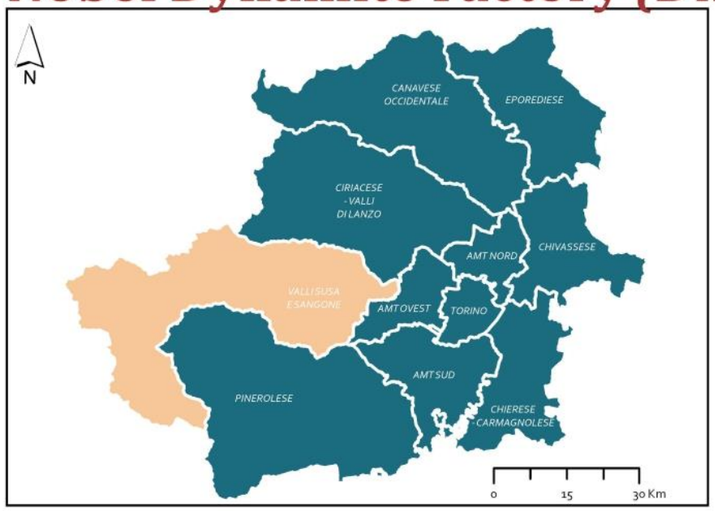
The building is abandoned and partly demolished.



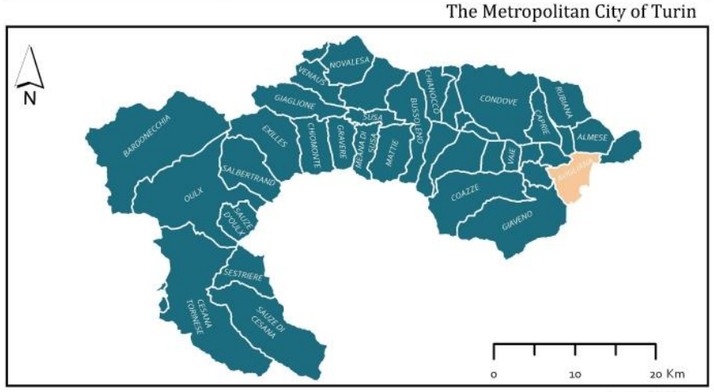
(T4 Region [*Parco Naturale dei Laghi di Avigliana*]**)** In the T4 production area, all buildings except two close to Lago are in ruins and there is no access to this fenced area. The building closest to Lago is used as the Management Body for the Protected Areas of the Cottian Alps, and the other is the old thermoelectric power plant building, most of which has been demolished.

The former T4 area is completely covered with greenery and is bordered to the west by the Mareschi marsh, characterized by various hydrographic elements, such as the Naviglia Canal, and to the east by the hill.

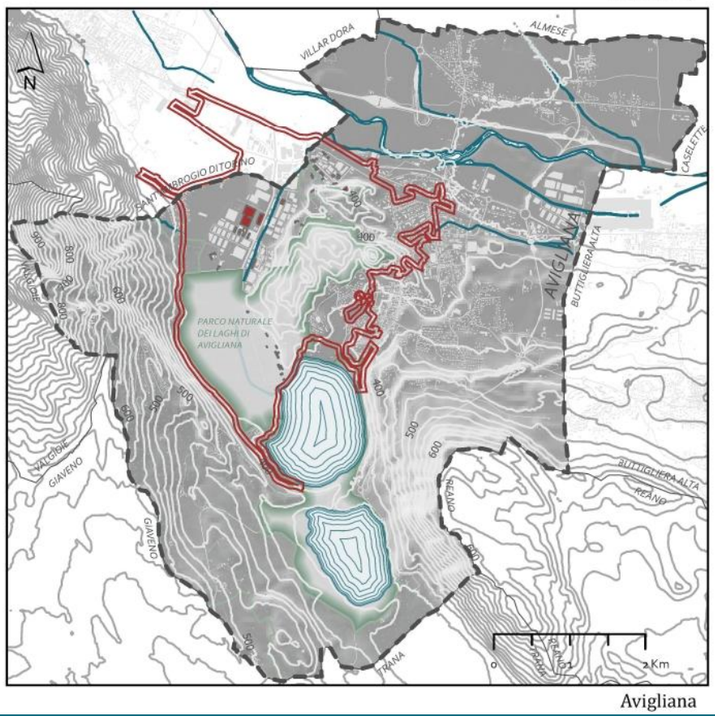
Nobel Dynamite Factory *(Dinamitificio Nobel)* - Avigliana



