# A STUDY OF THE MORPHOLOGICAL EVOLUTION OF MILAN'S URBAN CEMETERIES SINCE THE 19TH CENTURY

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BY

HE Yan

Supervised by

Prof. Marco Trisciuoglio

Associate Prof. DENG Hao

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# Abstract

Cities are aggregations accommodating people's lives, and cemeteries, as final abodes for people, constitute fundamental components of the overall urban morphology. Cemeteries function not only as burial sites but also as carriers for the spirit and memory of the living; this special cultural attribute enables them to enduringly influence the process of urban morphological evolution. Taking Milan, Italy's long-standing economic and cultural center, as a representative case, its urban cemetery morphology, throughout more than two millennia of history, has continually interacted with the urban economy and social activities of different periods, becoming an 'index fossil' that reflects and reveals the laws of urban spatial evolution. Milan's urban cemeteries are taken as the primary research object in this study. Their morphological evolution process is deeply investigated using the methods and perspectives of urban morphology, connecting it with complex socio-political-economic developments. The aim is to systematically explore the main characteristics and driving mechanisms of urban cemetery morphological evolution.

The research comprises three main parts. The first part researches the theoretical methods of typo-morphology, synthetically analyzes the theoretical frameworks of the British Conzenian school of urban morphology and the Italian school of architectural typology, and focuses on elaborating the research content of fringe belt theory, providing guiding methods for the subsequent urban cemetery morphology research. Under this theoretical framework, the second part, covering Chapters 3 and 4, conducts a phased diachronic investigation and a hierarchical comprehensive analysis of Milan's urban cemetery morphology, emphasizing the description of the cemetery as a fringe belt element and its dynamic relationship with the city at different hierarchical scales. Based on this, it systematically summarizes the complexity behind its morphological evolution. The third part undertakes exploratory research, carrying out a cross-cultural comparative analysis of cemetery morphology in different cities to examine the uniqueness and universality of cemetery morphological types from a broader perspective and further deepen the understanding of the theme.

Urban cemeteries, as a special type of physical morphological element, deeply participate in and even drive the emergence and evolution of urban morphology. Against this background, the study aims to systematically organize and summarize the changing patterns

of Milan's cemeteries within its urban morphology. The research findings not only contribute to understanding the generation and evolution process of modern urban cemetery types in Italy and even Europe but also help deepen the historical understanding of the evolution of funeral culture, and provide a mirror for reflecting on China's own funerary concepts, culture, and spatial layout.

**Keywords:** Urban Cemetery; Fringe Belt; Morphological Evolution; Urban Morphology; Milan;

# Contents

# 1. Introduction

## 1.1 Research Background and Significance

1.1.1 Research Background

Urban cemeteries, as a special component of urban form, are land used to bury the dead and also serve as places for the living to commemorate the deceased. Urban cemeteries occupy a considerable proportion of urban land and space. Taking Newham in London as an example, cemeteries constitute 61% of the city's open space, while in Boston, this proportion also reaches 35%[1]. Additionally, urban cemeteries also serve as carriers of emotion and memory, and commemorating the deceased helps to make the existence of the living more complete.

Historically, the relationship between cities and cemeteries has always been very close, with both being shaped by a common system of social relations. The spatial structure of cemeteries is both a reflection of urban hierarchy and differentiation, and concurrently, at certain periods, influences the formation and evolution of urban space. Michel Foucault once pointed out that cemeteries, as heterotopias, although separated from everyday urban space, precisely map out the internal order of the city [2]. The rational arrangement of funerary space plays a crucial role in constructing social order and soothing civic emotions. Michel Lauwers conducted a detailed study on the relationship between religious "sacred places" such as churches and cemeteries and the construction of medieval Western settlement space, and pointed out that cemeteries were the main impetus for the formation of early resident settlements[3]. The social and spatial value embodied by cemeteries ensures that they hold a crucial place in different cultural contexts.

However, as urbanization continues to deepen, the increasing demand for construction land has made the conflict between the living and the dead over land resources increasingly prominent, and the function of cemeteries as carriers of cultural information is gradually declining. This conflict between the living and the dead has erupted intensely in modern society and, to a great extent, has weakened the cultural power of death. A century of urban expansion and population mobility has pushed the funerary spaces that originally carried the culture of death out of modern life. Ruth Rogaski argues that the rise of modern sanitation

concepts has promoted the functional separation of urban landscapes, creating things that are visible and invisible. Cemeteries, like sewers and landfills, share a common function by hiding the city's impurities, fostering a straight, seamless, and ordered visual appearance[4]. The development of funerary space in this process has been largely constrained by urban planning dominated by functionalism.

Just as death cannot be mechanically described as a physiological phenomenon solely related to sanitary conditions and epidemics, urban cemeteries also cannot be simply understood from the perspective of spatial efficiency as infrastructure that isolates the living from the dead. Given this, this study attempts to explore the complexity and contradictions of urban cemeteries against the dual backdrop of concepts of death culture and urbanization, summarize and synthesize the patterns of morphological evolution of urban cemeteries and the underlying mechanisms and driving forces, to provide morphological evidence for contemporary urban cemetery planning.

1.1.2 Research Subject and Significance

This study takes the urban cemeteries newly built in Milan since the 19th century as its research subject, with the period from 1787 to 1964 – the history of burial changes and evolution following the Italian funerary reform – as the scope of investigation. During this period, the evolution of Milan's urban cemeteries underwent the historical processes of urban modernization and shifting funerary practices, presenting a wide variety of morphological features.

Milan, as an important historical, cultural, and economic center of Italy, is not only the birthplace of the early modern Italian Enlightenment and Revival movements, but is now the capital of the Lombardy region and Italy's economic and industrial capital, home to a large population. Its unique trajectory of urban development makes it a typical case for studying the evolution of urban form, particularly the transformation of specific elements within it. Against this backdrop, Milan's existing urban cemeteries are a product of the wave of European funerary culture reform in the early 19th century. This reform notably reflected the shift in European funerary tradition from "the dead among the living" (les morts parmi les vivants)[5] – the process of transforming from churches and their surrounding sacred grounds in the city center towards modern public funerary spaces located far from urban areas. Milan's first

Monumental Cemetery (Cimitero Monumentale) was built between 1863 and 1866, and its magnificent form was highly regarded as an important symbol for the establishment of a new cultural and political identity in Northern Italy. These new urban cemeteries, serving as a microcosm of the evolution of social and political order during a particular era, were not only situated away from the urban built environment but are also characterized by secularization, publicness, and planned development, representing a completely new type of funerary architecture. As urban monuments, they contributed to defining Italy's national myth and collective memory. For this study, the construction and morphological evolution of Milan's urban cemeteries hold significant value for social morphological research. This is not only a response to the physical needs brought about by urban population expansion, but even more so, a result jointly driven by multiple socio-political and cultural factors including the Enlightenment, the rise of the Italian bourgeoisie, the weakening of papal authority, the improvement of public health standards, and the development of urban planning.

Currently, research related to urban cemeteries is more focused on historical retrospection of cemetery forms, while research on cemeteries as elements of urban form and their dynamic relationship with contemporary urban development is relatively limited. Milan's urban cemetery types have experienced a transition from church cemeteries in the city center to suburban cemeteries far from the urban area, and then, with urban expansion, were again incorporated into the built-up areas. A continuous process of land competition between the living and the dead is played out, which inevitably reflects the influences of various economic, cultural, and policy factors. The relationship between the living and the deceased can also be reflected through the spatial morphology of urban cemeteries and their surrounding residential areas. Therefore, the morphological form of Milan's urban cemeteries can be seen as an index for understanding the process of "urban modernization" and "the evolution of funerary space," providing a new perspective for interpreting contemporary urban culture.

## 1.2 Explanation of Related Concepts

### 1.2.1 Cimitero Pubblico

In the Italian context, a cemetery usually refers to a public infrastructure established and managed by municipalities or public institutions, serving the residents of that area, and is the main research subject of this paper. Among these, monumental cemeteries built in the latter

half of the 19th century are an important type of Italian cemetery. Furthermore, the concept of 'cemetery' needs to be distinguished from the traditional Italian family tomb (Tomba di Famiglia). The latter is not an entirely separate type of burial ground outside of the public cemetery, but is more accurately an exclusive burial space unit set up within public cemeteries for specific families. This type of family tomb can manifest as family grave plots within the public cemetery, multi-level niches, small family chapels (Cappella di Famiglia), or family mausoleums (Mausoleo di Famiglia), aiming to bury multiple generations of the same family in one place, reflecting the family's continuity and collective memory.

## 1.2.2 Churchyard

Churchyard is a sacred burial place exclusive to Christian communities, referring to burial grounds adjacent to or encircling religious sites like churches and their surrounding sacred grounds, serving as the cemetery for a town or village. Church cemeteries are typically circular or polygonal in form, and their boundaries are not constrained by adjacent buildings or other "morphological frameworks," such as pre-existing walls or fields.

## 1.2.3 Foppone

In the Lombardy region of Italy, suburban cemeteries are known in Italian as "foppone," a term derived from the Italian dialect words "foppa" or "fossa," meaning "pit" or "trench." It originally referred to large mass graves or public burial pits, primarily used during sudden public health crises, especially during widespread epidemics, for the rapid handling and burial of large numbers of deceased. These large pits were typically located on the outskirts of the city or in isolated areas, established to deal with mass deaths during emergencies as temporary or semi-permanent burial sites. Over time, the meaning of "foppone" became generalized and began to refer to centralized cemeteries located outside the city, i.e., suburban cemeteries.

## 1.2.4 Monumental Cemetery

Monumental cemeteries appeared in Italy in the 19th century. Using a large scale and axial design as their planning framework, they incorporated key elements like grand entrances, arcades, chapels, and private monuments. The monumentality of a cemetery can be defined based on the classical planning of its planar form, the size of the cemetery, and the importance of the cemetery to the city and its community.

It should be noted that many urban cemeteries in Italy also contain areas following a

Picturesque layout, and the distinction between French Picturesque cemeteries and Italian monumental cemeteries needs to be clarified to avoid conceptual confusion. Both represent the results of the 19th-century funerary reform, but their morphological types are significantly different. Picturesque cemeteries or garden cemeteries are often based on an area open to the public, featuring winding paths and gardens as well as scattered arboretums, private tombs, and chapels. Their planning is more flexible and inclusive, contrasting with the unified morphological framework of monumental cemeteries.

## 1.3 Review of Existing Research

### 1.3.1 Current State of Research on European Funerary Spaces

Discussions on funerary space are often placed within the framework of the interaction between European architecture and funerary concepts. Representative among these are historical studies led by scholars such as James Stevens Curl and Howard Colvin. These studies frequently categorize European funerary architecture historically based on the stages of evolution of burial rites and customs, outlining the basic trajectory of European funerary space development through representative examples. Among the notable works are James Stevens Curl's "*Celebration of Death - Introduction to Some of Buildings, Monuments, and Settings of Funerary Architecture in Western European Tradition*" [6] , Michel Ragon's "*The Space of Death: A Study of Funerary Architecture, Decoration and Urbanism*"[7], and Howard Colvin's "*Architecture and the After-Life*" [8]. These studies, from perspectives such as funerary concepts and architectural examples, chronologically summarize the achievements in funerary architecture since the Classical era, providing essential historical background and reference points for this study's analysis of Milan's urban cemeteries. Compared to the rich perspectives in the English-speaking academic community, particularly their attention to the differences between Nordic landscape cemeteries and monumental burial architecture in Mediterranean nations, Italian scholarship's research on its national funerary architecture is more concentrated. "*The Architecture of Memory in Italy: Cemeteries, Monuments and Cities 1750–1939*" [9], edited by Maria Giuffre and others, and Mauro Felicori's "*Gli spazi della memoria. Architettura dei cimiteri monumentali europei*" (Spaces of Memory: The Architecture of European Monumental Cemeteries)[10] , drew upon experts and scholars from both within and outside the architectural field, along with relevant professionals, covering

conceptual research, design research, historical research, and other aspects, to review and analyze modern and contemporary European cemeteries. They emphasized the differences between Italian monumental cemeteries and cemeteries in other European countries, offering a wider range of perspectives for the research.

Apart from the comprehensive review and description of Italian funerary space based on the characteristics of burial rituals mentioned above, there are also in-depth studies focusing on specific areas or factors, such as Grazia Tomasi's book "*Per salvare i viventi: Le origini settecentesche del cimitero extraurbano*" (To Save the Living: The Eighteenth-Century Origins of the Extramural Cemetery) [11], which explores the reforms in 18th-century burial practices from the perspectives of policy, physiology, and urban planning, with its arguments primarily centered on policy and planning text content. Similarly, there is Diego Carnevale's book "*L'affare dei morti. Mercato funerario, politica e gestione della sepoltura a Napoli secoli XVII-XIX*" (The Business of the Dead: The Funerary Market, Politics and Burial Management in Naples from the 17th to 19th Centuries) [12] , which contains a systematic review and analysis of the mechanisms of corpse management in Naples, Italy, during the 17th to 19th centuries, exploring the technical aspects of burial reforms. Representative studies on funerary concepts include Michel Vovelle's "*Mourir autrefois: Attitudes collectives devant la mort aux XVIIe et XVIIIe siecles*" (Dying in the Past: Collective Attitudes Towards Death in the 17th and 18th Centuries) [13] . The author explores the evolution of Italian attitudes towards death in the 17th and 18th centuries by describing texts such as correspondence and epitaphs from specific periods, funeral orations, and wills. Similarly, there is Philippe Aries's systematic review in "*Western Attitudes toward Death: From the Middle Ages to the Present*" [14] , which covers the evolution of the concept of death in Italy during the 17th and 18th centuries. He also pioneeringly categorized the shifts in European attitudes towards death into four distinct periods: "Tamed Death," "Death of the Self," "Death of the Other," and "Forbidden Death." Vovelle and Aries, through detailed examination of literary and artistic works spanning a thousand years, integrated and discussed the framework of European funerary concepts. Meanwhile, Thomas Laqueur, in his book "*The Work of the Dead: A Cultural History of Mortal Remains*" [15] , traced the trajectory of the development of European funerary concepts since the Roman period under the influence of the ideas of the Renaissance, the Reformation, and the Enlightenment. He extensively examined the

interaction between the tension of secular and religious conflict and funerary forms by looking at everything from morgue archaeology, medical pamphlets, letters, songs, poetry, and novels to paintings and landscapes. To a great extent, these studies offer the social context for this study's analysis of the concepts of life and death reflected in modern and contemporary Milan's funerary spaces.

1.3.2 Current State of Research on Italian Urban Cemeteries

Overall, research on Italian urban cemeteries is mostly concentrated in the field of historical research, centering on urban planning and cemetery morphology during specific periods, with less systematic research on the relationship between modern and contemporary cemeteries and contemporary cities. Ornella Selvafolta's "*L'architettura dei cimiteri tra Francia e Italia (1750–1900): Modelli, esperienze, realizzazioni*" (Cemetery Architecture between France and Italy (1750–1900): Models, Experiences, Achievements)[16] provides an overall description of the development trajectory of modern Italian urban cemeteries. The text includes discussions on various aspects, such as the characteristics of the development of Italian monumental cemeteries in the early 19th century, design tendencies, and the influence of multiculturalism on planar forms. It also examines the special position of monumental urban cemeteries in modern and contemporary Italian urban planning -- serving both as indicators of urban expansion directions and as hubs for the expansion and intersection of the road network. Meanwhile, the volume "*TANEXPLORA 2012 – Evoluzioni contemporanee nell'architettura cimiteriale*" (TANEXPLORA 2012 – Contemporary Evolutions in Cemetery Architecture) [17] , compiled by the magazine in_bo, is a collection of conference papers that compiles discussions by Italian scholars on contemporary cities and cemeteries, where the topics discussed are not confined to individual architectural case studies, such as Matteo Cassani Simonetti's "*Limiti e recinti nel cimitero urbano di Ferrara. I progetti di Ferdinando Canonici tra architettura e citta 1819-1873*" (Boundaries and Fences in the Urban Cemetery of Ferrara. Ferdinando Canonici's Projects between Architecture and City 1819-1873) [18] , Michela Rossi's "La "*casa virtuale" el' abitare reale. Relazioni tra sepolture e insediamento*" ("The 'Virtual Home' and Real Dwelling. Relationships between Burials and Settlement") [19] , and Carla Landuzzi's "I rituali del morire nelle mixite etniche e culturali dell' ambiente urbano" (Death Rituals in Ethnic and Cultural Mixes of the Urban Environment) [20] . Among

these, Matteo Cassani Simonetti's article raises questions based on the morphology of the Ferrara urban cemetery. By examining artworks, texts, and planning documents, it traces the historical morphological evolution of the portico as a key element of interaction between the cemetery and the city. The relationship between the city and the cemetery is accurately expressed through the latter's posture towards the city. Although involving multiple aspects of the city and architecture, due to the limitations of the collection of papers, the research questions are relatively scattered and focus more on specific elements within the cemetery, thus they do not provide a comprehensive understanding of the relationship between Italian cemeteries and cities.

However, historical reviews concerning modern and contemporary Milanese cemeteries are relatively concentrated on the Milan Monumental Cemetery (Cimitero Monumentale), with less discussion on other cemetery types. In Hannah Malone's "*Architecture, death and nationhood: monumental cemeteries of nineteenth-century Italy*" [21] , the chapter "Milan" is an independent chapter which specifically examines the development of the Milan Monumental Cemetery in the early 19th century. Using the evolution of architectural form and style during the competition of political intentions as its research material, it analyzes the influence of the Italian nation-state formation period on architectural currents and forms of representation. Similar to this are two articles by Ornella Selvafolta: "*Il Cimitero Monumentale, il Famedio e la citta di Milano*" (The Monumental Cemetery, the Famedio, and the City of Milan)[22] and "*Oltre "la superstizione": i cimiteri della prima meta dell' Ottocento nel Lombardo-Veneto*" (Beyond "Superstition": The Cemeteries of the First Half of the Nineteenth Century in Lombardy-Veneto) [23] . Primarily focused on categorizing forms of urban planning and decorative elements, through case studies of Milan's urban cemeteries as representations and symbols of power and their dynamic integration with Neoclassical morphology, they present the social drivers behind the changes in the form and style of Milan's urban cemeteries. The above-mentioned studies supplement the knowledge background behind the form of the Milan Monumental Cemetery and expand the boundaries of subsequent morphological research.

