ISSN: 2978-5111

Journal on Political Sciences & International Relations

SCIENTIFIC Research and Community

Review Article

Open Access

Historical Evolution of Water Management in Liguria: From Agricultural Landscapes to Coastal Gardens

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ABSTRACT

Liguria is an Italian region of the Mediterranean, consisting of a narrow hilly arc overlooking the sea, with only the Magra River having a significant water flow. Despite its limited territorial extension and the scarcity of surface water, Liguria has always been a land of great agricultural diversity.

In the past, water use was defined by a contrast between the communal management of public resources and the individualism of private properties. This study focuses on the transformation of an arid landscape into fertile land through sustainable water management. The construction of terraces for cultivation on steep slopes, as well as the building of canals and cisterns for the ingenious use of water, are well documented through extensive historical records and cartography.

Emblematic examples of water management include coastal agricultural systems (such as Cinque Terre and Chiavari), while in noble estates, water plays a crucial role not only in supporting Mediterranean vegetation through elaborate hydraulic systems but also in maintaining productive agricultural areas.

Liguria's centuries-old expertise in water management provides valuable insights for addressing contemporary challenges: integrating traditional practices with technological innovations can offer sustainable solutions for the future.

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Received: February 10, 2025; **Accepted:** February 14, 2025; **Published:** February 25, 2025

Keywords: Landscape Architecture, Mediterranean, Terracing, Gardening, Historical Cartography

Introduction

Water resource management has been a crucial component of Mediterranean civilizations since antiquity. Liguria is an Italian region overlooking the Mediterranean Sea, characterized by a predominantly hilly morphology that descends directly to the coast. In this mountainous and rugged coastal landscape, water initially played a central role in shaping the environment itself and later in the development of human activities. In addition to its steep topography, the region's limited territorial extension and Mediterranean climate marked by heavy winter rainfall and dry summers have significantly influenced water use practices.

From Roman hydraulic systems to modern water management interventions, Liguria offers a unique perspective on both ancient and contemporary water practices, providing valuable insights into the governance of water resources in the present day, where sustainable use is increasingly essential.

This study focuses on both historical and modern hydraulic systems in Liguria, examining key examples of water infrastructure and their implications for sustainability and environmental management. Particular emphasis is placed on the role of water not only in shaping the landscape but also in its collection and efficient reuse, which has been fundamental to the socio-economic development of the region.

By analyzing geography, agricultural practices, and historical structures, this research highlights the interactions between humans and nature within the Ligurian context. In particular, it explores the technical and symbolic aspects of water management, assessing how these practices contribute to the sustainability and resilience of the territory.

Liguria

Geography, Morphology and Infrastructure Networks

Liguria is characterized by a complex morphology, where steep hills alternate with narrow coastal plains. This configuration has influenced land use, from Roman hydraulic infrastructure to modern water management practices. The hills, often covered by dense oak and chestnut forests, feed seasonal streams that flow toward the sea, presenting both opportunities and challenges for water supply.

Adaptation to such a challenging environment has led to innovative engineering solutions. One notable example is the system of terracing, designed to optimize water resources for agricultural practices in an otherwise unfavorable terrain. Additionally, the

region's proximity to the sea has facilitated the development of ports and hydraulic infrastructure essential for trade and fishing, both crucial to the local economy.

The Porto Antico of Genoa and the Gulf of La Spezia have historically played a key role in Liguria's maritime transport. The nearby town of Lerici served as a trade hub connecting Lunigiana, Tuscany, Parma, and Genoa, as the inland routes along the easternmost Ligurian coast were difficult to traverse. The Gulf of La Spezia also provided a safe harbor for sailors. Land connections between the western and eastern parts of the region improved only in the 19th century with the construction of the railway and new infrastructure.

Roman Aqueducts and Water Supply Infrastructure

Roman influence is evident in the numerous aqueducts and hydraulic infrastructures present in Liguria. These systems, built with advanced technologies for their time, ensured water supply to coastal cities and inland settlements. A notable example is the Roman aqueduct of Genoa, which transported water from mountain springs to the city through a complex system of canals, conduits, and cisterns.