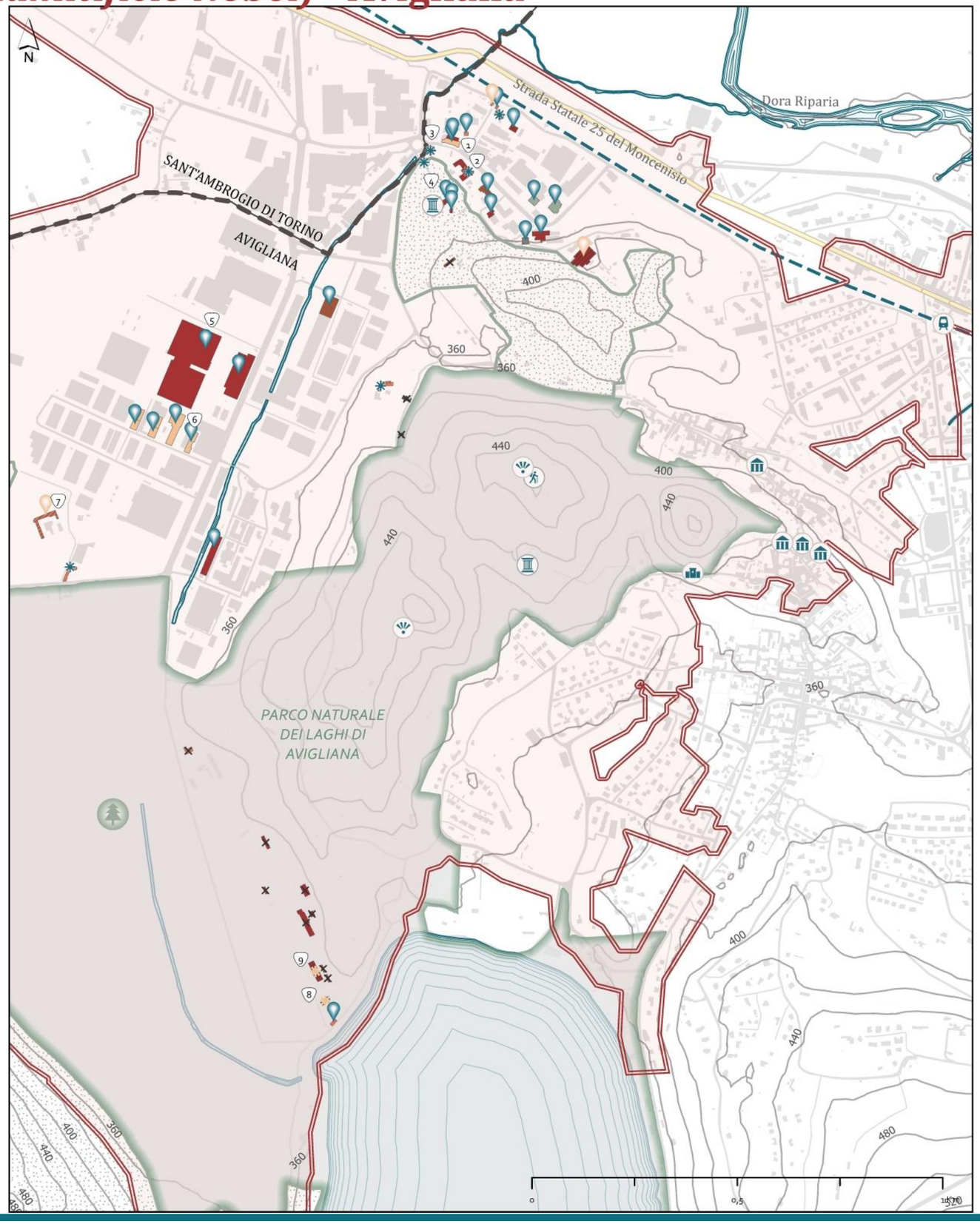
The Metropolitan City of Turin



Susa Valley



Avigliana



Legend

Historical Function

- workshop
- warehouse
- service
- resident
- hydroelectric power plant
- thermoelectric power plant
- uncertain
- abandoned building

Visitability and Condition

- enterance is not possible (private) / bad condition
- enterance is not possible (private) / good condition
- enterance is possible / bad condition
- enterance is possible / good condition
- no access

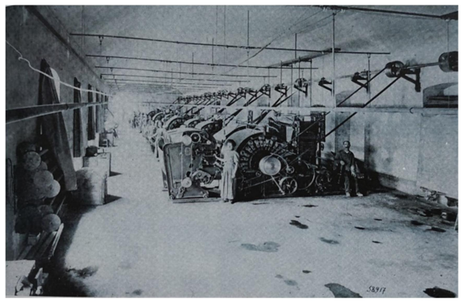
- Protected Area
- Historical Landmark
- Vista Point
- Hiking
- Castle
- Museum
- Train Stop
- Water Bodies
- Roads
- Buildings
- Municipality Border
- 1500 m distance border
- Main Roads
- Railway
- Contour 20m

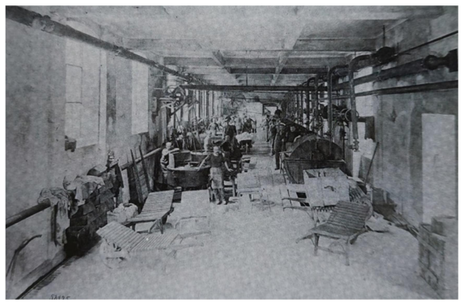
Maglificio Fratelli Bosio *is a textile company that existed in Sant'Ambrogio between 1872 and 1949. Architecturally, it is the most striking and aesthetic industrial structure of the Susa Valley. In addition to the factory, the workers' houses and the director's house are also standing in a very well preserved condition.*

(1) While the main facades of the factory facing the railway and transportation road have a detailed design, the other facades facing the valley and the city have a rustic character.

Structurally, the Maglificio Bosio used a supporting wall frame and a roof consisting of simple iron beams resting on two side walls, spanning the entire width at very short intervals.

The facade consists of special architectural elements such as arched doors, decorative cornices and different window designs. The use of materials such as brick and textured plaster also contributes to the different appearance of the factory.

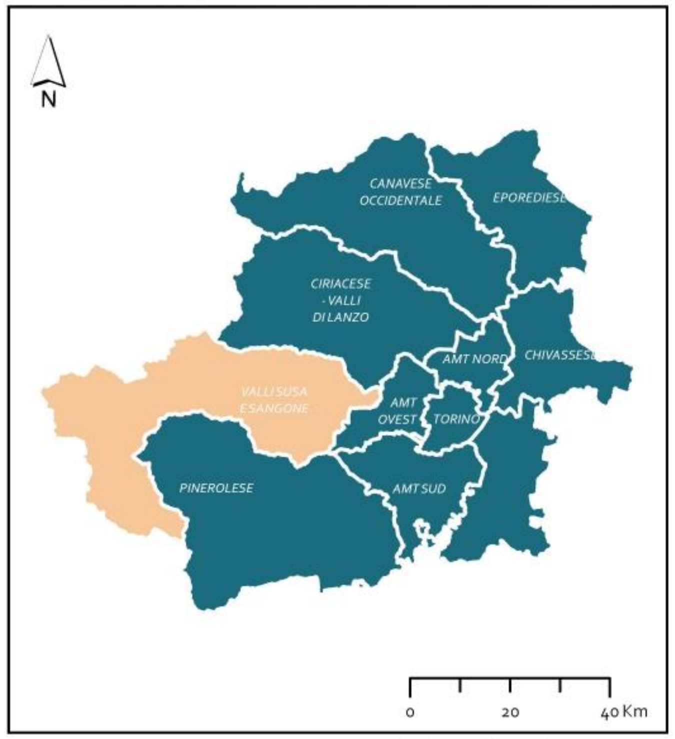




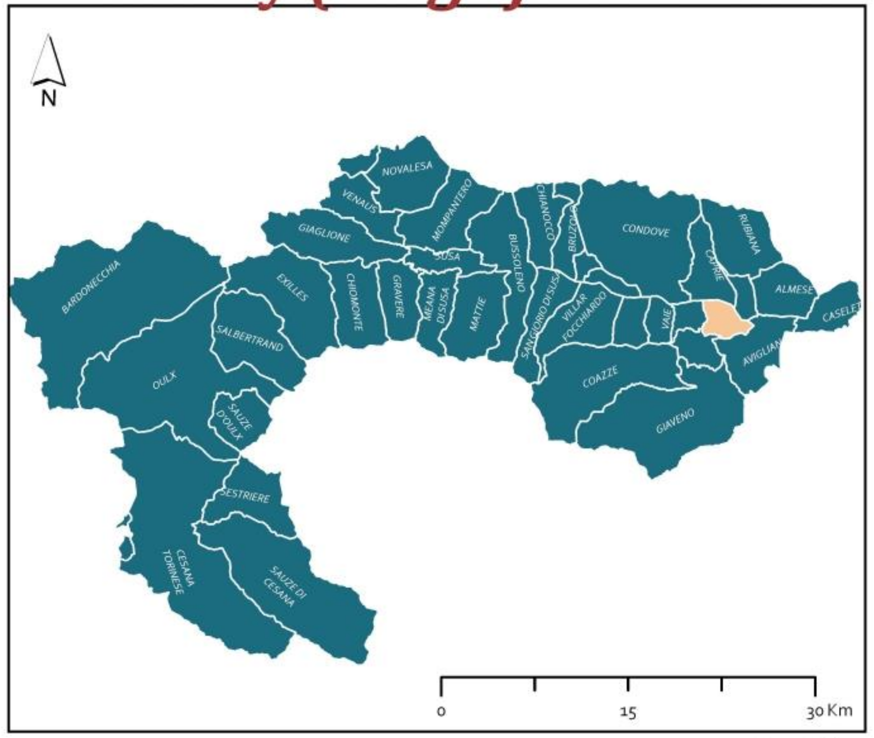
(2) The residence of the plant's director Alessandro Neveux. This location is now used as the municipality of Sant'Ambrogio Di Torino.