1.3.3 Current State of Research on Cemetery Morphology

Distinct from the historical studies mentioned above, discussions focusing on the

relationship between the city and modern and contemporary cemeteries, based on specific cemetery morphology, are relatively limited. A representative work is Thomas Kolnberger's article "*Cemeteries and urban form: a historico-geographical approach*"[24] . The article, through analyzing urban cemetery case studies from different periods, explores the transitions in cemetery form types across different historical periods and pioneeringly suggests integrating the concept of the fringe belt from urban morphology with cemetery morphology, opening a new perspective for research on urban form and cemetery layout. Similarly, there is Aliaa AlSadaty's "*Tracing morphological transformations in Cairo's historic cemeteries, a step toward urban conservation*" [25] , which, employing the historico-geographical approach of the Conzenian school, researched the morphological transformations of Cairo's historic cemeteries. It describes the unique intimacy of Cairo's cemeteries mixed with residential and handicraft activities and links the research findings to the conservation of cemetery form. In addition, there is research on the morphology of Nanjing cemeteries conducted within the context of Chinese society and culture. In the article "*Research on the Morphological Evolution of Chinese Urban Cemeteries in the Process of Rapid Urbanization - A Case Study of Nanjing*" [26] , Deng Hao and Li Meichen, using Nanjing urban cemeteries as a reference, extended the research methods of morphology from aspects such as morphological evolution and overall planning. The above-mentioned research perspectives on cemetery morphology provide methodological inspiration for this paper's study of the relationship between Milan's urban areas and cemetery morphology.

In summary, research on Milanese and even Italian urban cemeteries since the 19th century often periodizes and summarizes the evolutionary process of specific funerary space types based on historical development stages. Discussions concerning urban cemeteries are more focused on cemetery decorative elements and planar forms, lacking a systematic review and in-depth analysis of the interactive relationship between architecture and urban function, and spatial form from the perspective of the overall context of urban development. Furthermore, there is also a lack of in-depth discussion on the role of urban cemeteries within contemporary urban development philosophies. In view of this, this paper aims to take typical cases of Milan's urban cemeteries as the research subject, reconstruct the dynamic relationship between their construction process and urban development, and attempt to apply an urban morphology perspective to expand the understanding of the socio-cultural implications of

funerary spaces, to address the limitations of the aforementioned research.

## 1.4 Research Methods

(1) Historical Data Collection and Literature Review

Acquisition of data from Google Earth, historical maps, and historical photos constitute the main sources of data for this research. These include relevant documentation and data on Milanese cemeteries made public by Milan's planning department, archives, and educational institutions, including architectural drawings, municipal meeting records, competition briefs, and documents pertaining to design and construction.

(2) Empirical Research Method

Conduct empirical research on existing cemeteries in contemporary Milan, observing and recording the development conditions of the areas surrounding the cemeteries to acquire primary data.

(3) Morphological Type Analysis Method

Utilizing a MAPPING approach that presents filtered key information from historical maps to trace the morphological evolution of Milan's cemeteries, which includes diachronic analysis of morphological evolution processes and synchronic comparison of morphological elements. This classic method of urban morphological research is the primary interpretative tool for this research.

(4) Cross-Cultural Comparative Research Method

Conduct a cross-cultural comparison of the morphological evolution processes of urban cemeteries in Cairo, Egypt, Nanjing, China, and Milan, Italy. Through extensive examination of concepts of life and death in the Muslim world, the Christian world, and the traditional Eastern context, summarize and extract commonalities and differences in the morphological evolution process of urban cemeteries, and explore the socio-morphological value of urban cemetery space research on a global scale.

# 2. Research on Urban Morphology Theory, Methods, and Practice

Urban morphology primarily focuses on the generation, composition, and evolutionary processes of the physical form of human settlements. By applying morphological element structures at different scale levels as its theoretical framework, it investigates the interplay between specific forms and social, economic, and cultural processes. Among them, the British Conzenian school and the Italian Muratori-Caniggia school are the two main academic schools in the realm of morphological typology. Both developed within the European urban context of the latter half of the twentieth century and are centered on investigating the diachronic evolution mechanisms and motivations of traditional urban morphology. Their shared characteristics in approach and technical methods collectively constitute the foundation of contemporary urban morphology research (Figure 2-1).

This chapter will systematically examine the theoretical frameworks and methodologies of contemporary mainstream urban morphology and typology studies. By considering the unique characteristics of urban cemeteries, it will analyze how traditional morphological research interprets this specific morphological element, and consequently delineate the theoretical foundations related to the research on Milan's urban cemeteries.



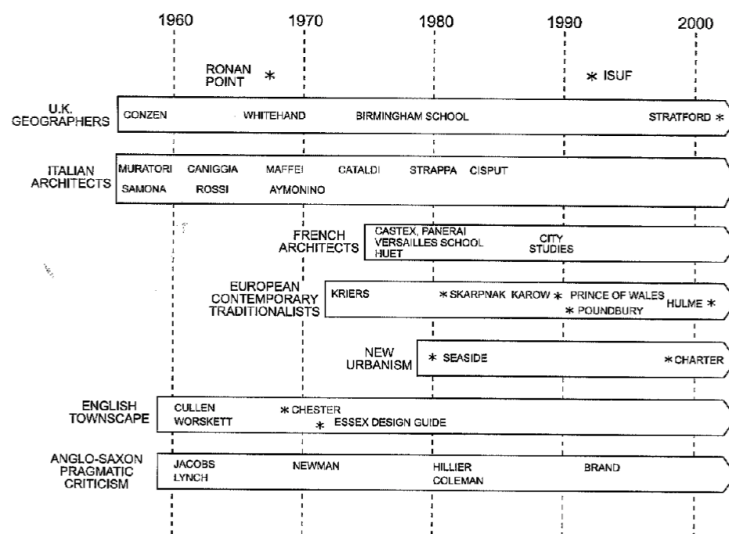Figure 2-1 Genealogy Chart of Urban Morphology Research

## 2.1 Overview of Urban Morphology Theory and Methods

### 2.1.1 British Conzenian Urban Morphology Theory

The research of the British school of urban morphology was primarily established and developed by the British scholar M.R.G. Conzen. His theory is mainly derived from urban form analysis in the German discipline of historical geography. Conzen adopted the

"morphogenetic" analytical method from German geographer Otto Schlüter. By comprehensively analyzing the town plan, building morphology, and land use patterns of the English historical and cultural town of Alnwick, he initially built the theoretical framework and terminology system for morphological research.

Within this approach, Conzen utilized 'plan units' and 'morphological regions' as tools for interpreting the town plan, systematically analyzing the morphological characteristics of various regions (Figure 2-2). Conzen pointed out that the town plan can be categorized into three fundamental elements: streets, plots, and buildings. Based on analyzing how different elements within the town plan combine to demarcate different plan units, in subsequent town plan analysis, plan units dating from different historical periods can be differentiated on maps using different fill colors, allowing for a rapid deconstruction of the urban development process.

Building upon diachronic research into plots and their associated built structures, Conzen further proposed the concepts of 'morphological period' and 'plot redevelopment cycles'. Both intuitively reflect the cyclical changes in land demand within the central urban area under the effect of economic cycles. Morphological elements that were stable and enduring in the previous stage become distinct types differentiating them from surrounding areas during the subsequent urban development cycle and have an impact on the new urban structure[27] .
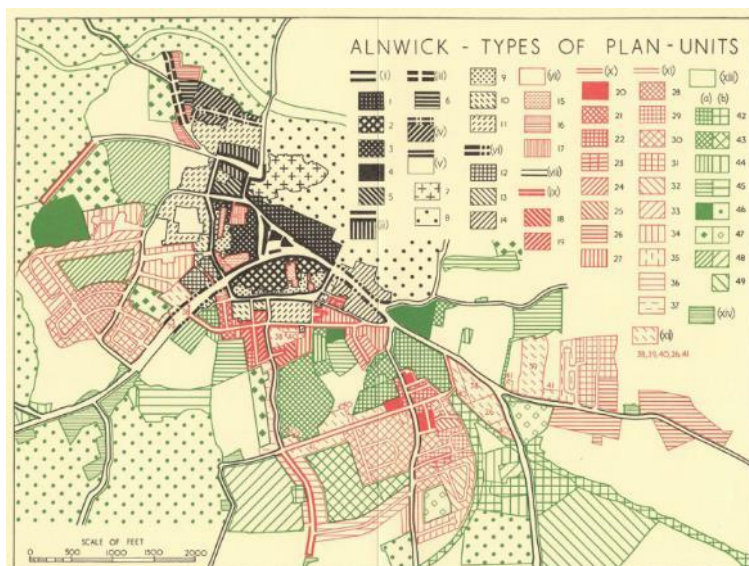


Figure 2-2 Alnwick Plan Unit Division

Morphological regions are effective tools for describing urban morphological characteristics and have been shown to play a strong role in heritage conservation planning.

For example, in 2007, J.W.R. Whitehand and Gu Kai surveyed Beijing. Based on their findings, they zoned the area based on different morphological characteristics and based on the analysis results, they produced the morphological region map of the Zhishanmen area (Figure 2-3). By comparing the boundaries of the protected areas delimited by the Beijing Municipal Planning Commission with the actual research findings, they confirmed that the original planning suffered from shortcomings such as neglecting the surrounding geographical environment and a lack of diachronic evolutionary study[28] , and also indirectly confirmed the validity of urban morphology theory.
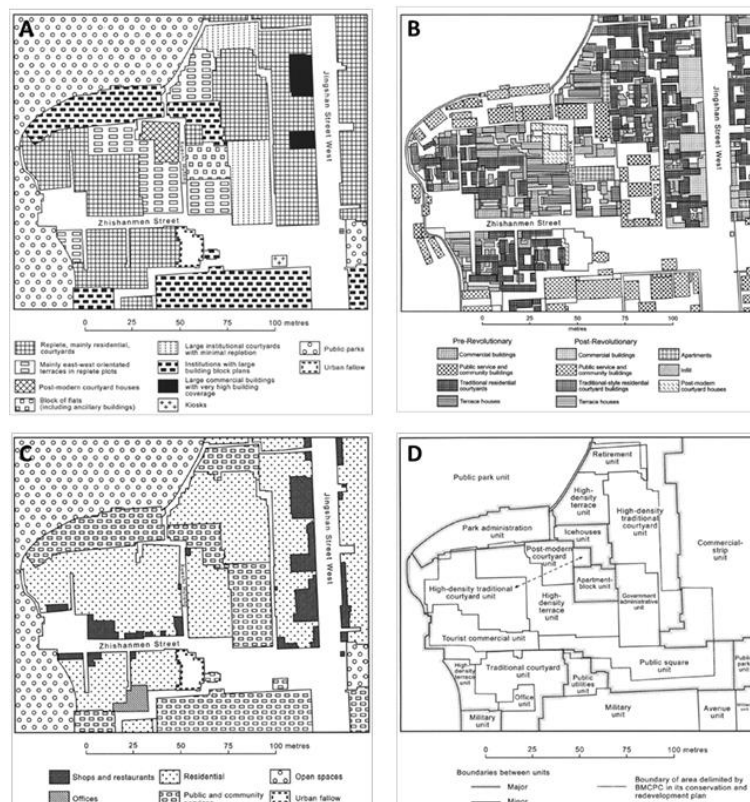


Figure 2-3 Beijing Zhishanmen Area; A. Plan Units; B. Building Fabric; C. Land Use; D. Comparison of Morphological Region Boundaries and Conservation Planning Boundaries

## 2.1.2 Italian Architectural Typology Theory

Italian scholar Saverio Muratori inherited the idea of the continuity of historical city centers from Gustavo Giovannoni [29] . By analyzing the history of the cities of Venice and Rome, Muratori was the first to propose the theory of Typomorphology and developed methods and tools for interpreting the process of diachronic evolution in historic cities. Muratori argued that "*towns are living organisms and collective works of art*"[30] . The urban organism ought to be a complex comprising different scales. New designs should adhere to

the sequential relationship between each level, ranging from building materials and individual building units up to regions and urban areas. All must adhere to the framework and integrate with historical forms, establishing the reciprocal relationship between the whole and the parts. It is evident that Muratori expanded the traditional concept of typology, previously limited to the architectural level, to the urban scale and integrated the two key analytical dimensions: diachrony and multi-scale, setting the stage for later Italian morphological studies.

Gianfranco Caniggia inherited the theory of his mentor Muratori and, building upon this, developed "Processual Typology". Caniggia argued that type, as an a priori entity existing in the consciousness of builders, would spontaneously guide people to construct similar forms under similar construction conditions, whereas the building process, constrained by present conditions, requires "critical" adjustment, thereby leading to formal variations[31] . According to Caniggia, this process is the fundamental mechanism that propels the evolution of urban and architectural morphology. Different typological processes leave their mark on the city's composition in every development phase. By understanding the evolutionary mechanisms of the dominant types in different development stages, there is an opportunity to integrate new buildings into the urban organic whole (Figure 2-4).

In "Interpreting Basic Building," Caniggia established a hierarchical sequence comprising four levels, namely element, element structure, systems of structures, and organism of systems, and applied this method of subdivision to both architectural and urban scales. Each sequence is formed by combinations of basic elements of similar types and is organized as a subset of the preceding level, constructing upwards based on fundamental historical structures, ultimately forming the urban organism[32] . Based on this, Caniggia constructed a morphological analysis framework that ranges from the overall urban form to the fine-grained material properties.
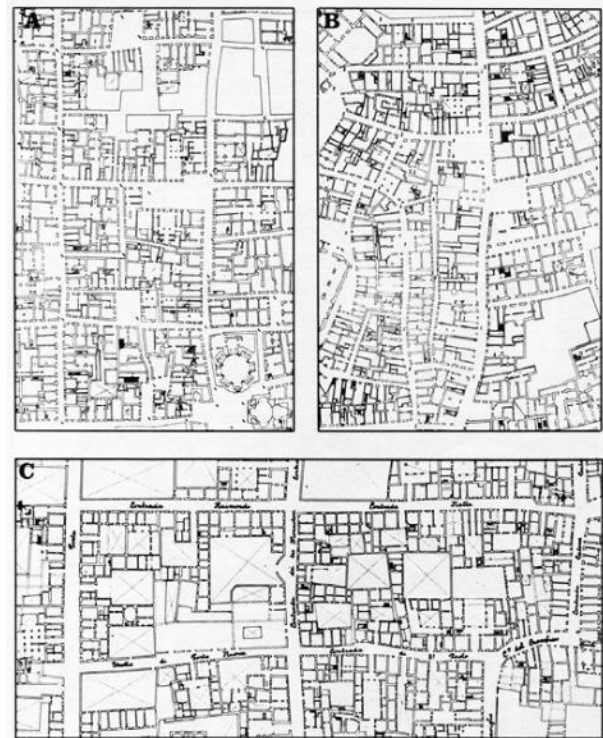


Figure 2-4 Typology Map Examples: A. Genoa; B. Luccol; C. Como

Another type-based research approach that fully realizes the entire process from type analysis to practice is Aldo Rossi's "The Architecture of the City." Compared to Caniggia's urban morphological design method based on the concept of typological evolution, Rossi's architectural theory places greater emphasis on the autonomy of form. Rossi argued for replacing "urban evolution is a natural process" with the concept of "urban artifact," and contends that public buildings are the primary elements (elementi primari) in the process of evolution, including urban landmarks and historic relics. Compared to residential buildings, public buildings are enduring in terms of form and institution, and collectively contribute to and form the city's collective memory. Rossi's analytical tools for primary element types are more akin to the analysis of iconography in art history (Figure 2-5).
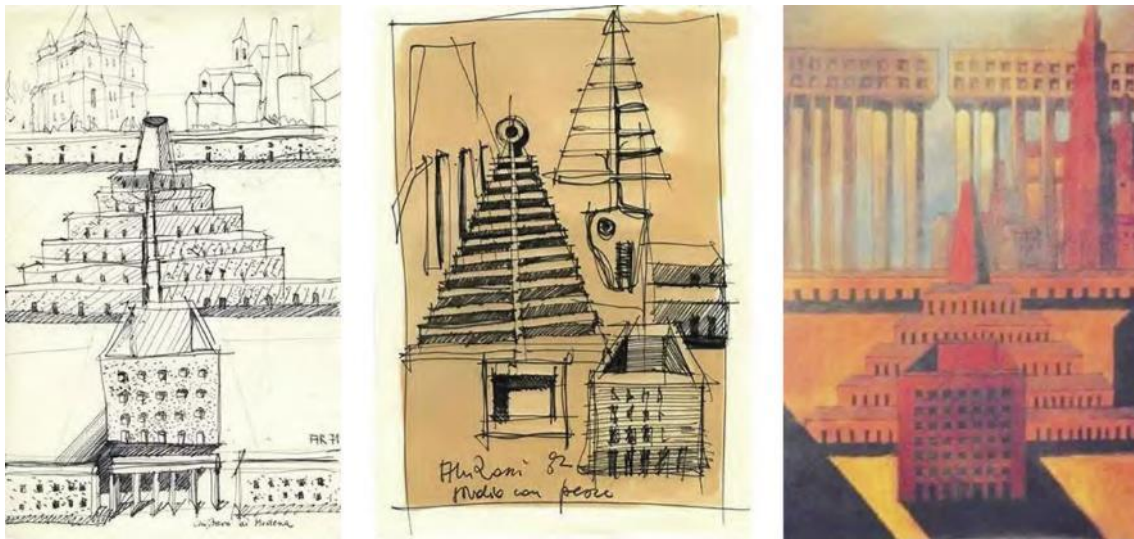


Figure 2-5 San Cataldo Cemetery Conceptual Sketches

### 2.1.3 Integrated Morphological Typology

As can be seen from the descriptions above, the British historical geography school and the Italian typomorphological school share many similar concepts. In terms of the spatial dimension, both divide urban form into different hierarchical scales for analysis, paying attention to the relationship between the overall urban form and various localized elements. In terms of the temporal dimension, both pay attention to the evolution of various morphological elements, and both use historical maps from different periods as analytical tools. These commonalities provide a fundamental framework for the convergence of the two schools.