The aqueducts reflect a deep understanding of hydrology and local topography. Their construction and maintenance demonstrate advanced engineering skills, allowing the Romans to overcome the challenges posed by the region's rugged terrain.

In particular, the Historic Aqueduct of Genoa, built in the Roman era and expanded until the 19th century, provided a continuous water supply to the city and port for centuries. Starting from Cavassolo, in the upper Bisagno Valley, it crosses forests, valleys, and urban districts, including engineering works such as the canal bridge over the Geirato stream (1777) and the one over the Veilino stream (1837), which offers a panoramic view of the Monumental Cemetery of Staglieno. Today, the pedestrian route along the aqueduct serves as a cultural itinerary that blends history, nature, and architecture, demonstrating how water heritage can be preserved and adapted to contemporary needs.

Cisterns and Water Collection Techniques in Historic Structures

In addition to aqueducts, cisterns were an essential element of ancient water systems. Many historic cisterns are still in use today, while new projects incorporate them to address the increasing periods of water scarcity.

Historically, these structures, often carved into rock or built with stone masonry, were used to collect and store rainwater. In rural areas, cisterns ensured a reliable water supply for irrigation and domestic consumption, especially during droughts. A significant example can be found in the Cinque Terre, where the scarcity of natural springs led communities to develop innovative water conservation solutions.

Cisterns are also present in Liguria's historic parks, where they continue to provide water for garden irrigation. One notable case is Villa Rezzola in Pugliola (Lerici), a property inherited by the FAI – Fondo per l'Ambiente Italiano in 2020. Through a PNRR-funded program for the enhancement of historic parks and gardens, restoration and redevelopment activities have been initiated. Villa Rezzola is an extraordinary example of an early 20th-century residence, where the myth of Mediterranean leisure takes shape through the harmonious relationship between architecture and nature.

The park, designed on an ancient agricultural property, enjoys a spectacular location overlooking the southwestern most part of the Gulf of La Spezia, with views of the Palmaria, Tino, and Tinetto islands. The ongoing project aims to restore the architectural layout—comprising staircases, pergolas, and pathways—and to rehabilitate the vegetation, counteracting the depletion of botanical species while reinforcing the original character of this Mediterranean garden of water and shade.

The intervention highlights the balance between the two defining aspects of the park: the formal garden in the upper section and the naturalistic landscape in the lower part. A key element of the restoration is the reactivation of the historical water system that once connected these areas.

A distinctive feature of the formal garden is the presence of numerous water features immersed in the Mediterranean woodland. Originally designed for aesthetic and recreational purposes, these elements required a sophisticated hydraulic system, including fountains, nymphaea, cascades, and a large storage basin. This reservoir, integrated into the architectural design of the park, interacts with the adjacent pergola, where the reflection of Wisteria sinensis (Chinese Wisteria) enhances the water's visual impact.

Originally, this system was fed by external water sources, but today the basin functions solely as a storage tank. With a depth of over two meters and a surface area exceeding 60 square meters, it has a significant volumetric capacity. Water remains a defining feature of the Rezzola estate: while the historical hydraulic system was initially designed to satisfy voluptas et venustas, today it responds to the utilitas required for the park's sustainable maintenance.

Once fully restored, like all FAI properties, Villa Rezzola will be open to the public. However, its upkeep will require a substantial water supply an increasingly scarce resource in Liguria, especially in the summer months for both irrigation and the reactivation of its historic water features.

Figure 1: Water Collection Basin with the Pergola in the Background - Garden of villa Rezzola in Pugliola (lerici). Sketch by Patrizia Burlando 2025

The Agrarian Landscape of Liguria
Water Management and Traditional Cultivations

A defining feature of Liguria's landscape is its terraced agricultural system, which, combined with an efficient water management

system, has sustained centuries of viticulture, olive growing, and vegetable farming, originally intended for subsistence.

Terracing not only gives Liguria its distinctive landscape but also represents a functional and sustainable solution for mitigating soil erosion and optimizing the use of limited water resources. The dry-stone walls supporting the terraces regulate rainwater drainage and create microclimates that favor plant growth [1].