(3) In 1893, workers' residences were established, forming a new village. Its main thoroughfare was named after the Bosio Brothers on May 3rd, 1894. These homes belonged to department heads of the plant and, to this day, are primarily owned by their descendants.

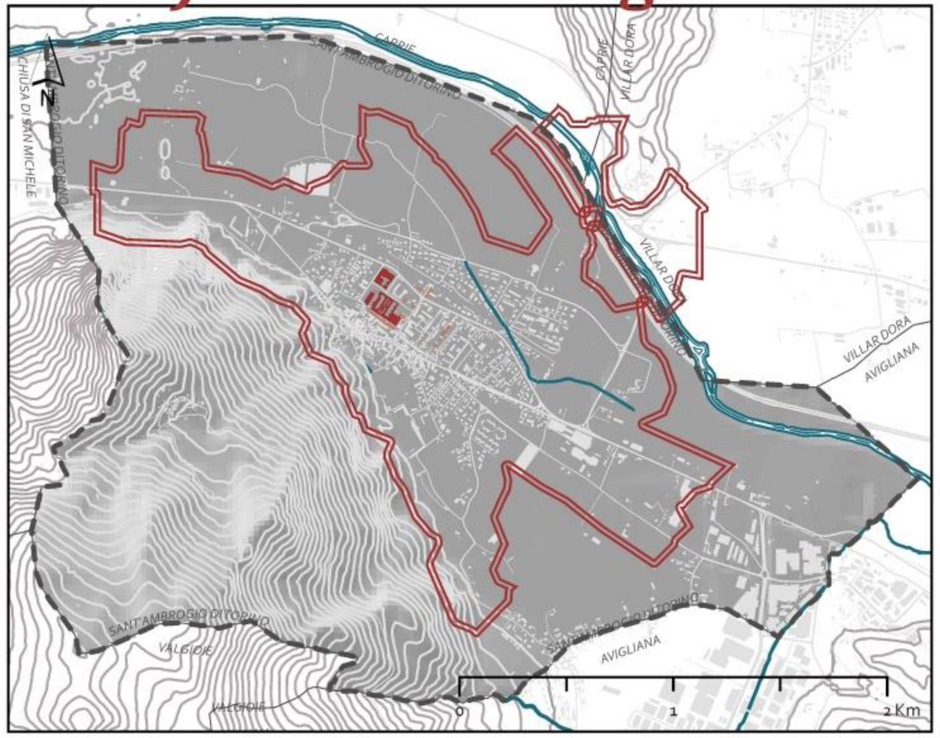
Fratelli Bosio Knitwear Factory *(Maglificio Fratelli Bosio)* - Sant'Ambrogio



Metropolitan City of Turin



Susa Valley



Sant'Ambrogio

Legend

Historical Function
- factory
- resident

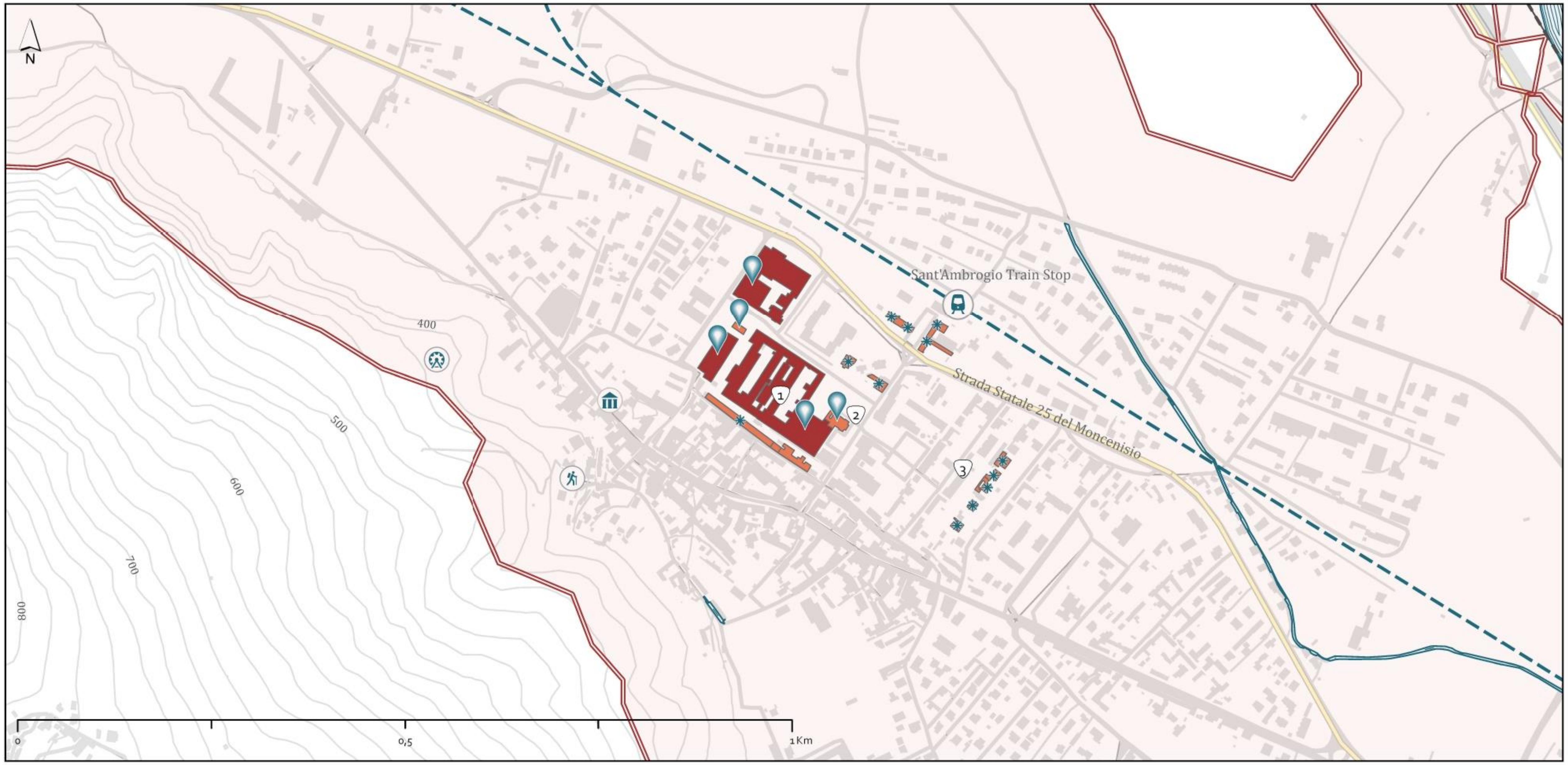
Visitability and Condition
- enterance is not possible (private) / good condition
- enterance is possible / good condition