Starting from the 1990s, British scholar Karl Kropf began the work of systematically comparing and integrating the theoretical contributions of Conzenian urban morphology and

Caniggian architectural typology. In his 1993 doctoral thesis, he first expounded a detailed hierarchical system for "built form." By analyzing built form, he formulated the practical theory of Form-based zoning and the concept of Resolution [33] . Kropf synthesized the hierarchical sequences of Conzen and Caniggia. Using the plot level as a baseline, he extended the Italian school's system to include building, components, and materials. By referring to the Conzenian school's method, he identified levels above the plot as plot series, streets, and urban fabric, and incorporated rooms, courtyards, and street space, integrating the previously overlooked void spaces into the constitution of material form, creating a more comprehensive hierarchical system (Figure 2-6).
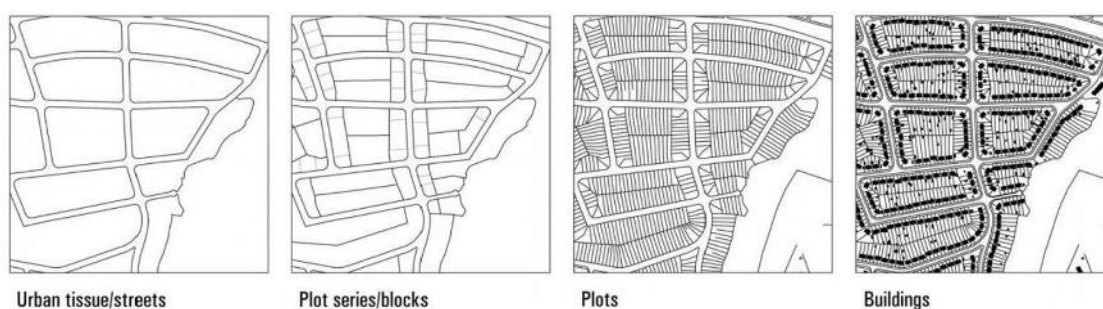


Figure 2-6 Representation of Type in the Same Area at Different Resolutions

## 2.2 Relevant Theories for Urban Cemetery Morphology Research

Urban cemeteries are a significant component of the overall urban morphology and also enduring primary elements. The basis for understanding this spatial structure lies in identifying the processes that shape it and the patterns generated by these processes at different geographical scales. This approach has received initial validation in cemetery morphology studies conducted by relevant scholars in Europe, Africa, and elsewhere. In particular, the concept of the "fringe belt" forms a crucial theoretical perspective for studying urban cemeteries. Therefore, prior to analyzing the morphological forms of Milan's urban cemeteries and adjacent areas, it is essential to further understand and clarify the relevant theoretical background to provide a foundation for the subsequent research.

The urban fringe belt is a zone formed at the edges of towns where development is halted or very slow, and is a belt-like area composed of land units originally sited on the urban periphery with marked mixed-use characteristics [34]. The core idea of the urban fringe belt theory is that the cyclical nature of urban development causes the alternation of land use belts

exhibiting clearly different characteristics during the outward expansion of the urban built environment. During periods of economic prosperity, private investment, largely driven by real estate market speculation, is widespread, and a large volume of residential construction forms the core of the new urban fringe. While in periods of economic recession, private investment declines and public capital is relatively ample, many public projects needing large areas of inexpensive land have the chance to congregate at the urban fringe to take advantage of the lower land prices in these fringe areas. These may include cemeteries, parks, villa estates, military camps, campuses, hospitals, golf courses, waste disposal plants, sports grounds, as well as religious retreats like monasteries [35].

Viewed from the trajectory of the fringe belt concept's evolution, related research can be categorized into three periods: firstly, from 1936 to the early 1960s, when the concept was discovered and defined by European geographers; secondly, from the 1960s to the late 1990s, when geographers integrated fringe belt morphology with economic concepts and elaborated on the underlying driving mechanisms; finally, from the 1990s to the present, the fringe belt concept has progressively expanded into the fields of sociology, urban planning, and ecology (Figure 2-7) [36].

The fringe belt phenomenon was initially referred to as "Stadtrandzone" in German and was first introduced by Herbert Louis in his study of Berlin in 1936. In his study, Louis identified two different types of fringe belts based on the density of different built-up areas within the city. One was the inner fringe belt, embedded within the built environment, the formation of whose form was closely linked to early city wall fortifications. This zone was characterized by vast gardens, railway infrastructure, palace compounds, and other non-residential developments. Its low-density open form contrasted with the surrounding high-density residential areas built in the
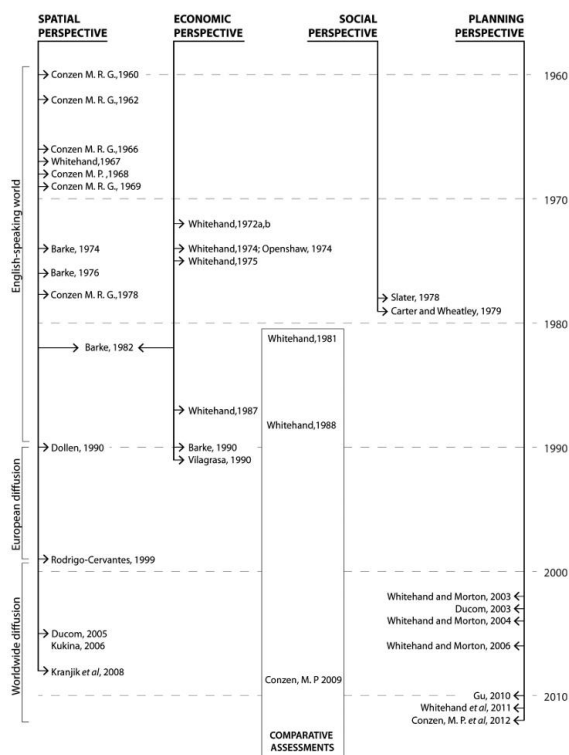


Figure 2-7 Historical Development of Fringe Belt Related Research

late 19th century. The other fringe belt, in a distant suburban area, was composed of industrial zones, agricultural land, villa districts, and villages that had been incorporated into the municipal area, presenting as a marginal zone on the city's periphery. Louis articulated the fundamental concept of the fringe belt and made the first attempt to delineate its boundaries on a map.

Building upon this, in 1960, Conzen also observed the fringe belt phenomenon in his research on Alnwick and Newcastle. Conzen's contribution was to integrate the urban fringe belt pattern into a comprehensive morphological theory, which accounts for the interplay among the processes of formation and transformation of diverse spaces like commerce, industry, residential areas, and public institutions, thereby enriching Louis's initial concept. Furthermore, Conzen extensively studied the intrinsic link between the Inner Fringe Belt in central Newcastle and the city walls serving as physical barriers, and noted that 'fixation lines' are directly related to the formation and definition of the fringe belt. More specifically, urban development experiences cyclical stagnation when confronted by the dual effects of this fixation line which is temporarily insurmountable and the effects of policy or socio-economic factors. As the city enters the subsequent development cycle, the outer areas previously blocked by the fixation line and featuring a mix of different land uses are incorporated into the urban structure, presenting morphological characteristics such as large plot sizes and often irregular boundary shapes, forming a stark contrast with surrounding areas of smaller, planned plots, thereby creating the morphological features of the inner fringe belt [35]. The classic conceptual terminology currently used in academia concerning the structure and changes of the fringe belt are directly derived from these two studies (Figure 2-8).
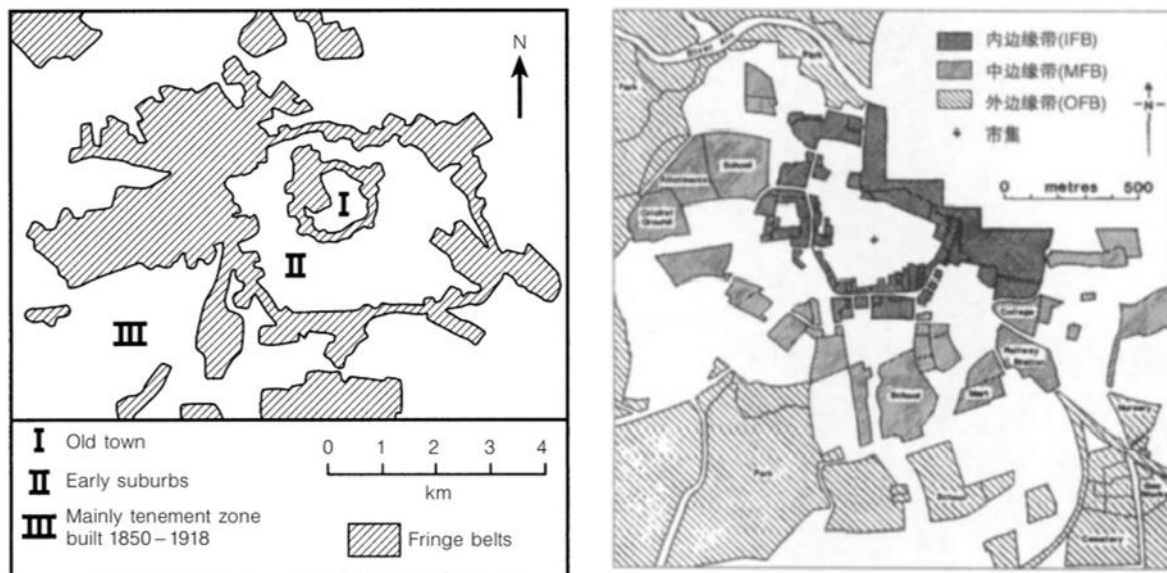
Figure 2-8 Berlin's Urban Fringe Belt (Left); Alnwick's Urban Fringe Belt (Right)

Since the 1960s, the fringe belt concept was expanded into other fields through Whitehand's research. Whitehand incorporated an economic perspective, fully confirming the close connection between fringe belts and fluctuations in urban development cycles. During his research on the dispersed but distinctive Edwardian fringe belts of Birmingham, he, through investigating the connections between public transport, building cycles, the land market, and suburban formation and transformation, summarized the evolutionary principles of fringe belts as the outcome of the interaction between supply and demand in construction activity and the real estate market -- where the economy is vibrant and central area land prices are high, high-density residential development shifts towards the suburbs; when the economy declines and land prices drop, a typical fringe belt pattern emerges in the suburbs (Figure 2-9) [37].

In the mid-to-late twentieth century, the fringe belt theory started gaining widespread acceptance in academia and expanded into various fields including sociology, planning, and ecology, significantly enriching the theoretical scope of this concept. In 1979, Carter H and Wheatley S linked the fringe belt to the evolution of land rent theory, property rights, and social distribution patterns, tracing the connection between the evolution of urban structure, land use characteristics, and the organization of
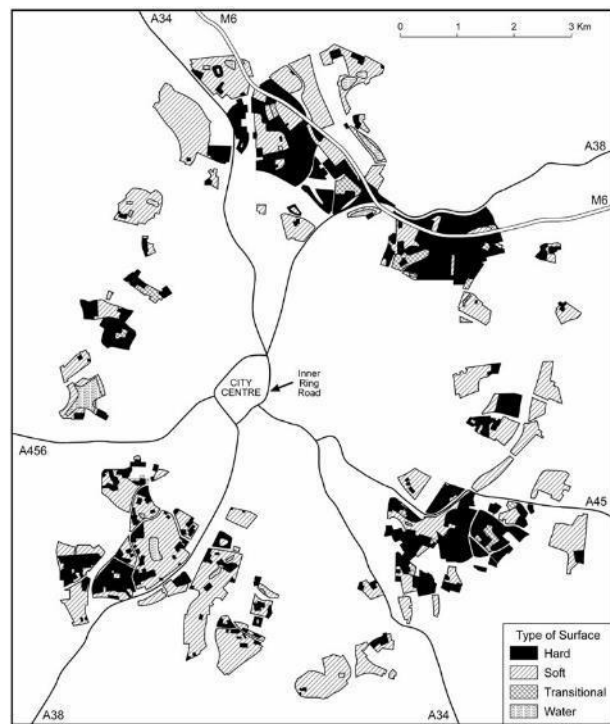


Figure 2-9 Birmingham's Edwardian Urban Fringe Belt

social public infrastructure, expanding the fringe belt concept into the sociological domain. Their study analyzed the social prerequisites for the emergence of healthcare and educational institutions, parks, and municipal service facilities in fringe belt areas and indicated that the necessity of providing public services to suburban residents as well as the scarcity of developable land within the urban core are key factors [38]. Similarly, in 1978, Slater also employed a social perspective to investigate the influencing factors behind the location of 19th-century wealthy residential villa areas. In his research on the town of Cirencester, he correlated structural changes in wealthy households with location, plot size, and changes in land tenure, extending the concept's boundaries [39]. With the advent of the twenty-first century, the volume of research on fringe belts has steadily risen. By way of comparative analytical studies by relevant scholars on the urban suburbs of Europe, China, and the United States, compelling evidence for the global universality of the fringe belt is offered. For example, urban morphologists like Whitehand and Gu Kai have studied the fringe belts of walled cities in China, including Pingyao [40] and Nanjing [41]. Through detailed fieldwork and comparative analysis, they uncovered the differences and commonalities in Eastern and Western fringe belt development. Within the last decade, fringe belt research from an ecological perspective has increasingly appeared, which aims to investigate the ecological value of fringe belt areas. Among these is Hopkins' 2012 research on urban green spaces in

Birmingham [42] . By comparing tree cover in different areas, he highlighted the value of the high proportion of trees in fringe belts for urban ecology and biodiversity. Furthermore, there is also Whitehand's 2019 research on the ecological and cultural heritage value of surviving green spaces in the metropolitan fringe belts of Sweden, Poland, and the UK, and he highlighted the importance of their ecological value for urban management [43].

It can be seen from the above summary and analysis that the fringe belt phenomenon is commonly observed during the cyclical development process of historical cities expanding from a single core. In this context, urban cemeteries, as public projects occupying significant land areas, are inevitably key components of the fringe belt. Furthermore, influenced by views on life and death, cemeteries also display a clear "fixation" characteristic, which throughout different stages of historical development consistently revolve around characteristics like impurity, inauspiciousness, etc., that somewhat impede the development of the urban periphery. Consequently, during modern and contemporary funerary reforms, cemeteries were widely relocated to the urban periphery, away from settlements. However, during subsequent periods of urban expansion, cemeteries again exhibited considerable inertia, making rapid relocation impossible, and were consequently re-incorporated into urban areas, creating distinct cemetery fringe belts. Given this, the urban morphological concept of the fringe belt is justified as a rational observational perspective to dynamically analyze the relationship between cemeteries and the city.

## 2.3 Summary

This chapter first briefly reviewed the main theoretical frameworks and research methods in urban morphological typology studies. The research of the British historical geography school is primarily centered on urban plan analysis, utilizing morphological regions as the primary interpretive tool to analyze the morphological characteristics of town plan, building fabric, and land use. The Italian school concentrates more on identifying the processes of typological evolution; typological maps serve as the school's main research tool. With the aim of identifying the internal structures of different hierarchical scales, it seeks to synthesize their evolutionary patterns, offering a reference for future design. The two schools are highly complementary in terms of the essential logic and technical approaches of morphological analysis. This summarization provides subsequent urban morphological analysis with

fundamental methods and a framework.

Secondly, drawing upon the specific characteristics of urban cemeteries, the second section of this chapter analyzed the morphological and typological research methods related to the fringe belt. The fringe belt is a phenomenon commonly observed during the historical urban development process, and is a belt-like zone created during the cyclical expansion process of historical cities, with basic characteristics of low building density and mixed land use. This unique morphological form has been amply confirmed in studies from the twentieth century to the present. By considering cemeteries as components of the fringe belt, it facilitates a rapid understanding of the fundamental characteristics of their morphological evolution, offering a basis for further in-depth research.

# 3. Research on the Morphological Evolution of Milan's Urban Cemeteries Since the 19th Century

Milan is one of Europe's important cities with a long history, and its development trajectory has been accompanied by significant urban expansion. The medieval walls built in the 13th century demarcated the core area of the city, creating the early morphological features characterized by dense built form and high-intensity land use. During Spanish rule in the 16th century, Milan expanded outwards concentrically, constructing the Spanish Walls (Mura Spagnole), parts of which remain visible today. This wall not only enlarged the urban area but also laid the groundwork for subsequent ring-based development. With the advent of the 19th century, modern urban planning concepts and the process of industrialization started to deeply influence Milan, driving the city's continuous evolution, and it reached its peak scale in the mid-20th century. Every development phase left its unique morphological imprint on the city.

This chapter will analyze by combining the background of Milan's urban development and the characteristics of the morphological evolution of urban cemeteries, and will divide the process of morphological evolution of Milan's urban cemeteries since the 19th century into four phases: Stagnation Phase (1782–1861); Initial Planning Phase (1861–1895); Planning Adjustment Phase (1895–1934); and Rapid Construction Phase (1934–1964). On this basis, the morphology of urban cemeteries in different stages will be studied at different hierarchical scales, summarizing and synthesizing the patterns of change in the morphological form of Milan's urban cemeteries.

## 3.1 Overview of Milan's Urban Development Background

Milan is the capital of the Lombardy region of Italy, situated in the heart of the Po Valley (Pianura Padana) in Northern Italy, located on a key transportation route connecting Northern Europe and the Mediterranean, playing a significant role in Italian and European history and culture. Its urban development dates back to the 4th-century BC settlement of the Insubres. In the Roman period, it was converted into a military camp and quickly rose to prominence as a major political and administrative center of the empire, even briefly serving as the capital of

the Western Roman Empire, laying the groundwork for its early orthogonal or irregular urban morphology. In the medieval period, Milan, capitalizing on its status as a transport hub, became an economic powerhouse of Europe, gained autonomy through the Lombard League, and its textile industry boomed. Urban expansion spurred the construction of the medieval walls, demarcating the inner city core; concurrently, iconic structures such as the Milan Cathedral began to be built. Despite undergoing Spanish and Austrian rule from the 16th to the early 19th century, resulting in urban planning stagnation for a time, the Spanish Walls built between 1546 and 1560 nevertheless established a framework for concentric development that has persisted to the present. In the modern period, the 18th-century Enlightenment and 19th-century railway construction together propelled Milan to the position of the economic engine of Northern Italy. Following its incorporation into the Kingdom of Italy in 1861, Milan witnessed the implementation of its first modern urban expansion plan, formulated under the direction of engineer Cesare Beruto, which critically shaped the formation of the modern urban layout. In the 20th century, despite enduring the ravages of two world wars, Milan, leveraging its strong sectors in automotive manufacturing, mechanical engineering, and chemical industries, generated the "Italian economic miracle." Post-war, it gradually shifted towards deindustrialization and high-end fashion industries, and urban development consequently pivoted towards central area renewal and sustainable development, ultimately establishing its current reputation as a global fashion capital.