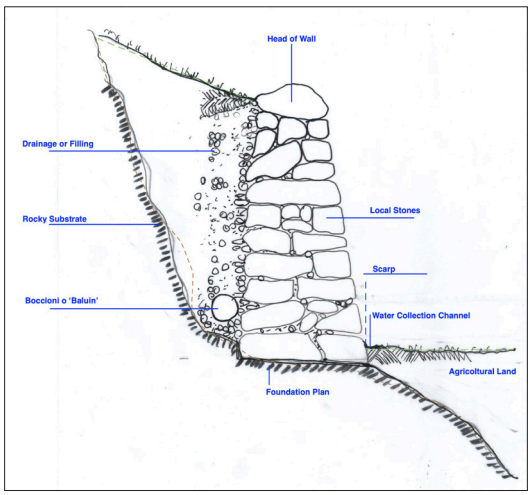

Figure 2: Components of a Dry Stone Wall. Sketch by Patrizia Burlando - 2025

Components of a Dry Stone Wall. Sketch by Patrizia Burlando - 2025

In addition to the coastal hillsides, historically transformed into artificial terraces over millennia, Ligurian agriculture also occupied narrow strips of land along the coast, often near river mouths. These locations were strategically advantageous due to the consistent presence of freshwater, essential for agriculture.

Travelers and writers of the past frequently described these cultivated lands as an idyllic landscape, where the interaction between humans and nature created a harmonious symbiosis. The dedication required to maintain the terraces reflects the significance of the local agricultural community and its ability to adapt to a challenging environment, transforming it into a valuable resource.

Figure 3: Cinque Terre: Terraced Landscape behind Vernazza. Photo by Mario Manfroni - 2024

Case Study: Terraces vs. Coastal Plains

The Terraces of Cinque Terre

The Cinque Terre, in eastern Liguria, represent a global icon of agrarian landscapes. This area is characterized by extensive terracing, with dry-stone walls supporting vineyards and olive groves, demonstrating a perfect balance between tradition and functionality. These terraces serve as a model of sustainability, preserving the soil and fostering biodiversity.

According to the Code of Cultural Heritage and and the European Landscape Convention (2000), landscapes are a cultural and collective heritage, essential for quality of life. The uniqueness of a landscape is shaped by various factors geological, natural, climatic, historical, cultural, and economic which give individuals a sense of belonging to a specific place [2]. Human life is deeply intertwined with both natural and man-made landscapes.

In 1997, the Cinque Terre, along with Porto Venere and the Palmaria, Tino, and Tinetto islands, were declared a UNESCO World Heritage Site, recognized as "a cultural area of exceptional value, illustrating a harmonious relationship between humans and nature, resulting in a landscape of extraordinary scenic beauty, reflecting a traditional way of life preserved for a thousand years and continuing to play an important socio-economic role in the community."

The UNESCO Designation is based on Three Criteria:

- Demonstrating significant architectural, artistic, or landscape development within a given cultural area.
- Representing an outstanding example of an architectural, technological, or landscape development that illustrates a significant period of human history.
- Serving as an important example of human settlement and land use representative of a particular culture, especially when threatened by irreversible changes.

The combination of unique landscape techniques, exemplary land use, and the threat of uncontrolled transformation makes this territory unparalleled and irreplaceable [3].

In such a transformation, humans not only modified steep surfaces for agriculture but also developed water collection and management systems to cultivate olive trees, vineyards, and vegetables. Terraces built with dry-stone walls help stabilize the soil, prevent landslides, and retain rainwater, crucial for irrigation. This system optimizes water resources while allowing cultivation in otherwise inhospitable hilly areas.

Historically, over 60% of Liguria's territory was terraced. However, many of these terraces, including those in the Cinque Terre, are now abandoned. This lack of maintenance disrupts the balance of the territory, leading to increasing hydrogeological instability due to uncontrolled water runoff.