- Amusement Park
- Hiking Area
- Historical Landmark
- Train Stop

- Water Bodies
- Roads
- Buildings

- Municipality Border
- 1500 m distance border
- Main Road
- Railway

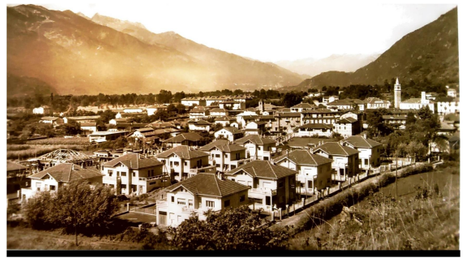
- Contour 20m



Officine Moncenisio *was a company serving in the metal industry that existed in Sant'Ambrogio between 1906 and 1974. In addition to the factory structure, which is still in good condition although not currently in use, there are many worker residences and service buildings built by the company in the region.*

(1) Canteen. This large building, situated just in front of the factory entrance, features a ground-floor warehouse for bicycles and a spacious cafeteria on the first floor with seating for 400 people. For a nominal sum, individuals can receive soup or eat their own meals brought from home.

(2) Mussolini Village, a residential area for employees designed by Cesare Piazza. This village comprises twenty small houses with gardens and vegetable plots, each containing two separate apartments with independent entrances, bathrooms, and even garages.



(3) Public baths, providing hot water and towels for a small fee, alongside accommodations for workers.

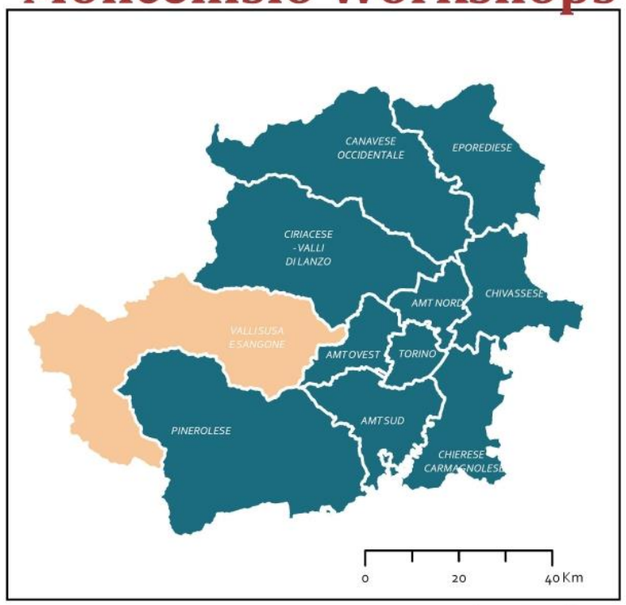
(4) Polyclinic

(6) Six large public apartment buildings named "Ca' neire".

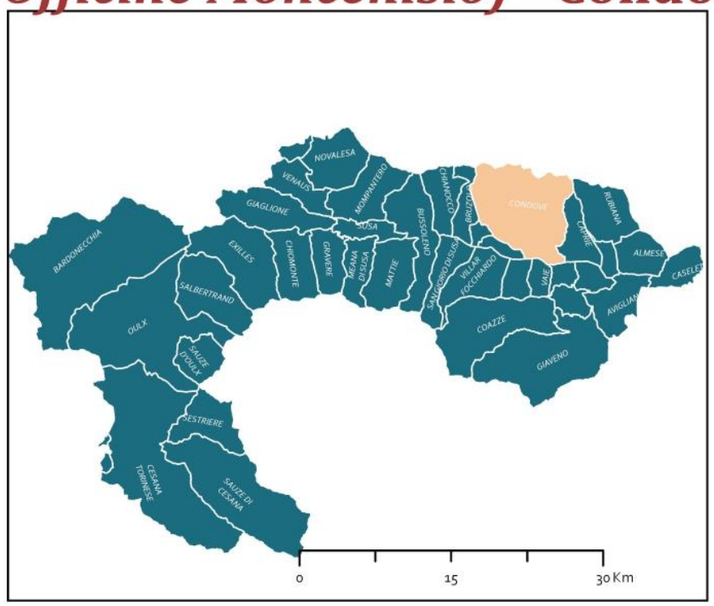
Designed along British lines, these structures included communal amenities for both families, such as external bathrooms, communal washing areas, and free lighting and water provided twelve hours a day by the Gravio power plant. 180 families lived in these buildings.

(5) Ina-Case plan. Four buildings, comprising a total of 16 apartments with five rooms each.

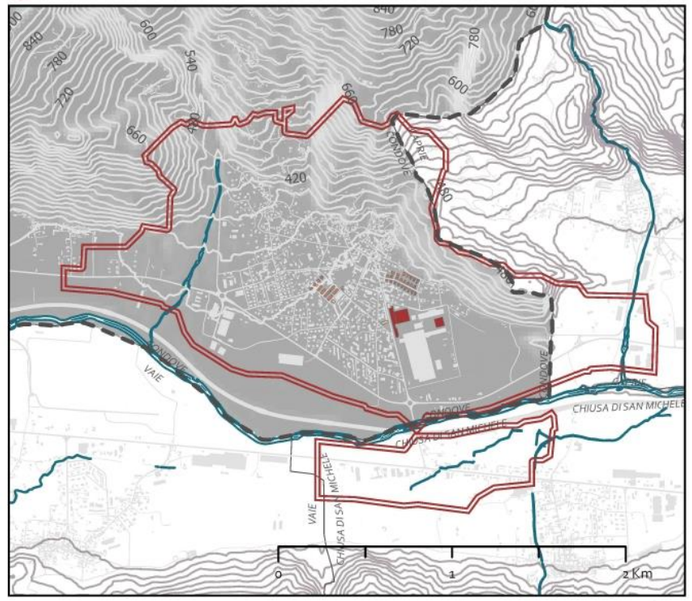
Moncenisio Workshops *(Officine Moncenisio)* - Condove