## 3.2 Stagnation Phase (1782–1861)

From the late 18th to the early 19th century, Italy underwent a turbulent period marked by frequent changes in government. Accompanying planning and institutional reforms propelled Milan into a new phase of development. Against this backdrop of change, traditional burial practices in churchyards and church cemeteries were challenged, leading to the gradual appearance of new types of urban cemeteries exhibiting diverse morphological features. To gain a comprehensive understanding of the morphological forms of cemeteries during this period, this subsection will follow a research path from macro to micro: First, we will begin by examining from the perspective of the urban fringe belt, analyzing the connection between urban pattern evolution and cemetery development at the macro level. Then, at the mezzo level, we will focus on cemetery plots and their surrounding areas,

discerning their dynamic relationship and categorizing evolutionary types. Finally, through a micro-level analysis of representative cemetery building types, we will explore the typical characteristics of suburban cemeteries emerging during this period.

3.2.1 Overview of the Urban Pattern

Prior to the unification of the Kingdom of Italy, urban construction in Milan developed relatively slowly due to repeated shifts in power. In this period, the city's newly developed areas were primarily concentrated within the medieval walls, with only a few buildings extending outwards along the roads leading to the city gates. Overall, the urban form during this period exhibited the following two main characteristics (Figure 3-1):
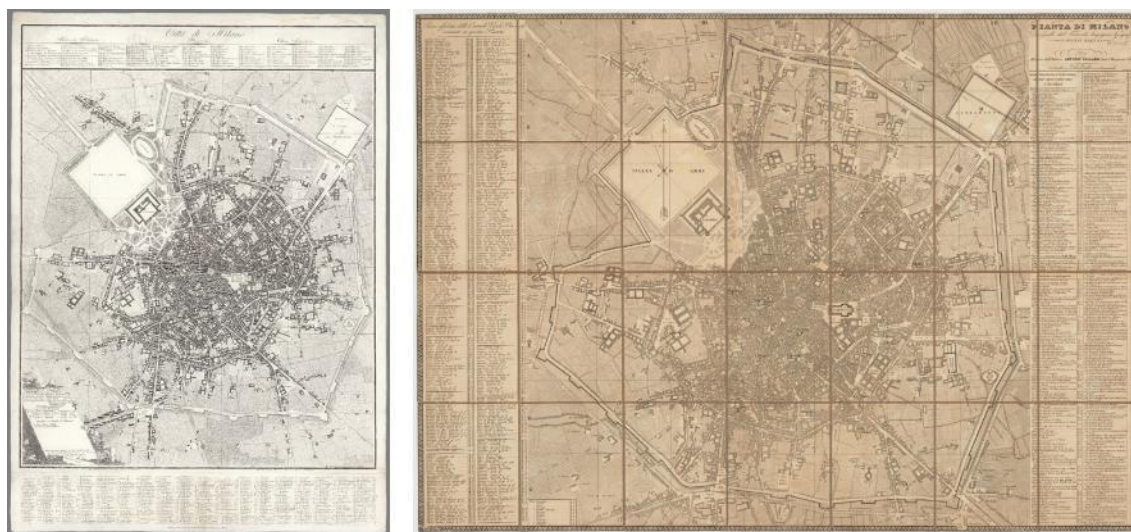


Figure 3-1 Map of Milan 1801 (Left); Map of Milan 1860 (Right)

(1) The core area retains medieval characteristics, and the level of development is low. The city's core area had not yet fully overcome the limitations imposed by the medieval walls, still retaining notable medieval urban morphological features. Significant open spaces still existed within the walls, and the overall level of development was low. Built areas were heavily concentrated within the medieval walls, with limited buildings extending outwards along a few main transport axes towards the outer Spanish walls. The road network structure of this area combined the organic medieval street pattern with outward radiating main roads, creating an urban road layout dense at the center and sparse on the periphery, and dividing the internal plots into irregular and fragmented forms.

（2）Significant variations existed in the land use patterns across different areas of the city. The core area within the medieval walls developed around the Duomo di Milano.

Residential and public buildings were small in scale and densely occupied irregularly shaped plots. By contrast, the area between the medieval walls and the outer Spanish walls was not yet highly urbanized. Its main characteristics were large expanses of agricultural land and low-density farmsteads (cascinas). Arterial roads radiating outwards from the city center demarcated large wedge-shaped areas between the two sets of walls, where roads and buildings constituted the boundaries of each wedge-shaped zone, while the central portions were occupied by extensive agricultural fields. These productive farmlands were crisscrossed by irrigation ditches and, along with the moat outside the Spanish walls and adjacent waterways, formed a complete water network. Furthermore, Sforza Castle (Castello Sforzesco), situated at the northern tip of the city, as a standalone military facility, was a self-contained entity with its large squares and wide walkways, creating a distinct morphological area, juxtaposed with the aforementioned two types of areas. Beyond the outermost Spanish walls lay vast agricultural fields, with hardly any trace of construction. Limited construction took place in the Borgo della Ripa area north of the castle and the Borgo degli Ortolani area in the city's eastern corner. The former comprised mostly residential buildings, situated along the streets. The latter still housed the leper hospital designed by Lazzaro Palazzi in the late 15th century; this building was also derelict during this period, being used only as farmland and storage space by farmers.

3.2.2 Cemetery Morphological Characteristics

**3.2.2.1 Fringe Belt Morphology**

Prior to the implementation of unified urban cemetery planning in the 18th century, citizens commonly sited graves in enclosed areas adjacent to or surrounding churches or chapels within the city, to ensure a resting place for the soul after death. By the late 18th century, escalating epidemics and the pressure on space within city churchyards forced the authorities to take action. The rulers of Milan issued a decree in 1768 forbidding burial near churches: "To preserve the dignity of churches, burial outside the city should be reinstated as far as possible, and to this end, cemeteries must be established in open areas located far from residential districts." Subsequently, this initiative was expanded to include the closure of private family cemeteries near churches and convents, and all graves were relocated to cemeteries designated outside the Spanish walls for centralized management and burial [44].

Against this backdrop, from the late 18th to the early 19th century, Milan began constructing four suburban cemeteries consecutively along the area of the outer Spanish walls. Notably, the locations of these new cemeteries frequently utilized and expanded upon the former sites of mass graves used for burying plague victims in earlier periods. These were Cimitero del Gentilino (Gentilino Cemetery), Cimitero di S. Gregorio (St. Gregory Cemetery), Cimitero di S. Giovannino alla Paglia (St. Giovannino alla Paglia Cemetery), and Cimitero della Moiazza (Moiazza Cemetery) (Figure 3-2).
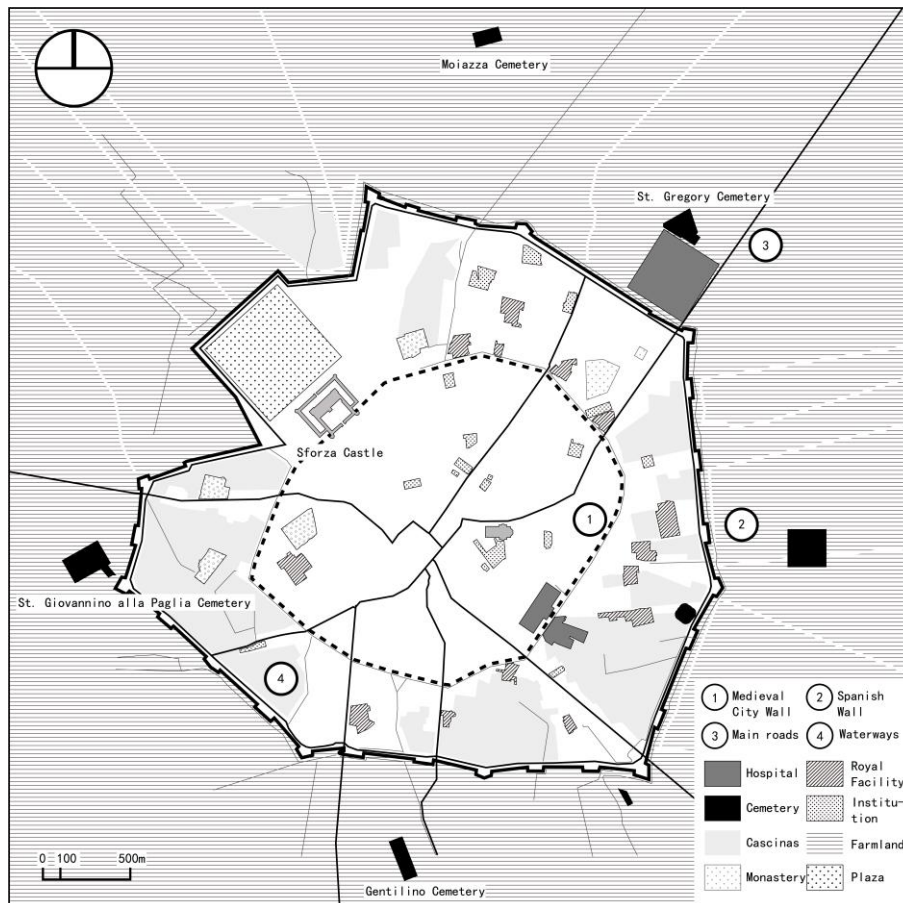


Figure 3-2 Spatial Distribution of Milan's Suburban Cemeteries, 1810

Unlike the churchyards within the city, the suburban cemeteries of this period were mostly regarded as impure sites and had to be separated from the residential areas of the living. Government decrees stipulated clear regulations regarding the distance between cemeteries and main residential areas. Specifically, the medical regulation (il regolamento di Polizia medica) promulgated in 1807 mandated that the distance between cemeteries and residences should not be less than 60 meters and must be far from main roads. A year later, this regulation further increased this distance to 100 meters and forbade construction or the digging of wells within this zone. Despite these restrictions, however, as urban development

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remained relatively slow during this period, the outer fringe belt had not yet taken shape, and the cemeteries were quite distant from the built-up areas. Consequently, these cemeteries did not affect urban development nor had they yet served as a restrictive fixation line, merely reinforcing the existing characteristics of large plot sizes and a sparse road network in the urban periphery.

During this period, a distinct "inner fringe belt" emerged between the core and the periphery of Milan, that is, the vast area between the medieval walls and the Spanish walls. Morphologically, this area was initially shaped by the two sets of walls and large public institutions like convents and hospitals; its primary component was extensive agricultural land and was viewed as potential space for urban expansion. The wedge-shaped plots in this area formed by the radial arterial roads were further subdivided under new transport planning and refined along the existing network of field paths. Furthermore, large tracts of land in the northwestern city area were designated for military and royal use, particularly on either side of Sforza Castle for military purposes, where significant open space was retained for the establishment of facilities like military barracks and mints. As the demand for urban development overflowed, new construction started moving into this area, particularly in its southern and northern sections. Numerous residential buildings as well as facilities like government offices, hospitals, and factories were constructed here, many occupying quite large plots. Representative large institutions of the time included religious complexes combining churches and convents, such as Basilica di Sant'Eustorgio, Chiesa dei Santi Paolo e Barnaba, Santa Maria della Passione, Church of San Pietro in Gessate, and others, as well as medical facilities such as Ospedale Maggiore. These historic buildings are still preserved today and are widely distributed within the area between these two sets of walls.

**3.2.2.2 Street Block Pattern**

From the late 18th to the early 19th century, the shift in Milan's social and political attitudes towards funerary practices led to exclusionary interventions targeting city churchyards, thus fostering the appearance of entirely new types of suburban cemeteries. This subsection aims to, through comparing the differences in urban morphology and spatial patterns between the two types of burial sites, analyze the early impact of suburban cemeteries as "fringe belt" elements on the surrounding areas.

During this period, both churchyards and suburban cemeteries were present in Milan, and the two exhibited marked differences in aspects such as plan morphology, land use, and traffic organization. The former, as the common burial type within the city prior to the 19th century, were largely enclosed areas adjacent to or surrounding churches or chapels. Despite repeated explicit prohibitions by municipal decrees, however, due to resistance from influential families who possessed exclusive burial plots, the gravesites within city churches and their associated areas were not immediately emptied, with some burial grounds even remaining until the mid-19th century before being fully cleared. For instance, churches that still practiced church burial during this period included: Santo Stefano, San Lorenzo, Santa Eufemia, and others. The burial areas of these churches were situated within the dense fabric of the traditional city center, often situated along one side of the city's main thoroughfares. The vicinity of these areas featured a dense road network composed of a dense network of interwoven main and secondary roads. Buildings occupied almost the entirety of the plots, leaving only small, irregularly shaped burial grounds and inner courtyards between buildings or around the churches.

Early churchyards served as both dedicated burial places for Milan's Christian community and also as multifunctional spaces. For example, at San Lorenzo, its burial area was adjacent to one of the key arterial roads of the time - Corso di Porta Ticinese. This arterial road linked the city center with the Ticinese district, which was then dominated by artisanal manufacturing (particularly blacksmiths and tanners). Waterway transport congregated here, attracting a large number of practitioners and goods to gather in this area. Immediately north of the burial area was a high-density residential zone consisting of two- and three-story buildings and narrow backyards, while on the other side was an open square bordering a canal, which previously served as a venue for assemblies, speeches, markets, dances, and even goods storage. Another example is the Santa Eufemia churchyard, which was integrated into a denser urban fabric, with the cemetery wall even linking to the rear walls of a row of houses. The entrance area of the church and churchyard was also adjacent to a main city thoroughfare. From these morphological features, it is easy to infer the spatial relationship of "intimate coexistence" between the living and the dead prior to the 19th century (Figure 3-3).。
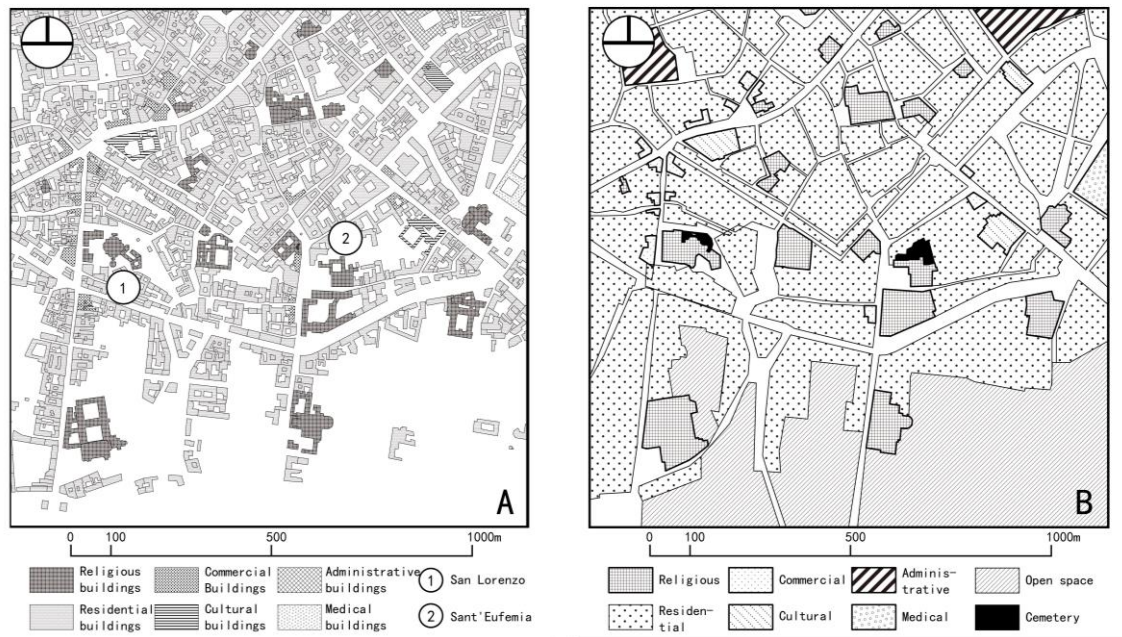
Figure 3-3 Morphology of Milan Churchyards, 1810: A. Building Morphology; B. Land Use

In contrast to the close connection between churchyards and urban areas, the newly established suburban cemeteries were moved to sites distant from the city and were separated from the urban area by a powerful fixation line - the Spanish Walls. The existing surroundings of the new locations consisted of dispersed layout, low-density buildings, and extensive agricultural fields. The surroundings showed a sprawling and fragmented built fabric. These buildings were predominantly farmsteads and warehouses outside the walls and had little direct connection with the cemeteries themselves. Buildings next to the cemeteries were largely subsidiary structures related to funerary functions. These scattered structures, along with the cemetery walls, created physically separated burial zones. It can be concluded that within the fragmented urban landscape, urban cemeteries were relocated to an area with more detached spatial connections.

This spatial segregation partly reflects the decree's regulations concerning the requirement that cemetery sites be "open and far from residential areas," and also mirrors the contemporary concerns about cemetery hygiene. As an example, Cimitero del Gentilino, situated outside Porta Ticinese in southern Milan, was founded in accordance with the decree and was intended to receive the remains relocated from churchyards as well as the bodies of residents of the Corpi Santi (suburbs). The origins of Cimitero del Gentilino date back to the plague isolation area between 1524 and 1576; on its edge, a small chapel dedicated to S.