Despite significant funding for terrace restoration, the abandonment of traditional agricultural and pastoral activities has led to reforestation and land rewilding, negatively affecting landscape conservation, cultural identity, and biodiversity. While it may no longer be feasible to preserve the entire historical landscape, a balanced territorial planning strategy is necessary integrating new natural landscapes while partially maintaining those that reflect centuries of human labor.

Coastal agriculture in Liguria continues to exemplify sustainable farming and intelligent resource management. However, land abandonment remains a challenge for preserving traditional landscapes. In recent years, renewed interest in terrace restoration and ancient agricultural practices has emerged, supported by initiatives to safeguard Liguria's agricultural and landscape heritage.

A significant example is the Stonewalls for life project in Manarola's Anfiteatro dei Giganti (Cinque Terre), funded by the EU LIFE Programme. This initiative, set to conclude in 2025, focuses on restoring traditional agricultural terraces. Activities include dry-stone wall reconstruction, replanting of crops, and restoring drainage channels, with active participation from local businesses reclaiming abandoned farmland.

The project allocates land to local farmers based on sustainability criteria, encouraging biodiversity conservation and water efficiency while promoting youth engagement in sustainable agriculture. By preserving traditional farming techniques and promoting environmental sustainability, Stonewalls for life is helping safeguard both the natural and cultural heritage of the Cinque Terre.

Case Study: Chiavari – Coastal Plain vs. Terracing

The coastal cultivations of Chiavari represent an emblematic example of agricultural management in Liguria, a region that, despite its hilly terrain and limited water resources, has developed highly specialized farming techniques, particularly along the coastal areas. Chiavari is a small town on the eastern Ligurian coast, surrounded by terraced hills. Additionally, it features a flat area along the alluvial plain of the Entella River and a coastal plain. This entire area, characterized by fertile alluvial soils and direct proximity to the sea, is particularly suited for viticulture, despite the challenges posed by the maritime climate and the presence of sand in areas near the beach.

Historically, as seen in the Vinzoni map of the entire hillside behind the walled historic village built at the foot of the castle was characterized by terracing [4]. The coastal cultivations of Chiavari played a key role in Ligurian agricultural history, contributing not only to the local economy but also to landscape conservation. Like in the Cinque Terre, terraces in Chiavari helped shape a unique and irreplaceable image, which still attracts visitors from around the world today.

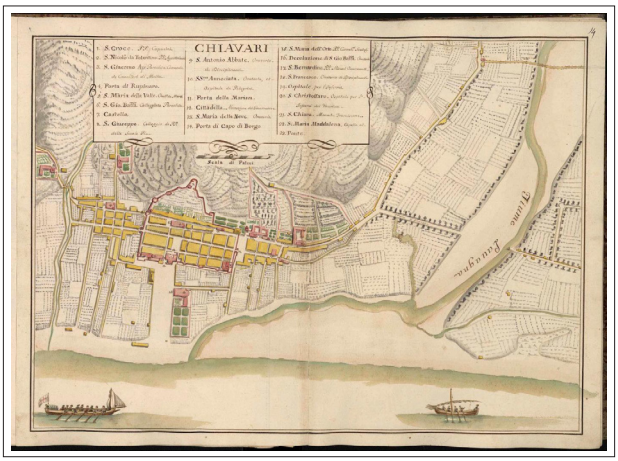

Figure 4: Chiavari. Map by Matteo Vinzoni -1773 Il Dominio della Serenissima Repubblica di Genova in terraferma [Riviera di Levante], in https://archive.org/details/ge-0036-m.r.-cf.-2.9/page/n127/mode/1up

In Liguria, in addition to vineyards, fruit trees, and citrus groves, olive cultivation spread widely, likely introduced by Benedictine monks during the Middle Ages, particularly in the Taggia area. From there, olive trees expanded toward the Lavagna valley, located on the western (left) bank of the Entella River. In the past, favorable climatic conditions supported the growth of the Lavagnina olive, but the increased cultivation also led to higher production costs.