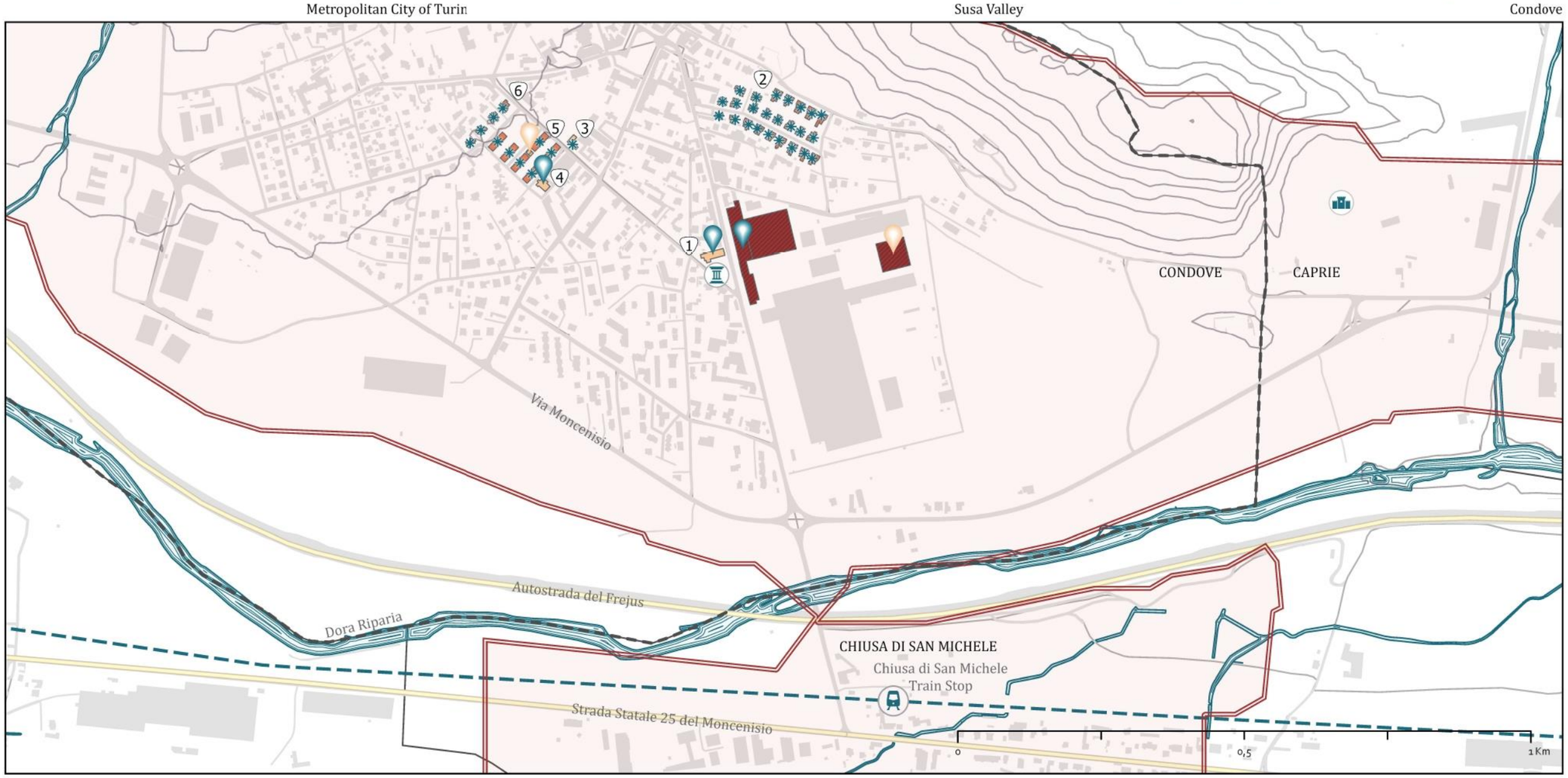
Metropolitan City of Turin



Susa Valley



Condove



Legend

Historical Function

- factory
- resident
- service
- abandoned building

Visitability and Condition

- enterance is not possible (private) / good condition
- enterance is possible / bad condition
- enterance is possible / good condition

- Castle
- Museum
- Train Stop

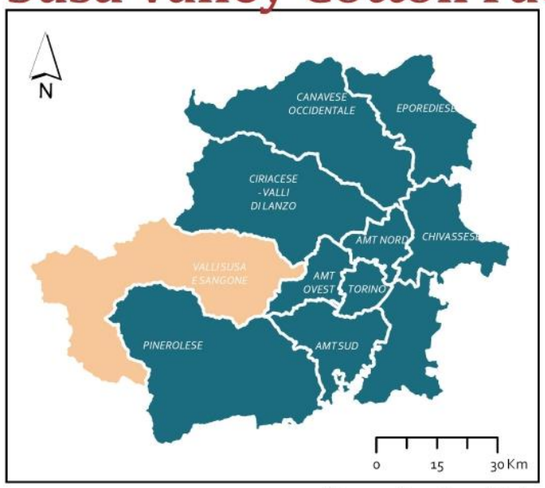
- Water Bodies
- Roads
- Buildings
- Municipality Border
- 1500 m distance border
- Main Road
- Railway
- Contour 20m

Cotonificio Valle Susa *is a textile company that existed in many different parts of Turin between 1880 and 1969 and was founded by Swiss Wild and Abegg. Since one of the three different factory complexes in the Susa valley is completely destroyed today, only the Borgone and Chianocco factories are included in the route.*

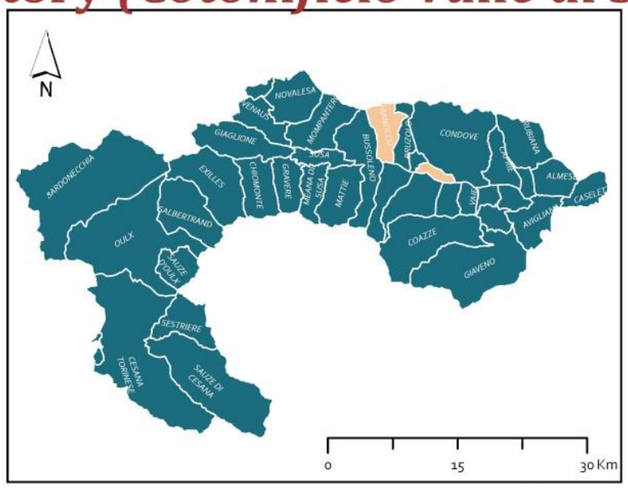
(Borgone-1) The structure consists of cast iron columns, iron beams supported by load-bearing perimeter walls made of conglomerate stone and bricks, and brick vaults.