Rocco was constructed. Cimitero del Gentilino was originally situated on an open grassland to the west of the old chapel, and its auxiliary altar was added through funding from the Brotherhood of Scholars (Confraternita di scolari). In 1787, in accordance with the decree, the cemetery was expanded and relocated to the southeast of the former site. The cemetery entrance was deliberately positioned about 69 meters away from the main municipal road. To the east and west of the cemetery were municipal arterial roads directly linked to the city gates. Lining both sides of these roads were linearly arranged dense residential and industrial buildings, all located at a distance of over a hundred meters from the cemetery. The only structures close to Cimitero del Gentilino were the farmstead to its east; in addition to that, there were subsidiary buildings related to the cemetery's function. Similarly, the land use map shows that suburban cemeteries during this period were situated within an environment that was primarily agricultural and single-functional, while urban development concentrated further out along the arterial roads (Figure 3-4).
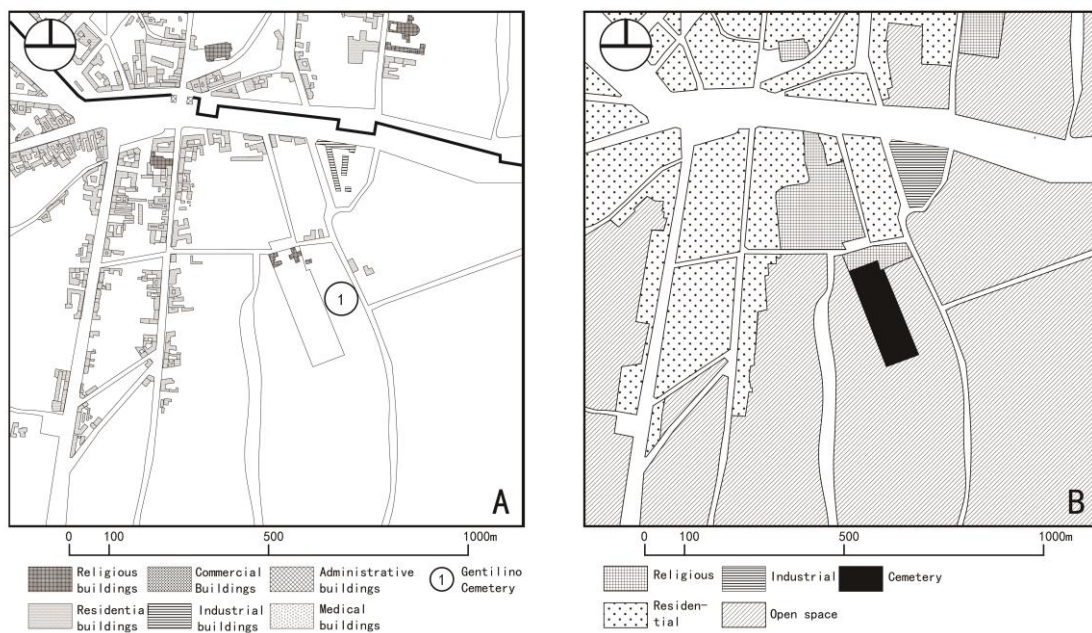


Figure 3-4 Morphology of Milan's Cimitero del Gentilino, 1860: A. Building Morphology; B. Land Use

In contrast to the detached environment of Cimitero del Gentilino, Cimitero di San Gregorio, outside Porta Venezia in northeastern Milan, was situated in an area with relatively better surrounding infrastructure and more diverse functions. The surroundings of this cemetery featured a concentration of various functional facilities: To its west, it was directly adjacent to the bustling Corso Buenos Aires, which in the 19th century served as an important

transport and commercial corridor linking Milan and Monza, lined with textile trading businesses. Closer to Porta Venezia was the Public Gardens (Giardini Pubblici Indro Montanelli), established in 1786 and spanning 170,000 square meters, primarily laid out in a geometric French garden style, supplemented with rockeries and an artificial lake, and including sports grounds in its northeastern corner, being an important public recreational space. To the south of the cemetery was a leper hospital constructed in the 15th century; the building was constructed concurrently with the cemetery's predecessor. It subsequently underwent renovations, serving successively as a farmstead, military camp, school, and poorhouse, providing a large spatial framework for the area. While to the east of Porta Venezia, Milan's first luxurious open-air swimming pool - the Bagno di Diana - was constructed in 1842. Together with its swimming school, gymnasium, changing rooms, restaurant, ballroom, and a seven-hectare accompanying garden, it collectively formed a large suburban entertainment complex. To the east of the cemetery, there was a small chapel for religious services and a villa named after San Gregorio, which was later converted into a school (Figure 3-5). The presence of rich surrounding cultural and recreational facilities to some extent dispelled the NIMBY (Not In My Backyard) nature of the cemetery.
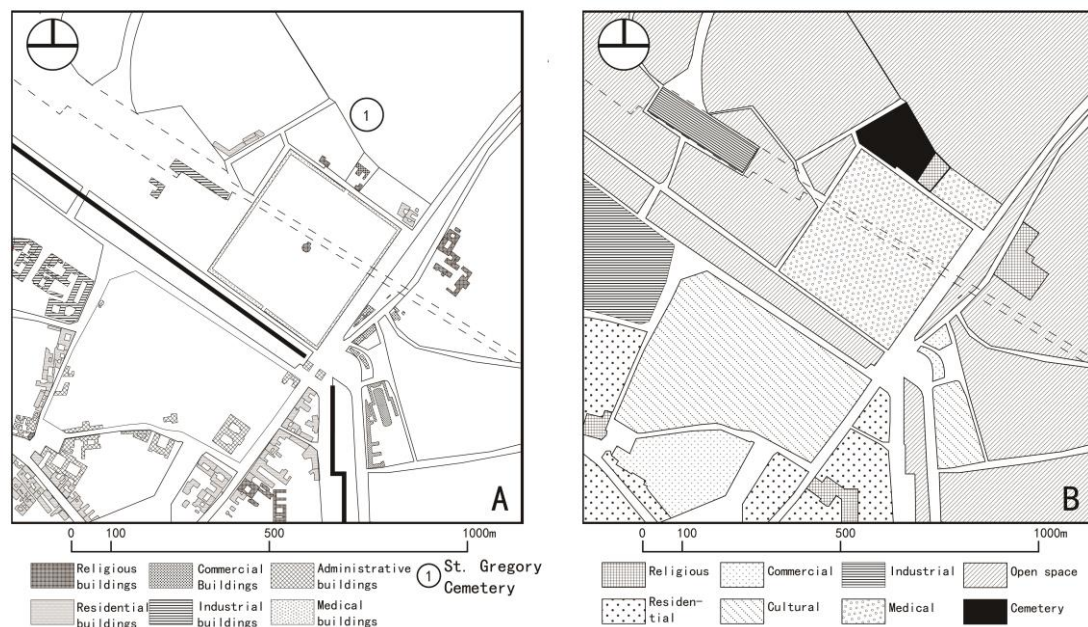


Figure 3-5 Morphology of Milan's Cimitero di San Gregorio, 1860: A. Building Morphology; B. Land Use

From the contrast between churchyards and suburban cemeteries during this period, it is evident that the spatial pattern of Milan's urban cemeteries was in a period of change, which

also implicitly reflected the changes in the relationship between the living and the dead. This change is manifested in that the nobility within the city still actively protected their families' right to burial within churches, whereas the newly built suburban cemeteries, relocated to the outermost edge of the city, distant from populations and built-up areas, were primarily used for burying ordinary citizens, the poor, the marginalized, and prisoners who had undergone "social death." This act of moving cemeteries away from daily life not only increased the burial costs for ordinary citizens, but more significantly, it spatially segregated the phenomenon of "death," detaching urban cemetery sites from the urban fabric and turning them into a tool of spatial exclusion.

### 3.2.2.3 Building Type

The suburban cemeteries of this period were designed to function as and embodied a tool for spatial exclusion. This subsection aims to, through architectural spatial analysis, investigate how their site-specific features achieved this exclusion. Despite the relatively simple form of suburban cemeteries in this period, micro-spatial analysis can reveal the internal functional order of these cemeteries and their design intention for isolation from the outside.

The entire space of suburban cemeteries can be regarded as a system comprised of a core functional zone (e.g., the chapel and its vicinity), burial areas, and a defined boundary. Spatial uses associated with mourning rituals were concentrated around the chapel and the paths leading to it. The boundary typically consisted of a rudimentary wall and a separate entrance, together creating an enclosed site. There was often a small open space in front of the chapel, serving as a space for other related activities and also acting as a buffer zone between the cemetery and residential areas to satisfy the behavioral norms and hygiene requirements of funerary rituals. It is evident that these suburban cemeteries, as enclosed systems, possessed the necessary spatial elements to maintain their operation and functional integrity.

For example, Cimitero del Gentilino, its design clearly demonstrated this spatial isolation. The cemetery consisted of two parts. To its north was a standalone chapel; to its west was an open space connected to external roads by a path. The burial ground was then situated to the south of the chapel area. The plan had a standard rectangular shape, enclosed by walls with wooden gates. The interior was exceptionally simple, featuring only crosses and a few wall-

mounted gravestones. Despite its surroundings being a low-density agricultural environment, the cemetery still opted to build walls approximately 3.5 meters high, intended to physically and visually impede external entry. The entrance was also deliberately set apart from the chapel area, with only a narrow path linking external roads and the cemetery grounds. This camp-like layout lent the area an "extra-territorial" quality. Clear boundaries, including the high walls and separate entrance, by emphasizing the separation between inside and outside, created a clearly defined independent zone. This pronounced separation had a dual function: it both separated the outside from the inside and protected the inside from external interference. These design features reinforced their role as places separated from daily urban life (Figure 3-6).



Figure 3-6 Plan of Milan's Cimitero del Gentilino (Left); Illustration (Right)

The plan layout of Cimitero di San Gregorio also displayed distinct enclosed characteristics. Its boundary wall was 3.85 meters high, enclosed by walls two bricks thick. The cemetery entrance was situated on one side of a one-way road, connected to the south via a small bridge to the leper hospital, with buildings controlling both ends of the road, thereby limiting people's line of sight. In contrast to the narrow and straight entrance passage of Cimitero del Gentilino, the entrance of Cimitero di San Gregorio was intentionally offset by 30 degrees, thereby preventing a direct view into the cemetery grounds from the leper hospital side. Through the design incorporating high walls, restricted passages, and the angled entrance, this cemetery effectively achieved physical isolation and visual control over the internal landscape, further strengthening its enclosed morphology (Figure 3-7).
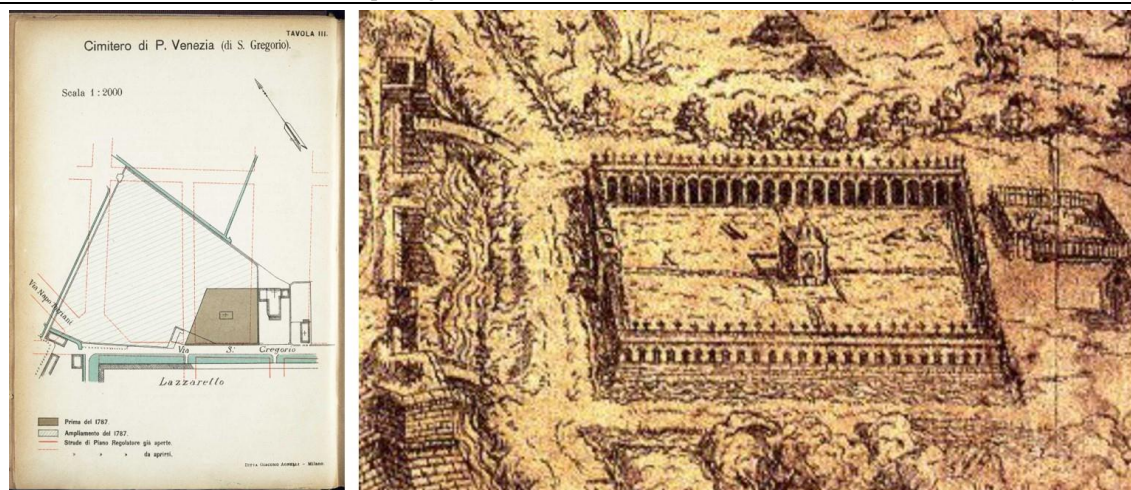
Figure 3-7 Plan of Cimitero di San Gregorio (Left); Illustration (Right)

The form of suburban cemeteries in this period not only directly embodied the fundamental characteristic of spatial isolation but also represented a representative of the transformation in the funerary spatial model. Their boundaries featured straight rectangular shapes and standardized dimensions. The overall layout was no longer shaped by traditional Christian culture but adhered to modern planning concepts. Within the cemetery grounds, there was a clearly planned road network and durable tombstones, preliminarily acquiring the key characteristics of a modern cemetery. Accompanying this spatial change, the management structure for funerary activities also shifted: the construction of housing for municipal management staff around the cemeteries served as physical evidence of the transfer of management from the church to the municipality. It is evident that the form of suburban cemeteries, compared to traditional churchyards, already displayed "modern" features, constituting an early paradigm for the subsequent evolution of urban cemeteries.

## 3.3 Initial Planning Phase (1861–1895)

In the mid-19th century, Italy concluded over half a century of social upheaval, achieving unification in 1861. Urban development in Milan also progressively unfolded thereafter. The ongoing construction of railway facilities in this period and the implementation of the first modern master plan provided Milan with a new framework for development. During this period, the rapid expansion of urban development and population created new demands for burial space, not only prompted changes in the form of existing suburban cemeteries but also fostered the emergence of new urban cemeteries. Given this, this subsection will concentrate

on researching the characteristics of different types of urban cemeteries and the varying relationships they exhibited with the built-up urban areas.

3.3.1 Overview of Urban Pattern

The Beruto Plan (Piano Beruto), initiated in 1884, was Milan's first comprehensive urban plan and one of the most significant urban planning documents of the era. The plan underwent lengthy revisions and was finally approved and officially took effect in 1889. During this period, the urban pattern was further developed, with not only the areas outside the Spanish Walls beginning to develop extensively, but also the street system within the city was more finely divided. The main characteristics of the urban pattern during this period include (Figure 3-8):
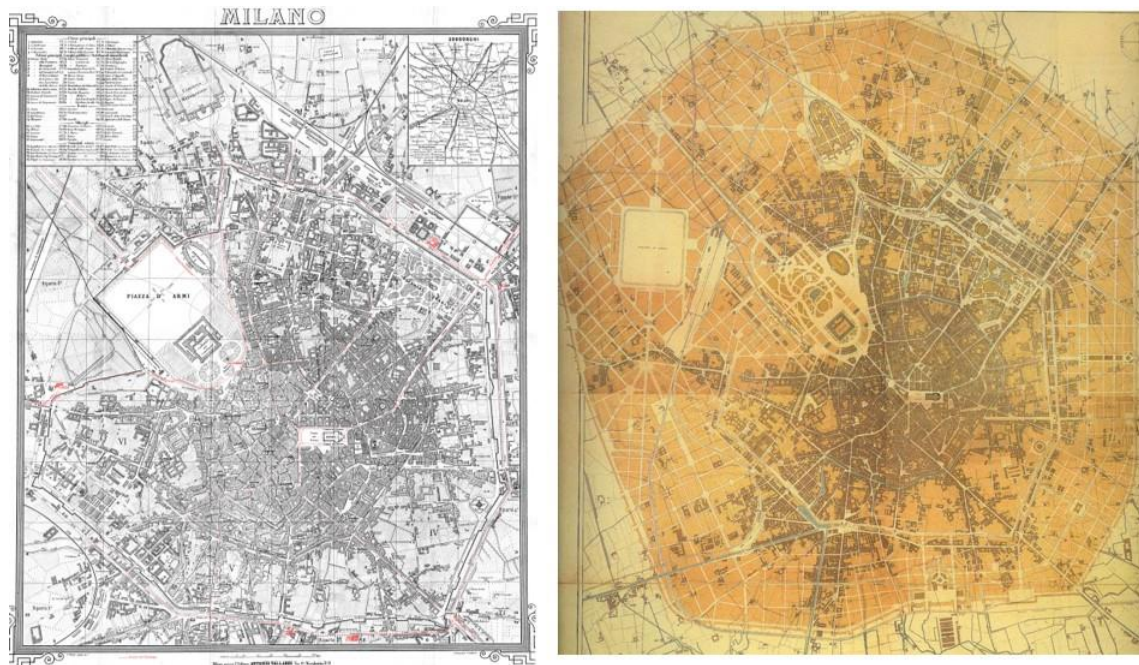
Figure 3-8 Map of Milan, 1883 (Left); Beruto Urban Master Plan, 1889 (Right)

(1) The urban structure exhibited three distinct morphological zones, distributed in concentric layers. The morphological pattern of the central urban area within the medieval walls was largely defined, retaining the characteristics of the original organic road network. The area between the medieval walls and the Spanish walls was further subdivided: New urban roads created a network combining orthogonal and radial elements, subdividing the wedge-shaped plots initially formed by radial arterial roads into smaller square grids. Concurrently, the planning of this area remained influenced by a complex water system (including canals, channels, and sewers), resulting in plots exhibiting multi-layered

characteristics that blend orthogonal grids and organic forms. The areas outside the Spanish Walls, previously used extensively for agriculture and without formal planning, were designated in the Beruto Plan as numerous regular, rectilinear geometric plots. The main roads extending straight outwards from the city gates constituted the fundamental framework for this area. Later block construction was largely arranged perpendicular or parallel to the main roads and formed circular nodes at intersections, collectively forming the orthogonal grid of the outer zone.

(2) The urban morphological evolution mode during this period was dominated by linking the central urban area with the outer zones. The core principle of the Beruto Plan was to regard the city as an organism expanding outwards from its core, advocating for the maximum possible connection and integration of the city's internal and external areas, breaking physical barriers, and achieving overall coherence and unity. The plan cited that the city "*should develop gradually along its most densely built initial lines, constructing houses one after another, just as a large crystal forms.*" [45] viewing expansion as a natural extension of the ancient single-center structure. To realize this objective, the plan put forth several key measures. The plan first suggested the demolition of the Spanish Walls to remove the physical barrier separating the historic center from new development areas and convert the area surrounding the walls into wide primary transport routes and green avenues, thereby achieving coherent spatial and traffic unity between the city's interior and exterior. Secondly, the plan addressed Milan's complex water system with proposed renovation measures, undertaking the improvement of canals, channels, and sewers to resolve issues of water stagnation and deteriorating sanitary conditions, improving the overall urban environment. Moreover, concerning Sforza Castle as a particular element, its extensive parade ground occupied space in the northwestern city center, hindering urban expansion. The plan suggested means such as constructing direct roads to effectively integrate it into the new urban structure. Overall, the plan, building upon the reorganization and utilization of existing elements in the city center, further stressed the widening and restructuring of the urban road network, aiming to create urban spaces with a clearer structure, enhanced livability, and vitality. The Beruto Plan laid the groundwork for the modern urban system of Milan, enabling the city to rapidly evolve into an international metropolis blending historical tradition with modern functions by the late 19th century.