Despite extensive terracing in the hills, Chiavari's coastal plains were also densely cultivated and inhabited in the past. The Vinzoni map from the 18th century documents irrigated vegetable gardens near the coast, which bordered settlements and protected them from sea winds. In this regard [5]. noted that, in the early 18th century, Genoese magistrates were concerned about increasing illegal encroachments on public beaches, particularly in Savona, Chiavari, and Lavagna, as villas and gardens expanded toward the coast. The Vinzoni map also shows that the flat area in front of Chiavari, near the river mouth, was entirely covered with crops. Coastal properties were enclosed by protective walls, except on the seaward side, where a light pergola, possibly made of reeds, was likely adjusted seasonally based on weather conditions.

Due to limited surface water availability, water management in Chiavari's coastal agriculture has always been crucial. In the past, water was channeled through a network of ditches and canals along the terraces to collect and distribute rainwater. Additionally, cisterns and wells helped store water for dry periods, ensuring irrigation during the summer.

In the coastal plains, well sweeps (pozzi a cicogna) were used to draw water directly from the Entella River. From 1932 until recent years, irrigation in the Chiavari plain was maintained through an underground pipeline, which extracted water from the Lavagna River to meet agricultural needs. However, excessive riverbed dredging has since lowered water levels, rendering the canal unusable.

Traditional Agriculture in Chiavari

Chiavari's landscape still preserves a key feature of local agriculture—the combination of vegetables, vines, and fruit trees.

Local publications from the mid-19th century mention traditionally cultivated species, such as:

- **Potatoes:** Quarantine and Cannelline, often associated with olive cultivation on hillsides.
- **Cabbages:** Various types, including cavolo broccolo lavagnino (its seeds have been preserved to this day), cavolo lombardo, and cavolo gaggetta, named after a local dialect term.
- **Other crops:** The Chiavari root, scorzonera, and the Lavagna pea.

Fruit trees were widely cultivated, particularly apple, pear, and peach orchards. Due to the fragmented nature of the plots, planting was not systematically organized, allowing farmers to maximize the use of available land. Trees were pruned at high canopies to allow vegetable cultivation beneath them.

- **Peaches:** Varieties included Mazenghe (May), Zunine (June), and Settembrine (September).
- **Pears:** Included Noci and Giambattà.
- **Plums:** Fiaschette variety.

In 1817, Gallesio's Pomona Italiana documented the presence of fig trees (Ficus carica) in the Prupissalutto variety[6]. According

to Gallesio, Renette and Carle apples were also common.

Additionally, Arundo donax (giant reed), which grows along the Entella River, was widely used in local agriculture:

- As a windbreak to protect fields from sea salt.
- As plant supports for vegetables such as tomatoes, green beans, peas, and zucchini.
- For chair stuffing, using its durable leaves.

Viticulture in Coastal Plains: The Vineyards on the Beach

A unique agricultural practice developed in Chiavari's coastal plains: vineyards planted directly on the beach or near the coast. This rare practice contrasts with the typical preference for well-drained soils away from sea salt exposure. However, local viticulturists adapted to these conditions, achieving remarkable results.

Vines grown on the beach benefit from:

- **Mild Climate:** Proximity to the sea moderates temperatures year-round, reducing the risk of winter frost and ensuring uniform grape ripening.
- **Solar Reflection:** Light-colored sand reflects sunlight, enhancing photosynthesis and grape maturation.
- **Constant Ventilation:** Sea breezes keep plants dry, minimizing fungal diseases and humidity-related issues.

Despite these benefits, coastal viticulture faces challenges, particularly salt exposure, which can damage leaves and alter grape flavors. To mitigate this, farmers use high pruning techniques and plant natural windbreaks such as salt-tolerant vegetation—to protect the vines.

Additionally, water management is crucial, as sandy soils drain quickly, requiring more frequent irrigation and careful monitoring of soil salinity.

Traditionally, vines were trained using chestnut stakes, with willow and reed trellises, and pruned using a method similar to today's Guyot system.

The Main Grape Varieties Cultivated in the Chiavari Plain Include

- **Vermentino:** A highly valued white grape producing fresh, mineral wines with a light saline note due to its coastal proximity. Initially used as a table grape, it later became a key variety for winemaking.
- **Albarola (Bianchetta Genovese):** Another local white variety, traditionally grown alongside vegetables. It produces light, fragrant wines, ideal for pairing with Ligurian seafood. It was known for high yields but lower quality.
- **Dolcetto and Sangiovese:** Red varieties, less common along the coast but still cultivated in some vineyards.