(Chianocco-1) The structure consists of cast iron columns, iron beams supported by load-bearing perimeter walls made of conglomerate stone and bricks . The façade features window decoration using simple brick moulding, brick columns standing in front of plastered walls, and brick marcapiano details.

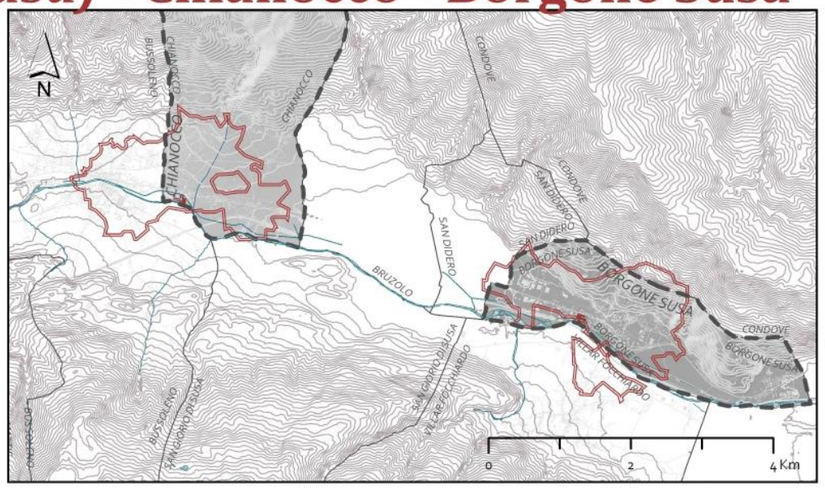
Susa Valley Cotton Factory *(Cotonificio Valle di Susa)* - Chianocco - Borgone Susa