3.3.2 Cemetery Morphological Characteristics

**3.3.2.1 Fringe Belt Morphology**

Milan's first urban master plan attempt started in 1807 during the French rule period. This ambitious scheme aimed to, based on the ideology and political vision of the French rulers, by means such as introducing a geometric network and creating new arterial roads in the city center, thoroughly reshape Milan. Although this scheme was ultimately not implemented, it nonetheless offered a completely new vision for Milan's urban development in the 19th century, prompting the city to gradually shed its medieval structure and move towards a modern form. From 1807 until the Beruto Plan was finally approved and took effect in 1889, Milan's urban planning underwent a long and complex process spanning nearly 80 years. This final plan embodied early rationalist planning concepts and, by utilizing a concentric urban grid system, systematically coordinated various issues in urban development and consequently shaped Milan's urban spatial form of concentric expansion from its core.

Yet, unlike the comprehensive Beruto Plan, which was time-consuming and only formally implemented towards the century's end, Milan's urban cemeteries, as crucial components of the urban outer fringe area, had a relatively earlier and ongoing construction and development process. The suburban cemeteries (Foppone) from the previous phase, built in 1787 and remaining operational until their official closure in 1895, they significantly participated in the urban morphological evolution of Milan that occurred during this period. Concurrently, new urban ideas also fostered the emergence of entirely new types of monumental and centralized cemeteries, among which the Monumental Cemetery (Cimitero Monumentale), constructed in 1866, became one of the most significant landmark elements in the northwestern area of Milan during the 19th century. These two types of urban cemeteries, originating from different periods but with partially overlapping operational periods, collectively formed key spatial characteristics of Milan's urban outer fringe belt during its transitional development phase.

The transformation of Milan's funerary spatial model during the 19th century was primarily driven by two major forces: increasing population pressure and changing views on life and death. As the urbanization process accelerated, Milan's population increased significantly, surging from around 135,000 people at the start of the 19th century to nearly 268,000 in 1861, almost doubling. This was accompanied by a significant increase in the

death toll. Yet, the suburban cemeteries (Foppone) built earlier not only suffered from severe space limitations but also their infrastructure was dilapidated due to age. Studies conducted by the Milan Health Committee in 1874 and 1882 indicated that most cemeteries were nearing capacity, with some even being unusable due to water accumulation [44]. These cemeteries established in the late 18th century were clearly unable to meet the increasingly expanding funerary demands of Milan.

Furthermore, with the conclusion of French rule, the cult of commemoration for the deceased resurfaced among the citizenry. Cemeteries, as significant sites for the living to express grief and show respect, their emotional function became increasingly pronounced. Unlike the rational or even detached attitude towards death during the Enlightenment, the Italian independence movement spurred heightened national and familial sentiments, further propelling the revival of the cult of the dead in Milan. Meanwhile, the early suburban cemeteries, distant from the city center and rudimentary in form, could not meet the emotional needs of the citizenry. In view of the dual challenges posed by population pressure and public demands, the Milanese municipal government commenced planning a completely new cemetery scheme starting in 1822, aimed at providing ample space, creating an open environment, and promoting public art development, ultimately constructing the Monumental Cemetery in 1866, which met these goals.

The newly constructed Monumental Cemetery is situated in the northwestern part of Milan's urban outer fringe belt, that is, beyond the Spanish Walls, directly opposite Porta Volta. Site conditions were crucial factors in the site selection, requiring a plot area of no less than 90,000 square meters to accommodate a large centralized cemetery. Simultaneously, to align with the design concept of rational symmetry, the site boundaries needed to be as regular as possible. Ultimately, the city council, in the area of the Corpi Santi di Porta Tenaglia (suburbs near Porta Tenaglia), purchased this plot of land, measuring 91,700 square meters, from private owners and the railway company to serve as the cemetery site. Although this site selection was questioned due to potential conflict with the city's future development plans, the committee insisted that "there is no compelling reason to abandon the designated site" and ultimately approved this location [44].

During this period, the systematic characteristics of the relationship between cemetery planning and urban morphology were primarily evident in: the newly constructed

Monumental Cemetery was located in a large area of undeveloped land north of the walls and, together with the existing suburban cemeteries and funerary facilities outside the Spanish Walls, collectively forming the main characteristics of Milan's urban outer fringe belt. This area was initially characterized by homogeneous land use, a sparse road network, and extremely large plot sizes. Nevertheless, as the city expanded outwards, extending beyond the Spanish Walls, built-up areas increasingly encroached upon these cemeteries, and the conflict between urban development and cemetery land became increasingly apparent.

More specifically, in contrast to the rapidly transforming urban inner fringe belt (the area between the two sets of walls), the modernization of the outer fringe belt unfolded along specific axes. The inner fringe belt experienced significant "heterogenization" during the urban expansion phase: Residential buildings, government institutions, and various supporting facilities including hospitals, prisons, and parks rapidly replaced the previous low-density housing and farmland, whose traces were obliterated under geometric plot planning. Construction outside the Spanish Walls, by contrast, was concentrated in the southern and northern parts of the city. The construction and integration of large railway facilities was a key driver for the development of the northern area. For instance, between 1860 and 1870, the Stazione Centrale (Central Station) in the north, the Stazione di Porta Ticinese (Porta Ticinese Station) in the south, and the Merci di Porta Romana (Porta Romana Goods Station) successively came into operation. Along the municipal arterial roads linking these crucial infrastructure facilities with the city center, a significant number of new residential and industrial buildings also emerged. These newly constructed large public facilities, together with the cemetery cluster distributed around the Spanish Walls (including the Monumental Cemetery and some suburban cemeteries still in use), collectively shaped the character of Milan's urban outer fringe area during this period (Figure 3-9).

Figure 3-9 Spatial Distribution of Milan's Urban Cemeteries, 1883

**3.3.2.2 Street Block Pattern**

The Monumental Cemetery from this period differed significantly from the suburban cemeteries of the previous phase, which were primarily characterized by spatial exclusion. It not only offered larger public burial space but, more importantly, introduced new public landscape elements to the city and profoundly influenced the morphological features of Milan's urban periphery. The design and construction of the Monumental Cemetery coincided with the period of the Italian Risorgimento. Influenced by political movements and heightened nationalist sentiment, the rejection and fear of death prevalent since the Enlightenment gradually lessened. The cemetery was re-envisioned as a large open-air park, a city monument capable of embodying Italian family and individual sentiments, showcasing Lombard and Italian cultural values, and providing legitimacy to the emerging regime, and endowed with new aesthetic characteristics as a significant carrier of the city's collective memory.

Notably, due to the overall insufficiency of funerary space, even after the Monumental

Cemetery was put into operation, the surrounding suburban cemeteries were not immediately decommissioned and remained in use due to recurring outbreaks of infectious diseases in the mid-19th century, until their official closure in 1895. Therefore, this subsection will, through a comparative analysis of these two distinct types of cemeteries in Milan's urban outer fringe belt, examine their impact on the regional morphological evolution process during the initial urban expansion phase.

Architect Luigi Tatti commented that "*(the Monumental Cemetery) as one of the city's most significant monumental buildings, the cemetery landscape is not discomforting and is even worth observing.*" Architect Camillo Boito went further, arguing that the view of the cemetery "*would not be alarming,*" and noted that although the cemetery could not be compared to the Appian Way (Via Appia) of ancient Rome, but once the main facade of the cemetery was finished, viewing this scene from the newly constructed road would yield "excellent visual effects" [22]. Although when the cemetery site was first selected, some citizens worried that its distance from residential areas, along with hygiene and health issues, would negatively impact surrounding area development, inhibiting their productive activities and social development. But the city council upheld the original site decision after evaluation. Behind this were not only economic, administrative, and political considerations, but more significantly, stemmed from the design concept of viewing urban cemeteries as monuments. This idea held that the presence of cemeteries would not only not detract from surrounding development but would instead bring positive impacts due to their artistic value and the profound thoughts and civilized spirit they embody. City councilor Alessandro Righini strongly advocated for this perspective, stating that there was "*no absolute reason" to change the location and that investment and public expectations should not be abandoned. He stressed that a monumental cemetery that preserves artworks and ensures proper burial "ought to be situated within the city," "to better cultivate those sentiments that symbolize civilization*" [44] .

The construction of the Monumental Cemetery and its associated infrastructure allowed the cemetery to break away from the state of mutual isolation between suburban cemeteries and residential areas in the previous phase, and became a significant driver for urban development in Milan's northwestern suburbs. Prior to this, the morphological features of this area primarily consisted of extensive agricultural fields, a few winding roads remnants from

the Roman era, scattered rural settlements, and standalone farmsteads along waterways. Development in the urban periphery was limited to the area along Via Cesareo, located near the east side of the Sforza Castle square, using the Arena Civica Gianni Brera as a focal point connecting the city proper and the suburbs (Figure 3-10).

The urbanization transformation of this area was primarily propelled by the completion of a series of large-scale projects. These included the Central Station completed in 1864 and the Monumental Cemetery completed in 1866. These significant facilities were successively completed in the northern part of the city. The railway construction directly led to Via Comasina, located north of the Spanish Walls, shifting westward, becoming Via Farini, defining the boundary of the Isola district. Via Farini then connected with Via Alessandro Volta, which links the Monumental Cemetery to the city center, integrating into the inner ring road network below the Spanish Walls. In 1876, the municipal government approved the extension of Via Volta by demolishing a section of the Spanish Walls, opening up a straight road 350 meters long, lined with poplar trees, leading directly to the city center and creating a semicircular square on the city side. The spatial model of the Monumental Cemetery was thus completely transformed. No longer an isolated area concealed behind high walls, it was actively integrated into the urban structure through rigorous axial planning.

Along these new urban arterial roads, Via Volta and Via Farini, small-scale industrial production activities started gradually concentrating. Particularly in the area where the two main arterial roads intersected, that is, the plots on either side of the square in front of the Monumental Cemetery, began to be filled with industrial buildings of varying scales. Following the new planning concepts, the newly constructed roads in this area adhered to the plan, creating a more orderly urban structure and partially absorbed existing buildings. Building facades along the streets were continuous with varying heights. The interior of the plots contained various building types, forming a mixed settlement primarily composed of factories, worker housing, and large courtyard-style buildings. This indicates that the construction of the large urban cemetery provided a fundamental framework for suburban development, shaping a new urban edge landscape characterized by mixed-function and morphologically complex (Figure 3-11).

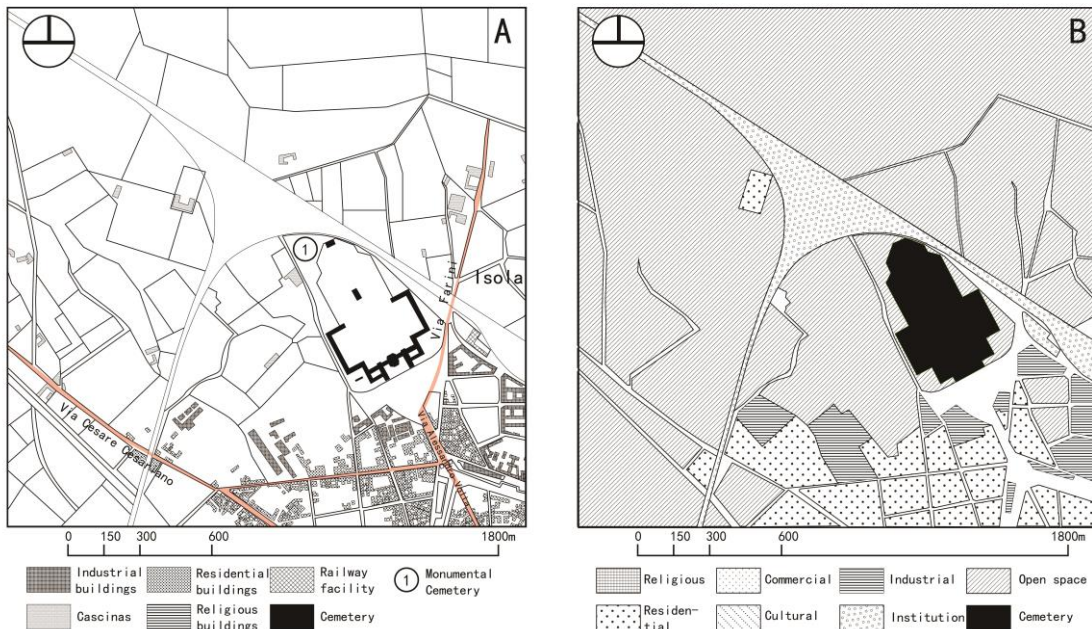Figure 3-10 Map of Milan, 1850 (Left); Map of Milan, 1895 (Right)



Figure 3-11 Morphology of Milan's Monumental Cemetery, 1885: A. Building Morphology; B. Land Use

In addition to the newly constructed road network, another notable morphological element surrounding the Monumental Cemetery was the large railway facilities to its north. This existing railway system had a dual impact on Milan's urban development. On the one hand, railway transport accelerated the process of urbanization, leading to the emergence of numerous factories and worker housing in the suburbs. On the other hand, due to its insurmountable nature, the railway system encircling the entire city formed a significant physical impediment to urban expansion, effectively continuing the role of the walls as a "fixation line" from the previous phase. Milan's first railway line was constructed in 1840,

connecting Milan to Monza, Treviglio, and Turin. Prior to Italian independence, railway construction was controlled by the Austrian government and its affiliated companies. For military, security, and fiscal considerations, stations were all located outside the Spanish Walls to control entry points into the city, and deliberately separate urban and rural areas, and prevent citizens from relocating to the suburbs by rail to avoid taxes. It was only after unification in 1861 that the railway gradually transitioned to commercial use. The completion of its network fostered the concentrated development of urban buildings along the lines [45].

In this context, the railway as a physical barrier conflicted with the concept of connection represented by the Monumental Cemetery and Via Volta. Regrettably, the Beruto Plan seemed to lack adequate consideration in addressing the railway's impact, appearing to idealistically incorporate it into the planning framework. Planning maps indicate that the Monumental Cemetery, a crucial node in the northwestern area, via the extended linear road - Via Volta, directly crossed the railway facilities and continued to extend northwestward, and, together with the new ring road, formed the outer urban grid. Yet, there was a significant discrepancy between this planning vision and the existing railway barrier. Its impact was so profound that within just 15 years after the Beruto Plan was approved, the city council launched a new planning phase, explicitly demanding the rectification of the railway system, acknowledging the criticality of the railway as a fundamental framework for urban planning.

Meanwhile, as the city began to develop outwards, extending beyond the Spanish Walls, the suburban cemeteries built in the early 19th century had inevitably become embedded within built-up areas and were constraining the development of surrounding areas. In contrast to the rapid land conversion and construction happening along infrastructure axes like the increasingly developed railway system, development in areas adjacent to these older cemeteries appeared slower. Although land speculation was lively at the time, with private capital flowing into peripheral development, however, compared to the positive impact of the Monumental Cemetery, the areas around the older cemeteries, due to their condition and public NIMBY sentiment, formed a discontinuous urban fringe belt, hindering the city's overall balanced development.

The periodic closures and reopenings experienced by suburban cemeteries during this period vividly reflected the dynamic conflict between them and the process of urbanization. As an example, Gentilino Cemetery was first closed in 1867 due to sanitation concerns

triggered by cholera and was later compelled to reopen due to insufficient capacity in urban cemeteries. In 1874, as surrounding residential construction drew near, it was closed again in response to residents' concerns and was not entirely decommissioned until 1895. During this period, aside from the gas plant (Gazometro) to the north and some public transport facilities, the built-up area around the cemetery was extremely limited. The 1894 land use map indicates that even when the Spanish Walls had not yet been demolished and industrial infrastructure such as the ring road had largely taken shape, the city's substantial expansion seemed to stop just short of the cemetery boundary. This contrasted sharply with the area developing in southern Milan along Corso S. Gottardo and the Naviglio (canal) towards the railway, highlighting the localized impediment to urban expansion posed by the older cemeteries (Figure 3-12).
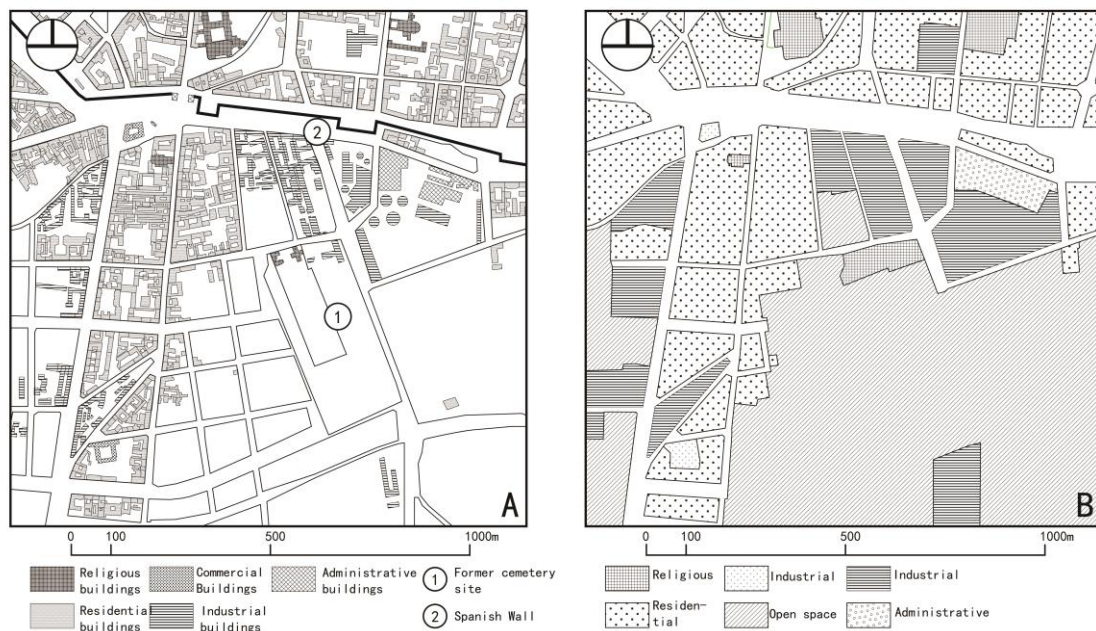


Figure 3-12 Morphology of the Former Site of Milan's Cimitero del Gentilino, 1894: A. Building Morphology; B. Land Use

Another representative suburban cemetery of this period was San Gregorio Cemetery. In contrast to Gentilino Cemetery, the area where the former was situated benefited from more effective development because a railway line passed to its south. Although San Gregorio Cemetery also underwent repeated periods of activation and closure, its land was sold in 1881 by the Hospital Management Committee (Ospitalieri) to the Italian Credit Bank (Banca di Credito Italiana). And in 1893, that is, twelve years after its closure, was transformed into public roads and building land [44], earlier than the final closure date of other suburban cemeteries. This indicates the faster pace of urbanization in its surrounding area.