These wines are recognized for their freshness and minerality, influenced by the maritime climate and sandy soils. The subtle saline character makes them unique in the Italian wine landscape.

Preserving Chiavari's Agricultural Heritage

The vineyards on the beach in Chiavari demonstrate how traditional agricultural techniques can be adapted to unconventional environmental conditions without compromising quality. This viticulture reflects centuries of expertise and a deep respect for the local environment.

Today, there is growing interest in these traditional practices, with local wineries reassessing coastal viticulture as a distinctive and valuable aspect of Ligurian winemaking.

Conclusion

The coastal cultivations of Chiavari are a remarkable example of how Liguria's agricultural traditions based on efficient resource use and innovative techniques have allowed successful farming in a naturally challenging environment. This adaptation has transformed the coastline into one of the region's most fertile and fascinating areas, preserving a unique agricultural and cultural heritage that deserves continued recognition and conservation.

Historic Systems of Parks, Gardens, and Villas in Liguria

The Role of Water in Landscape Systems

Water has always been a central element in Liguria's historic gardens and villas, serving both functional and decorative purposes. The presence of water features in these landscapes reflects a long-standing tradition of integrating technical expertise with aesthetic objectives. Moreover, water played a crucial role in linking individual landscape complexes with the surrounding territory. The use of water as a symbol of wealth and power is evident in the grand hydraulic works of noble estates, not only in the formal garden areas but also in the productive agricultural sections of these properties.

Liguria's compact and mountainous geography is defined by a dense network of ridges and valleys that run perpendicular to the coastline, with numerous small rivers and streams of limited flow. Due to the region's topography and the presence of these watercourses, large landholdings were uncommon, as properties were often intersected by public roads or water systems. In some cases, such as Villa del Principe Doria in Genoa, the connection between the estate and the hillside was maintained via a bridge over a public road (Via San Benedetto, located behind the main building). A similar example can still be seen at Villa Rostan in Genoa Multedo, where the 19th-century landscape parterre, now converted into a football field, is accessible from the main villa only by crossing a small bridge over the historic Via Antica Romana di Pegli.

An essential unifying element in Liguria's landscape remains its rich network of rural pathways, which connect parish churches, small villages, parks, gardens, and agricultural estates. This intricate system, combined with watercourses and the coastline, has shaped not only Genoa but also the entire Ligurian region.

The Role of Historic Villas and Gardens in the Contemporary Landscape

Today, Liguria's historic villas and their vast estates play a key role in preserving cultural landscapes and serve as green lungs, particularly in urban areas. These spaces help mitigate heat island effects, reduce air pollution, and enhance biodiversity. Additionally, as many historic properties have become public parks, they now function as open green spaces for local communities, providing significant social and environmental benefits.

Case Study: Villa Scassi (Genoa-Sampierdarena)

Sampierdarena, the first urban periphery west of Genoa's historic center, played a strategic role in industrial and maritime development between the 19th and 20th centuries due to its location along the Polcevera valley, connecting the Ligurian Sea with northern regions. Once characterized by an agricultural landscape and a network of villa gardens, the area underwent

profound transformations with the expansion of the port, which severed the hinterland from the sea and significantly altered the coastline. Today, Sampierdarena retains fragments of its historical landscape but faces numerous challenges related to traffic, urban decay, and the loss of historical memory [7].

Originally, Sampierdarena was a maritime village with shipyards active since the 13th century. By the 14th century, it had become a vacation destination for Genoese noble families, who, between the 15th and 16th centuries, built magnificent villas with terraced gardens, citrus groves, fountains, and statues, making the area renowned across Europe. The landscape, once famous for its beauty and the scent of citrus flowers detectable from ships offshore, gradually disappeared with industrial and port expansion [7].