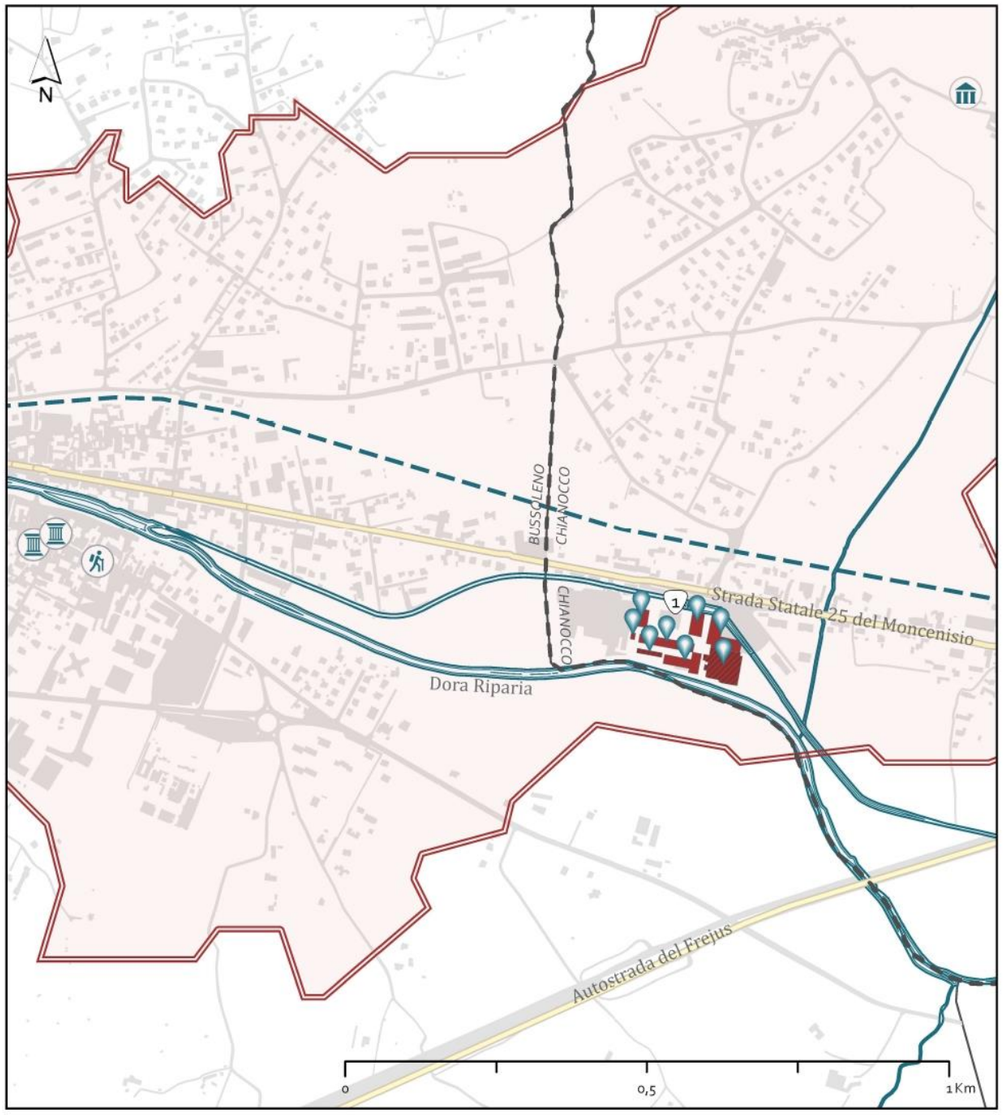
Metropolitan City of Turin

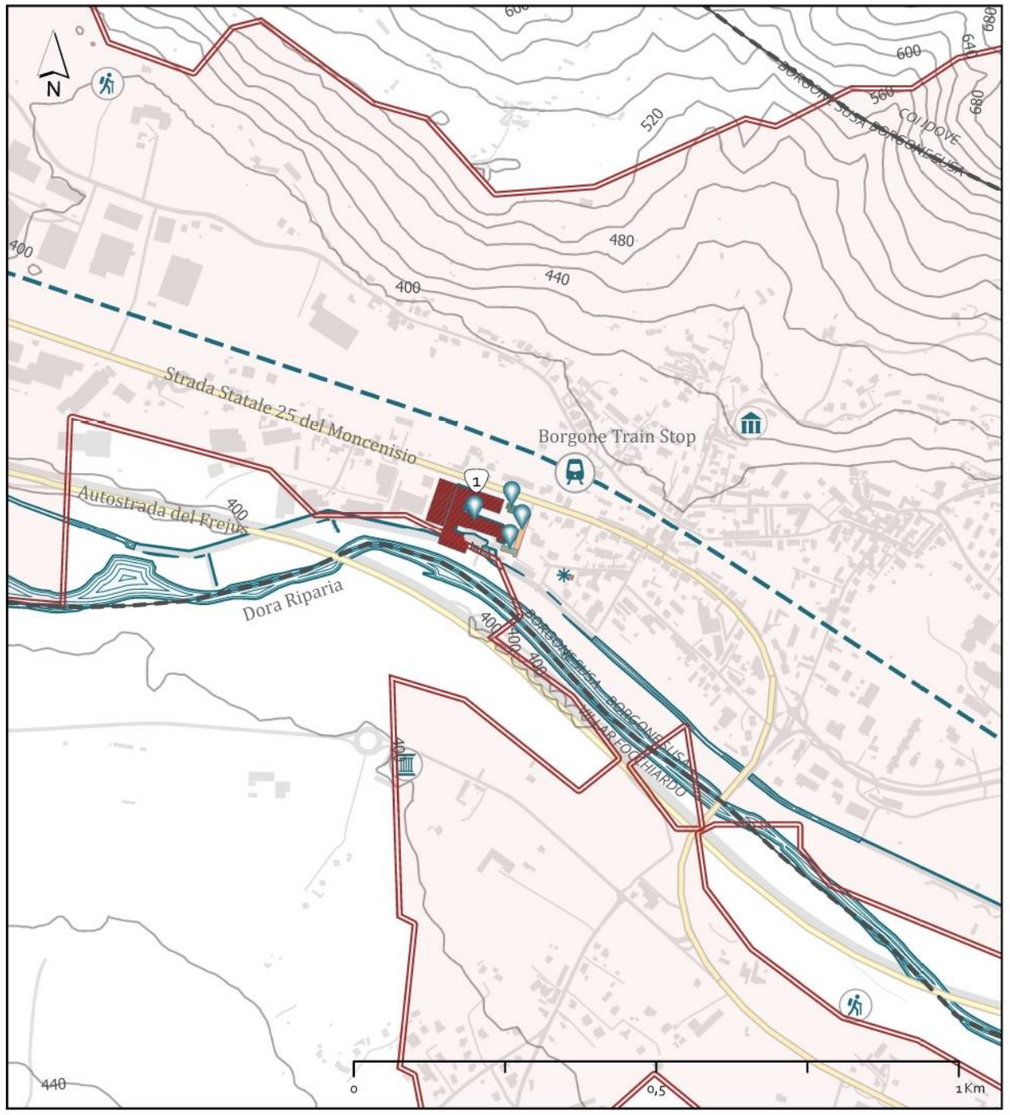


Susa Valley



Chianocco - Borgone Susa





Legend

Historical Function
- administration
- hydroelectric centre
- factory
- resident
- service

abandoned building

Visitability and Condition
- enterance is not possible (private) / good condition
- enterance is possible / good condition

Hiking Area

Historical Landmark

Museum

Train Stop

Water Bodies

Roads

Buildings

Municipality Border

1500 m distance border

Main Road

Railway

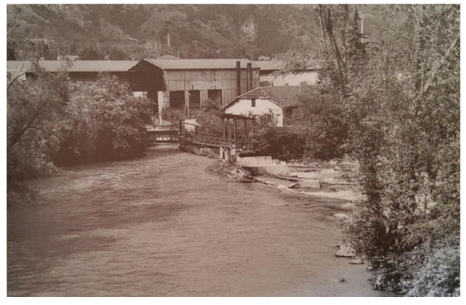
Contour 20m

Ferriera Colano *is a metal industry company that existed in Condove between 1876 and 1986. It is a poorly protected industry. It has either completely lost or is about to lose most of its structures.*

(1)

(2)

(3)

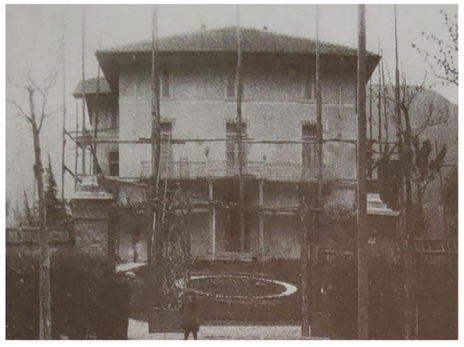


(4)

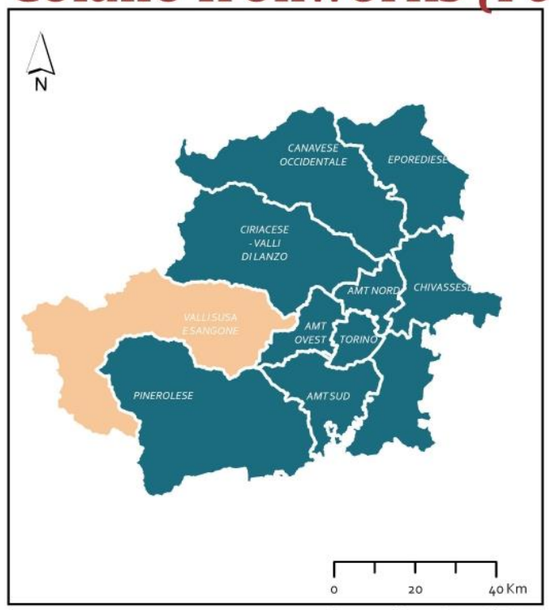
(5) Villa Ferro, which stands in an elevated position on the bank of the Dora opposite to that of the factory, was not built from scratch, but is the result of the renovation of a pre-existing building. The villa completed in 1906.

After having been the family home for over fifty years, during the Second World War, the villa was commandeered by German troops as their command center. After their departure in 1945, French "maquis" occupied the villa, later followed by Jews who survived concentration camps. Villa Ferro then was divided into small apartments which were then rented out to private individuals. Subsequently, in the 1960s, it became the seat of the state middle school. Having exhausted its function as a temporary school building, it remained uninhabited for several years.