The building morphology map shows that by 1894, the leper hospital south of San Gregorio Cemetery had undergone significant changes, being completely divided into 12 rectangular blocks of different sizes. San Carlo al Lazzaretto church was preserved in the center of the area, and a scenic promenade was added in front of the church's main facade, parallel to Corso Buenos Aires -- Via Benedetto Marcello. This new street intersected perpendicularly with the railway line traversing this area, collectively forming the main framework for the area's development. This area was predominantly residential. With the completion and opening of the Central Station square to the west, this block rapidly became one of the most popular and fastest-growing areas in Milan's periphery.

Despite the rapid development of the surrounding area, the former site of San Gregorio Cemetery still presented a localized constraint on the development of adjacent land in the short term. Two plots of land located just one street away from the former cemetery site were still not effectively utilized at the time, with only a few buildings scattered at the street corners. This demonstrates that even though the cemetery land had been planned for other uses and surrounding infrastructure was well-developed, its former cemetery attribute still caused a temporary development stagnation at the block level (Figure 3-13).
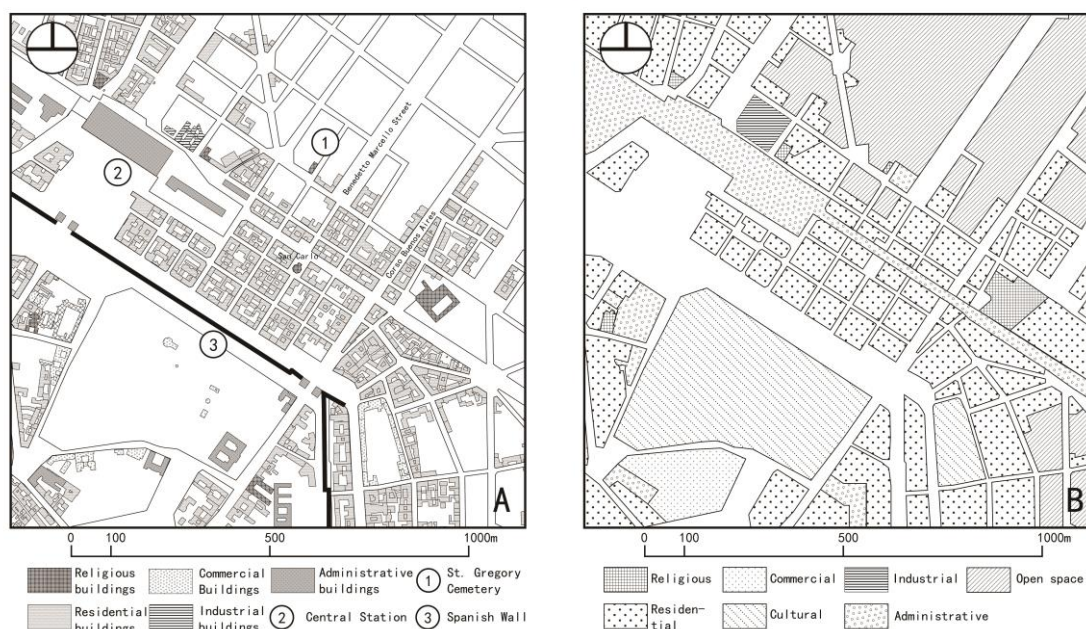


Figure 3-13 Morphology of the Former Site of Milan's Cimitero di San Gregorio, 1894: A. Building Morphology; B. Land Use

In summary, the two types of cemeteries from different periods were both situated on the outer edge of the Spanish Walls and were entirely encompassed within the range of the later-built ring railway system, a more powerful fixation line. Together with factories, railway

facilities, and large areas of undeveloped land surrounding the cemeteries, they collectively formed Milan's new morphological fringe area. However, despite the similar location, the impact of these two types of cemeteries on the process of urban development presented a stark contrast: the early suburban cemeteries, owing to their rudimentary condition and negative perception, became localized impediments to urban expansion, whereas the Monumental Cemetery, by entering into the Italian national discourse, became a crucial fulcrum for the development of the northwestern area of the city.

**3.3.2.3 Building Type**

By comparing the two types of urban cemeteries, it can be seen that the emotional value that cemeteries are able to bear directly influences how the city handles them and influences the morphological evolution of their surroundings. Therefore, this subsection aims to, by analyzing the building type of the Monumental Cemetery, studying its boundary characteristics, plan form, and architectural style, and discussing how urban cemeteries bear and represent the city's collective values.

In contrast to the enclosed layout of suburban cemeteries in the previous phase, the design of the Monumental Cemetery moved towards more open spatial forms to satisfy diverse individual needs for burial and commemoration. The design combined the cloister model (Chiostro) and the garden model, preserving the sense of order from architectural enclosure while also imbuing it with a more natural and free spatial experience. Specifically, the Monumental Cemetery was designed by the architect Carlo Maciachini and was officially commenced in 1863. The design championed the integration of architecture and nature: "*All principal buildings are centrally arranged on the facade: a church in the center, flanked by loggias on either side, extending outwards as two-winged cloisters facing the avenue, and enclosing the entrance. Behind this are private residences and auxiliary service facilities. These various architectural units are interconnected through suitable passages*" [22].

By incorporating open cloisters on either side of the church on the cemetery's main facade, a transitional zone was created between the Monumental Cemetery and the city, enabling people to view the interior of the cemetery, but the burial area was not thereby made entirely open to the outside. The porticoes and cloisters served to "filter" rather than "block" the cemetery landscape, thus fostering interaction between the living and the dead.

In the design, the cemetery's main facade was jointly composed of multiple elements -- the two side wings extending outwards at right angles, emphasizing the central church, creating a collective monument facing the city. Simultaneously, this design strategy also consolidated traditional public funerary activities within the main facade structures, allowing for greater flexibility in planning the large open space behind. In 1869, the church originally planned for the center of the facade was converted into the Famedio (Hall of Fame), for the burial and commemoration of notable citizens. This step not only enhanced the cemetery's symbolic meaning and visibility but also improved the coherence of the overall layout, rendering the spatial organization of the enclosed courtyards, the symmetrical composition, the hierarchical structure, and the decorative variations more cohesive. The boundary management morphology of the Monumental Cemetery thus moved away from the enclosed and rigid pattern of traditional cemeteries, successfully integrating built form and open space (Figure 3-14).
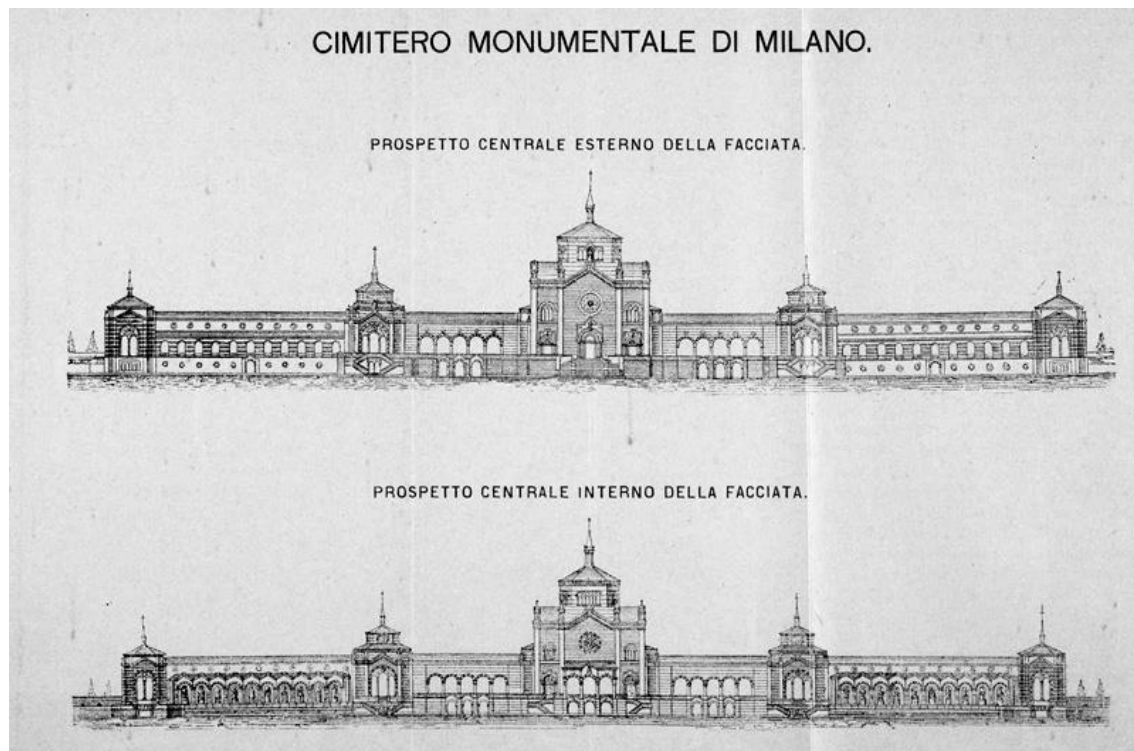


Figure 3-14 Elevation of the Monumental Cemetery, Milan

In terms of plan layout, the plan form of the Monumental Cemetery cleverly echoed the artistic and ideological aspirations of this period. As part of a new nation, the Milanese municipal government aimed to shake off the influence of the previous regime in architectural style. This implied a need to resist the rigid and authoritarian cemetery ideas of the Austrian

rule period. Earlier suburban cemeteries emphasized straight burial paths and regular layouts, strictly regulating the arrangement of tombstones, rendering commemoration and emotional expression stiff and monotonous. This rigid layout, devoid of individuality, freedom, and variation, confined monuments to limited spaces, making it hard to showcase unique artistic styles, and forcibly unified styles, excluding the architectural language of other periods and styles. Consequently, at the initial design stage of the Monumental Cemetery, the Milanese municipal government championed granting the new cemetery greater freedom, to embody the city's pursuit of freedom, individuality, and artistic innovation. The constructed plan successfully integrated elements from various architectural styles and in its overall layout, skillfully balanced the tension between the sense of order from architectural enclosure and the free experience of garden openness, ultimately yielding a modern memorial space that is both solemn and varied and encourages individual artistic expression (Figure 3-15).

Similar to the changes in plan layout, the evolution of the architectural style of the Milan Monumental Cemetery also profoundly reflected the aesthetic shifts and the demands of political identity construction during Italy's 19th-century political and cultural transition. The original design for the Monumental Cemetery featured an enclosed structure and strictly followed the Neoclassical style. However, by the mid-19th century, this style had gradually waned, and this style was seen as closely associated with the former Austrian rule, appearing incongruous in the political climate of rising nationalism. Consequently, the earlier design was rejected by the jury on the grounds that "*being unable to represent the spirit of the new nation* [21]".



Fig. 716. — Planimetria generale del Cimitero di Milano (arch. C. Maciachini).
A, famedio; a, a, ingressi; B, chiesa ed ossario; C, tempio crematorio; D, stazione mortuaria provvisoria; E, cimitero acattolico; F, cimitero israelitico.

Figure 3-15  Plan of the Monumental Cemetery, Milan

The final design for the Monumental Cemetery employed a composite style of "Lombard style mixed with Byzantine elements." The advantage of this style was not only that it
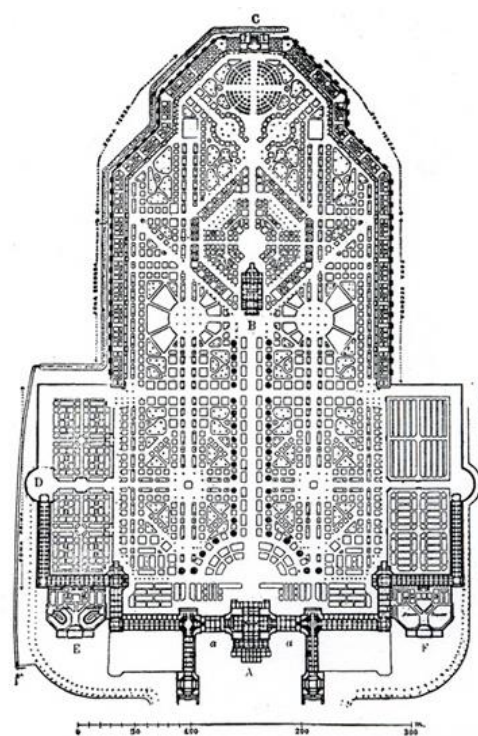
symbolized Christian values, but also its eclectic approach was more suited to the open and inclusive ideology of this period, contrasting sharply with rigid Neoclassicism. Ultimately, the Monumental Cemetery successfully elevated Lombard regional characteristics into symbols of freedom and patriotism. By creatively reconciling historical memory, regional characteristics, and the aspirations of modernity, it ultimately presented a completely new memorial spatial order (Figure 3-16).
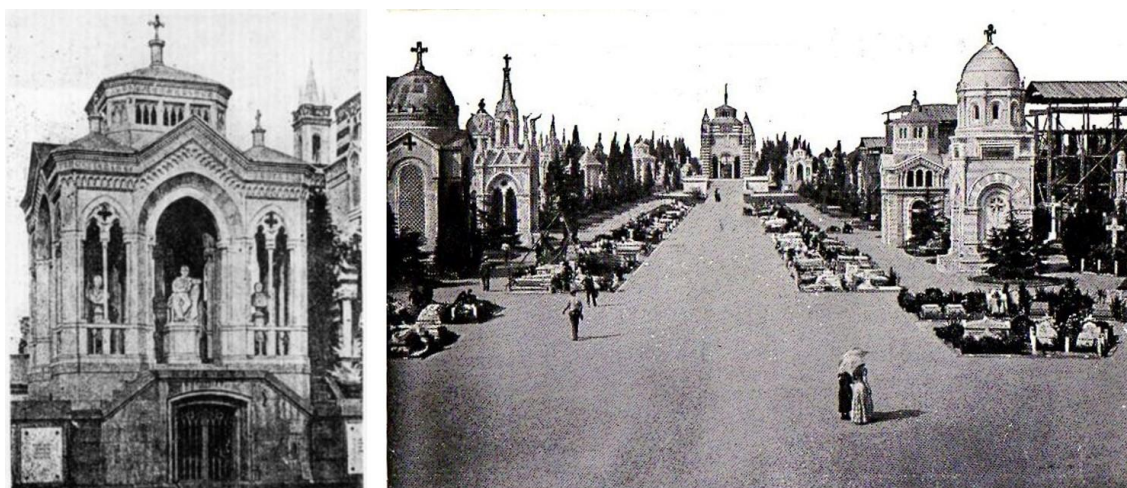


Figure 3-16 Historical Photos of the Monumental Cemetery

## 3.4 Planning Adjustment Phase (1895–1934)

As the level of urbanization in Milan's peripheral areas continuously increased, its construction density and population density had far surpassed the scope predicted by the 1889 Beruto Plan. The two main problems that Milan's overall urban planning primarily addressed during this period were the deterioration of the urban environment resulting from overcrowding and the conflict between the sprawl of built-up areas and the barriers formed by the ring railway system. Against this grim backdrop, the urban outer fringe belt experienced significant dynamic adjustment, and cemeteries and their surrounding morphology played a significant role in this process. This section aims to investigate how urban development and cemetery morphology mutually influenced and co-evolved during this period, and analyze the roles played by different cemetery forms in addressing urban challenges.

3.4.1 Overview of Urban Pattern

From the late 19th to the early 20th century, Milan's urban planning experienced several rounds of adjustment to meet the demands of population growth and industrial development.

During this period, the built-up urban area expanded significantly, with a large number of industrial and public projects relocating to the far suburbs. The overall urban pattern of Milan during this period displayed the following three main characteristics (Figure 3-17):
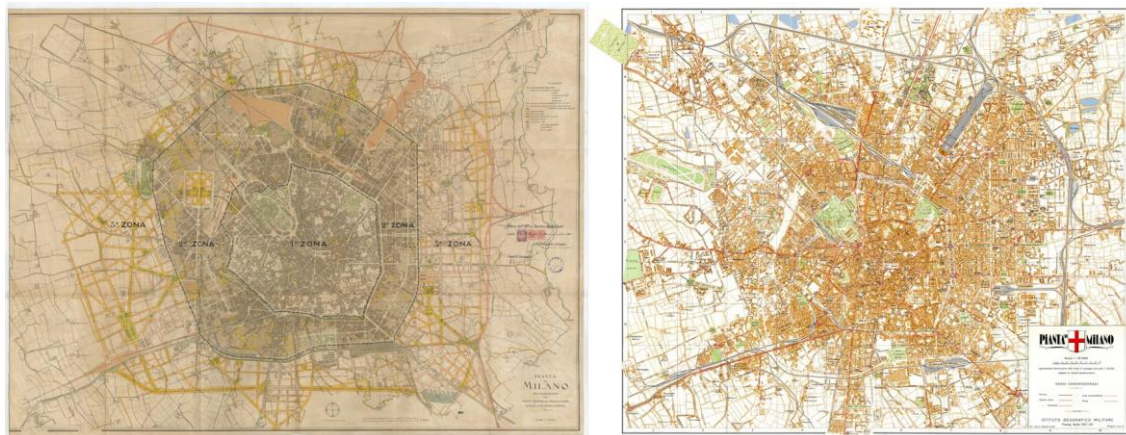


Figure 3-17  Pavia-Masella Plan, 1912 (Left); Map of Milan, 1937 (Right)

(1) Expansion of the planning framework and regional morphological differentiation. The street layout in the city center and the peripheral areas near the former Spanish Walls largely continued the framework of the 1889 Beruto Plan; the Spanish Walls were demolished, and the fringe areas expanded outwards along radial and new ring roads. As a supplement to the Beruto Plan, the Pavia-Masera Plan, formulated in 1912 by municipal engineers Angelo Pavia and Giovanni Masera, continued this system, while preserving the morphology of the city center, extending the concentric road network, expanding the planned area from approximately 20 sq km to 44 sq km, significantly broadening the scope of urban planning. Implementation of the plan was most complete in the eastern part of the city; the road network and construction projects in the east during this period all adhered to the control principles of urban axes, resulting in a regular and unified urban fabric. Expansion in the western part of the city deviated from planning control, where independent building forms predominated, their height and density far exceeding planned expectations, exhibiting a mixed urban fabric. In the northern city area, due to the reconstruction of the railway system, the urban morphology was relatively fragmented, with the predominant building types being large industrial buildings.