Villa Imperiale Scassi, built between 1560 and 1564 for Gio Vincenzo Imperiale by the Ponzello architects, was one of Genoa's most prestigious buildings, following the architectural tradition of Galeazzo Alessi and earning the nickname "la Bellezza". Located along the ancient Roman road (now Via D'Aste), the villa was spatially connected with other significant residences, including Villa Grimaldi and Villa Cristoforo Imperiale [8-10].

Over time, the villa underwent several transformations: during the Siege of Genoa (1800), it was used as a barracks and military hospital. In 1801, Count Onofrio Scassi commissioned significant restorations. By the late 19th century, it had been converted into a school, and in the 20th century, the construction of a hospital and Via Cantore drastically altered its configuration, separating the villa from its garden and its original landscape context [11-13].

The garden, poetically described by Gio Vincenzo Imperiale in Lo Stato Rustico, followed a classical orthogonal composition and was organized into three main sections. The first included two lateral spaces with aromatic plant labyrinths; the second, uphill from the building, featured three large terraces visible from the northern facade; the third consisted of agricultural terraces along the hillsides. The water system included three large basins, nymphaea, fountains, and a circular pool with a statue of Pegasus, integrating both functional and decorative elements. The garden also housed pavilions, a medieval tower, a dovecote, and rustic buildings [14].

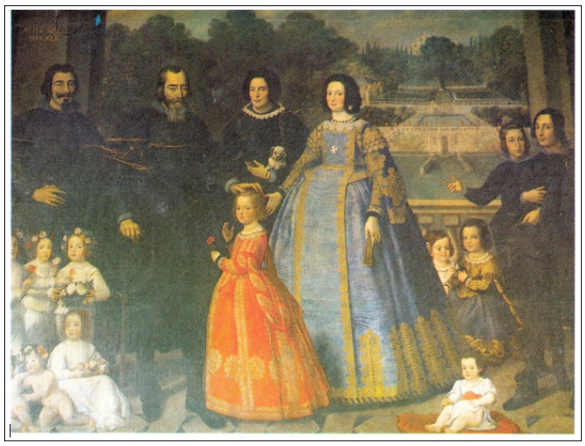

Figure 5: Portrait of the Imperiale Family. Picture by Domenico Fiasella, 1642, in https://it.m.wikipedia.org/wiki/File:Domenico_Fiasella-ritratto_famiglia_Imperiale_(1642).jpg

The interconnected system of villa, gardens, and water infrastructure is well documented in Matteo Vinzoni's 18th-century map, which illustrates its central role in Sampierdarena's landscape, embedded in a valuable agricultural and residential context. The system of fishponds and fountains exploited the natural slope to ensure water collection and distribution, serving both functional and aesthetic purposes. Beyond contributing to the monumental architecture—comprising nymphaea, grottoes, basins, and sculptural fountains—the water was also used to irrigate surrounding terraced fields, integrating aesthetic and agricultural functions harmoniously [15].

The connection with the agricultural landscape is evident in the garden's third section, consisting of agricultural terraces visible in Vinzoni's map, where they appear as an integral part of the region's historic cultivation. These terraces, designated for aromatic plants and other traditional vegetation, extended along the hillsides up to the valley's summit. At the highest point of the garden, the straight axis, inclined relative to the lower sections, was interrupted by a circular basin and concluded with an open space resembling an hortus conclusus. This straight pathway, aligned with a minor watercourse, suggests the presence of a water feature, similar to the cascading water chains of Villa Lante in Bagnaia, Villa Aldobrandini in Frascati, or the Royal Palace of Caserta. In Domenico Fiasella's painting (Figure 5), columnar trees, possibly cypresses, are depicted in this section, symbolically represented in Vinzoni's map as well [16].