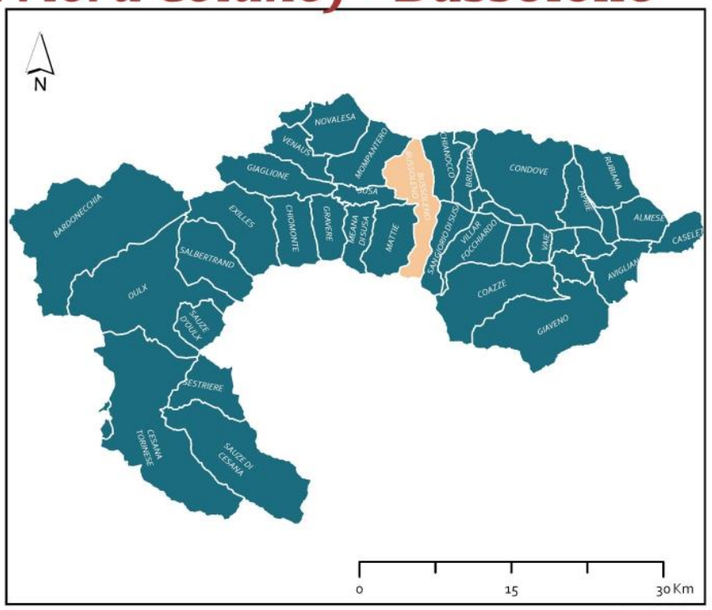
Today the building is owned by Susa Valley Mountain Union.



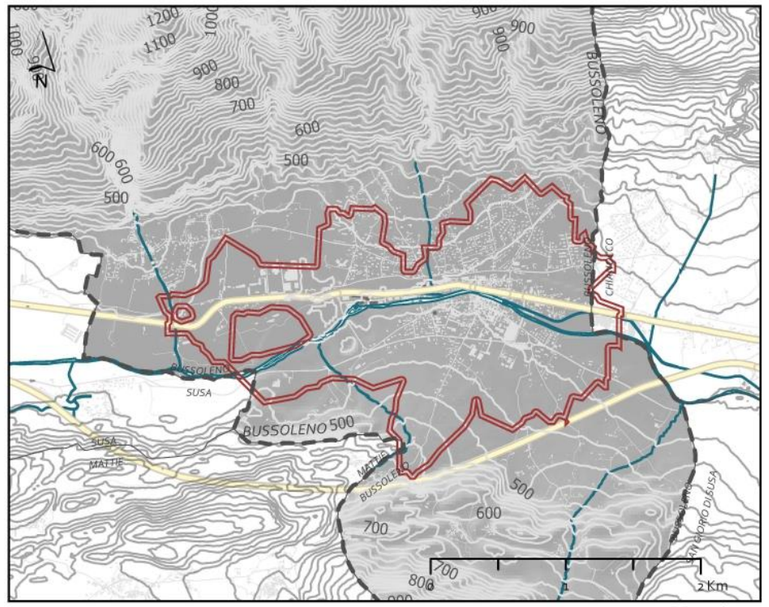
Colano Ironworks *(Ferriera Colano)* - Bussoleno



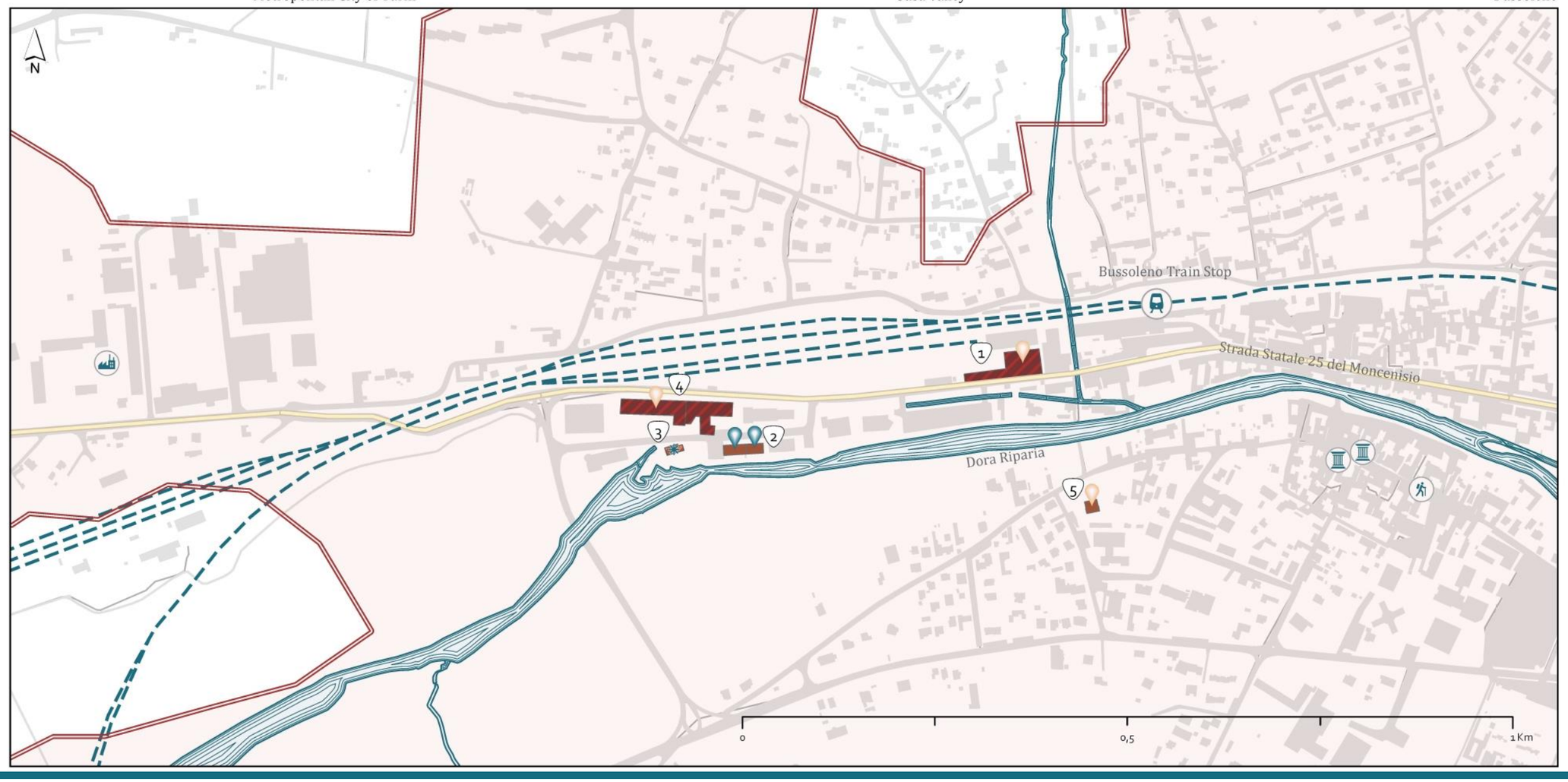
Metropolitan City of Turin



Susa Valley



Bussoleno



Legend

Historical Function
- factory
- resident
- workshop

abandoned building

Visitability and Condition
- enterance is not possible (private) / good condition
- enterance is possible / bad condition
- enterance is possible / good condition

Hiking Area
Industrial Heritage
Museum

Train Stop

Water Bodies
Roads
Buildings

Municipality Border
1500 m distance border
Main Road
Railway

Contour 20m

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