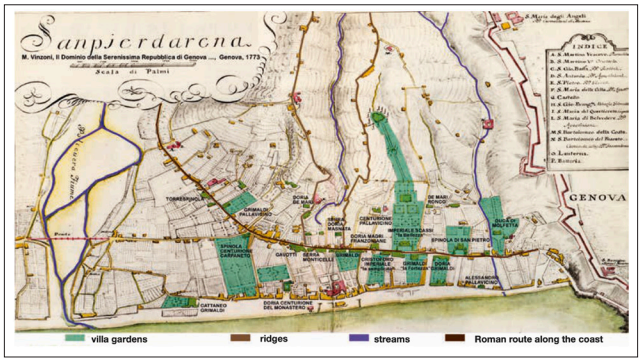

Figure 6: Sampierdarena Map by Matteo Vinzoni -1773 Il Dominio della Serenissima Repubblica di Genova in terraferma [Riviera di Ponente], 1773 in https://archive.org/details/ge-0036-m.r.-cf.-2.9/page/n127/mode/1up

During the 19th and 20th centuries, the complex underwent significant modifications. By the late 19th century, part of the garden was sacrificed for the construction of a hospital in the upper part of the site, altering the original relationship between the villa and its surrounding park. The upper section's water features were entirely erased by these interventions.

The opening of Via Cantore in 1930 created a severe division between the main building and the garden, disrupting the spatial and visual continuity of the original design. This urban intervention further fragmented the historic integrity of the complex, reducing the park's extension and its connection to the surrounding landscape.

Despite the disappearance of the original hydraulic system and agricultural landscape, Villa Imperiale Scassi'spark remains an essential green lung for Sampierdarena's urban area. The surviving water features, such as basins and nymphaea, now serve only a decorative function, whereas the historical water system played a crucial role in sustaining agricultural production and park maintenance. This transition highlights the loss of balance between functionality and beauty that defined the original design. However, despite its fragmentation, the remaining park retains

environmental and social value, providing a precious green space in a heavily urbanized setting and continuing to evoke the site's rich historical heritage.

For example, the plan by Von Alban Voight, documenting the Hanbury Gardens during Thomas Hanbury's time, provides crucial information about the natural and artificial water systems, including the Rio Sorba, essential for the irrigation and cultivation of the entire garden [9]. The valley of the Rio Sorba, known as the Vallone, was designed to restore the original natural reserve, aiming to recreate the coastal landscape as it was before being altered by agricultural cultivation prior to the Hanbury family's arrival. The plan sought to preserve and propagate the "spontaneous vegetation in the wildest parts of the property". The area east of the Rio Sorba was left in its natural state, while interventions in the valley floor and along the slopes focused on restoring native vegetation. At the same time, cisterns were created to collect water, partly sourced from existing streams and partly from rainwater collection.

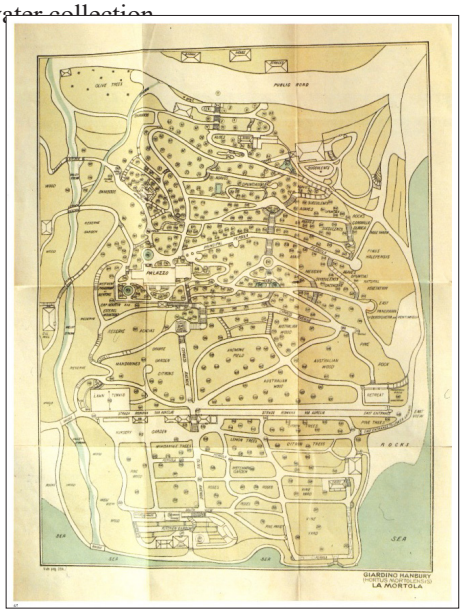

Figure 7: Hortus Mortolensis. Map by Alban Voigt -1914 in Junk's Nature Guide - The Riviera

Today, water management presents a critical challenge, exacerbated by climate change and water scarcity. The integration of traditional techniques with technological innovations offers sustainable solutions for the future. An exemplary case study is the plain of Marinella, a rare example of a flat agricultural area in Liguria, formed through the gradual silting of the ancient Roman port of Luni. Here, a dense network of canals still ensures efficient irrigation for local crops, particularly basil, representing a contemporary model of integrated water management.

The Ligurian landscape is the result of its communities' adaptability and ingenuity. The conservation and restoration of historic water systems, combined with modern technologies, can contribute to the sustainable use of resources, preserving the region's landscape and cultural heritage.

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