(2) Reshaping of the railway system and its impact on the urban pattern. Since the 19th century, the development of Milan and its railway system have been closely intertwined. As the city expanded into peripheral areas, the railway, initially regarded by the Austrian

government as a tool for administrative control, began construction at the outset of planning. The initially constructed Central Station (Stazione Centrale) and Porta Garibaldi Goods Yard (Scalo Porta Garibaldi) were later connected to the surrounding Sempione Goods Yard (Scalo Sempione) and Ticinese Station (Stazione Ticinese), forming a railway system encircling the city. Into the 20th century, the nationalization of the railway system facilitated the creation of the State Railways (Ferrovie dello Stato), allowing the Milanese municipal government to integrate it into the urban master plan. A significant railway reorganization plan was undertaken during this period: demolishing the old Central Station in the north and constructing a new terminal approximately 800 meters to its north; closing the Sempione Goods Yard and expanding the Farini Goods Yard (Scalo Farini) north of the Monumental Cemetery. With the city's radial expansion, the reorganized railway system exhibited the characteristic of "urban islands," separated from the surrounding block fabric but tightly interconnected internally as an infrastructure network, profoundly reshaping the urban pattern.

(3) Annexation of surrounding towns and construction of large facilities in the far suburbs. In 1923, Milan incorporated 12 surrounding towns, substantially increasing the municipal area to 18,000 hectares. These newly included outer areas provided vast space for the construction of large functional facilities, such as a university city, the new International Trade Fair (Fiera Campionaria), large sports facilities, a public slaughterhouse, a livestock market, and large urban cemeteries, among others. The concentrated implementation of these projects strongly propelled the rapid urbanization transformation of Milan's far suburban areas.

3.4.2 Cemetery Morphological Characteristics

**3.4.2.1 Fringe Belt Morphology**

From the late 19th to the early 20th century, Milan's urban planning entered an adjustment phase to address issues such as the conflict between the rapid expansion of the urban entity and the ring railway system, and the unbalanced development between the city center and peripheral areas. Concurrently, the outer fringe belt defined by the Spanish Walls' fixation effect in the previous phase gradually dissolved as the walls were demolished and converted into inner ring arterial roads, and urban development began to sprawl towards the farther suburbs. Milan's urban cemeteries directly participated in this dynamic adjustment process, being relocated to the far suburbs through planning and, to some extent, redefined the

city's boundaries.

The large-scale industrial development in the northern periphery of Milan during the previous phase laid the groundwork for suburban population concentration during this period. A large number of immigrants from outside the province flocked to Milan's peripheral areas, resulting in a suburban population surge of nearly 170,000 between 1901 and 1911, while the proportion of resident population in the city center fell from 45.5% to 33.6%. This was accompanied by a significant rise in suburban population density; for instance, the population density in the area outside Porta Comasina rose from 23 people per hectare in 1861, nearly eightfold by 1921, reaching 193 people per hectare [46]. The rapid population concentration directly fueled a construction boom in the suburbs: in the single decade between 1871 and 1881, the number of new buildings in the peripheral areas far surpassed that within the walls. These apartments housed residents who had moved out due to high rents in the city center, as well as new arrivals from rural areas.

The burgeoning land market attracted a large influx of private capital, leading to vast amounts of available land in the peripheral areas being rapidly filled with residential buildings and factories, not only fueling urban expansion but also creating competition with existing land uses (such as cemetery land). Notably, during this period, the municipal government functioned more like a large mediator; its public management role lacked clear guidance from planning intentions, tending to passively adapt to private development initiatives. This implied that private land speculation largely molded the practical execution of the urban master plan, having a lasting and profound impact on Milan's future urban morphology.

During this period, the conflict between cemetery land and urban expansion intensified, significantly impacting the construction morphology of the urban fringe areas. The existence of suburban cemeteries during this period greatly influenced the development of peripheral urban areas; the newly planned road network was laid through the cemeteries, and the value of the surrounding land also significantly decreased because of the long-term lack of maintenance and poor sanitary conditions of the cemeteries themselves. Under pressure from policy and capital, all suburban cemeteries were officially closed in 1895. Concurrently, the Spanish Walls, successively demolished from the second half of the 19th century, freed up urban peripheral space, accelerating the rapid transformation of the former suburban cemetery land, transforming into commercial, residential, and public institutional land. The "blank

zone" originally created by the cluster of suburban cemeteries was rapidly absorbed by built-up areas. The "fixation line" formed by suburban cemeteries in the previous phase completely disintegrated under the strong pressure of urban development.

The closure of suburban cemeteries created an opportunity for the emergence of new urban cemetery morphological types. To address the shortage of funerary space resulting from population growth, cemetery lifespan, and changes in management regulations, the Milan City Council planned a new large urban cemetery located in the far northwestern suburbs in the town of Musocco -- Musocco Cemetery (Cimitero a Musocco). Mayor Count Bellinzaghi emphasized its necessity: "*Most smaller cemeteries no longer meet sanitary requirements due to urban development, and the Monumental Cemetery is also unable to fully meet the demand. Under these circumstances, the construction of a new, large-scale, and suitably located cemetery is becoming increasingly necessary*" [44]. Subsequently, the planning and design were undertaken in 1883 by engineers Enrico Brotti and Luigi Mazzocchi, and it was opened in 1895. Its site selection comprehensively considered factors such as the land cost required for building a large urban cemetery, the soil conditions needed for burying bodies, and citizen accessibility. The cemetery is located in the far suburbs, about 7.3 kilometers from Milan's core, aiming to reserve land for the city's future northwestward expansion, marking the shift of the urban fringe belt to a farther distance.

The far suburban areas also experienced large-scale migration and construction of industrial and public facilities concurrently. The opening of the new Central Station spurred the development of the North Milan Industrial District, resulting in a high concentration of steel mills and mechanical industries in the northern suburban area of Milan, with industrial zones centered around the Breda, Falck, Pirelli, and Ercole Marelli factories. Furthermore, the newly constructed Farini Station facilitated the expansion of mechanical textile industries and emerging chemical industry facilities towards the city's northwestern suburbs. Concurrently, numerous large municipal facilities and institutions were constructed in Milan's suburbs during this period. With the eastern area seeing a concentration of educational institutions such as Milan University and Milan Polytechnic University. Furthermore, the eastern suburbs also developed numerous large market facilities, leveraging the Porta Vittoria Goods Station (Staz. Merci Porta Vittoria). The plan for the northwestern suburban area included large sports facilities and green spaces. These large urban projects, including Musocco Cemetery, reflected

the intensive nature of urban land development and utilization during this period, marking the rapid development of the far suburban areas (Figure 3-18).
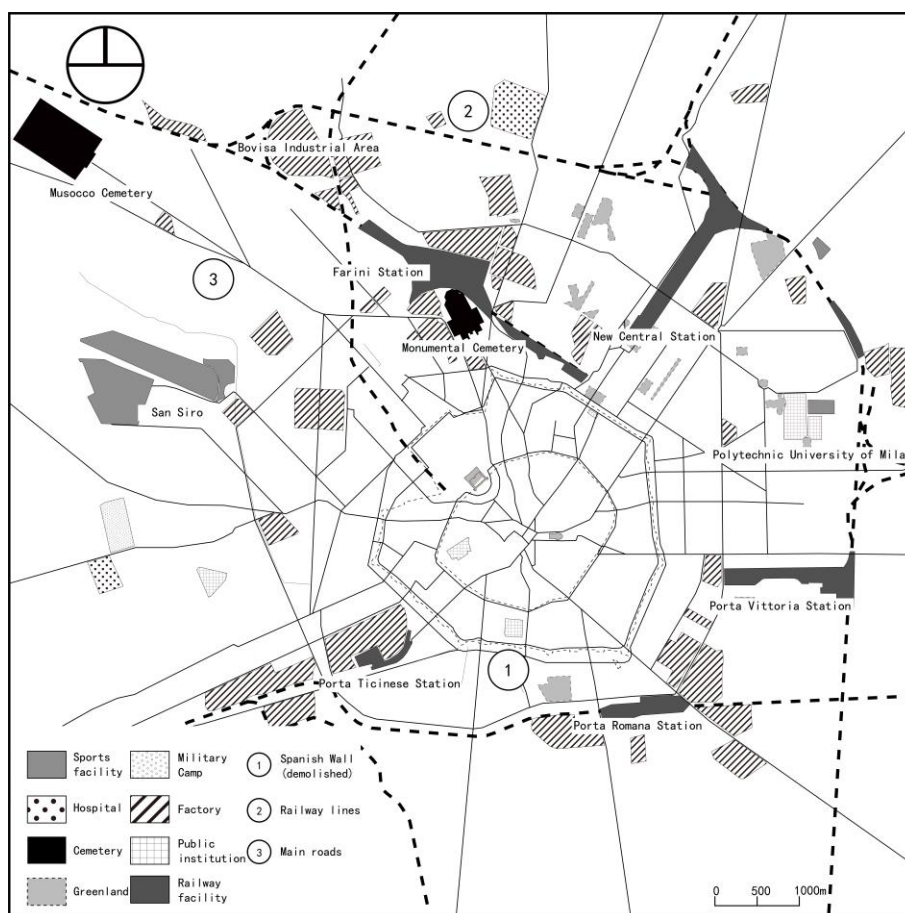


Figure 3-18 Spatial Distribution of Milan's Urban Cemeteries, 1930

Following the completion of Musocco Cemetery, the role of the Monumental Cemetery shifted from a primary collective cemetery to an urban landscape, retaining some permanent burial plots for the wealthy class, limiting its further expansion. Urban expansion broke through the cemetery fixation line of the previous phase, but in the face of the Monumental Cemetery's unique political and cultural attributes, expansion was temporarily unable to dismantle it, choosing instead to develop outwards by bypassing its area. Concurrently, the Farini Station north of the Monumental Cemetery disrupted the connection between the city center and the northwestern suburbs, causing the area around the Monumental Cemetery and the goods yard to form a discontinuous fringe belt.

In summary, the morphology of Milan's urban fringe belt during the planning adjustment phase resulted from the interplay of both inward consolidation and outward expansion development patterns, and linked the various discontinuous areas via the reorganized railway

system. Inward consolidation was characterized by the solidification of fragments of the old fringe belt, notably industrial clusters formed around railway goods yards. Outward expansion refers to new fringe areas formed by the outward expansion of the railway, primarily located along the northern and northwestern railway lines, with industry and large public projects predominating. Within this pattern, Milan's Monumental Cemetery is situated within the area of inward consolidation and, together with Farini Station, constitute the fringe belt morphology of the northwestern area. While Musocco Cemetery is located on the edge of the area of outward expansion, separated from the built-up urban area, marking the delineation of the new urban boundary.

### 3.4.2.2 Street Block Pattern

The Monumental Cemetery, preserved at its original location, and the newly constructed Musocco Cemetery in the far suburbs were key elements in the evolution process of Milan's urban fringe belt during this period. The latter redefined the edge of urban development and established a new balance in the physical space within the city occupied by the living and the dead. The former blended into the built-up area, forming new fringe belt elements. Both collectively reflect the morphological characteristics of Milan's urban fringe belt during this period.

Planning in the late 19th century overlooked the relationship between urban development and the railway system, leading to functional paralysis in the northwestern urban area. As discussed earlier, the Pavia-Masera Plan of 1912 was a correction and supplement to the 1889 Beruto Plan. In the Beruto plan, the Monumental Cemetery was designated as a key node in the northwestern part of the city, connected to the square in front of the cemetery by Via Volta from the city center, and from this node, connected northward to the north-south Via Farini, crossing the viaduct over the railway to link with the Isola district on the north side. The square connected westward via a circular piazza to the east-west Via Cenisio, leading directly to Corso Sempione, and forming a symmetrical layout with the old Piazza d'Armi on the west side of the city. The road network continued to extend along the direction of Via Volta at the far end of the Monumental Cemetery, and formed a rhombus-shaped piazza at its terminus, connecting to three ring roads, constituting the complete road network of the northwestern suburban area. This ideal urban structure was completely disrupted after the completion of

Farini Station in the early 20th century. The goods yard blocked the three originally planned outer ring roads, causing major traffic problems in the northwestern urban area.

The reorganized railway system altered the balance of urban expansion across the entire northern quadrant. During this period, the primary connection between the city center and the northern suburbs depended on only a few railway viaducts, for instance, bridges spanning Viale di Loreto and Via Farini, spaced approximately 2.25 kilometers apart. This distance was close to one-fifth of the perimeter of the former Spanish Walls (12.86 kilometers), directly hindering effective connections between the city and suburbs. Concurrently, traffic pressure was excessively concentrated on Via Farini, leading to severely insufficient capacity, even resulting in vehicles needing to detour via the square in front of the Monumental Cemetery to enter the city center [45]. Furthermore, the location of Farini Station directly interrupted the axis of Via Volta leading to the Monumental Cemetery. This rendered the Monumental Cemetery, originally planned as an important node in the northwestern area, functionally isolated, becoming a breakpoint in the northwestern suburbs -- a relatively isolated "urban island" (Figure 3-19).



Figure 3-19 The 1889 Beruto Plan (Left); Map of Milan, 1910 (Right)

Morphologically, the Monumental Cemetery and Farini Station to its north during this period together formed a functionally inhibitory control line, and for a considerable period, the development of Milan's northwestern suburbs was constrained by this area. This insurmountable physical structure has become embedded within the built-up area as the urban area sprawled, forming fringe belt characteristics around it characterized by a disordered road network, irregular plot shapes, and mixed land use, becoming a discontinuous patch within

the overall process of the fringe belt migrating towards the far suburbs.

In terms of traffic organization, this barrier completely disrupted the originally planned road network. The planned ring roads were severed, creating dead-end roads on the edge of the Monumental Cemetery and Farini Station area. For instance, two main ring roads were divided into Via Francesco Caracciolo and Viale Edoardo Jenner, and Via Principe Eugenio and Viale Vincenzo Lancetti. Only a few connecting passages remained within the area, including the railway viaduct at the north end of the goods yard and the one on the east side of the Monumental Cemetery.

Regarding plot morphology, the disordered road network resulted in severe deformation of plot shapes in the area adjacent to the Monumental Cemetery and goods yard. Originally connected rectangular plots were squeezed and fragmented into triangular plots with extremely small areas. These plots were often connected to the city only via cul-de-sacs, becoming wasteland with undetermined function. Regarding morphological type and land use, if Via Giulio Cesare Procaccini is taken as the dividing line for different morphological periods, the south side of the road developed earlier, with a large number of high-density residential buildings on small plots, with factories located only on the side near the Monumental Cemetery square. Whereas on the north side of the road, i.e., to the west of the Monumental Cemetery, an industrial area with a sparse road network and extremely large plot sizes developed, including the tram and railway rolling stock manufacturer Stab. Carminati e Toselli, the Officina Edison, and the Messina tram depot.

The concentration of industrial areas accelerated the deterioration of the environment around the Monumental Cemetery. The environment in many industrial clusters was chaotic and dilapidated, with slag heaps, harmful gases from chemical plants, and water pollution pervasive around the cemetery, causing the value of surrounding land to depreciate significantly, and to some extent, slowed down the intensity of construction in the surrounding areas, while also inhibiting the expression of the Monumental Cemetery's function as an urban landscape. It is evident that the Monumental Cemetery and Farini Station formed a high-intensity morphological framework, restricting and distorting the expansion of surrounding land use. The overall development trend in this area was to bypass this physical barrier, extending further northwestward along both sides of Corso Sempione and Via Farini, beyond the cemetery area (Figure 3-20).

Figure 3-20 Morphology of Milan's Monumental Cemetery, 1930: A. Building Morphology;
B. Land Use

Meanwhile, the location of Musocco Cemetery marked the further outward expansion of Milan's urban fringe belt during this period. This newly constructed cemetery is located in the far suburbs near surrounding towns and villages of Milan, reflecting the characteristics of the evolving new fringe belt morphology. At that time, urban development had not yet reached the far northwestern suburbs, and large areas of undeveloped farmland still existed between Musocco town and Milan's core area, serving as urban edge areas. In contrast to the Monumental Cemetery, which had begun to integrate into the built-up area and become a focal point for urban development in the previous phase, Musocco Cemetery in this period was located about 7.3 kilometers from the city center, which is three times the distance of the Monumental Cemetery, thereby achieving a renewed separation of the cemetery from the city core, making it an "exclave" outside the city. In contrast to the area surrounding the Monumental Cemetery, which possessed a complete urban structure, the infrastructure around Musocco Cemetery had not yet been completed, with only a few residential buildings gathered around the square in front of the cemetery, and the area around the cemetery walls was surrounded by wasteland and farms. Furthermore, Musocco Cemetery itself also became a localized impediment to the development of its area. The cemetery site is situated in a relatively upstream location in this area, coupled with insufficient surface water management and a long-term incomplete urban drainage system, raising continuous concerns among private developers regarding sanitation issues, directly hindering further development of

surrounding land (Figure 3-21).



Figure 3-21 Morphology of Milan's Musocco Cemetery, 1895: A. Building Morphology; B. Land Use

At the road planning level, Musocco Cemetery is connected to Corso Sempione, a major radial artery in the city core, via a linear arterial road approximately 14 kilometers long -- Viale Certosa. The process for daily funerary activities was complex. Hearses arriving from churches, residences, or outside the city had to first stop at the circular piazza on the west side of the Monumental Cemetery, where coffins were transferred to a funeral tram, then via Via Cenisio to reach the roundabout (Rondo del Sempione) at the intersection of Corso Sempione and Viale Certosa, before finally transporting the coffins to Musocco Cemetery. The planning and construction of the avenue to Musocco Cemetery caused a structural impact on Milan's northwestern transportation system, disrupting the rational framework of the neoclassical road network emphasized by early plans such as the Beruto Plan, and led to severe traffic functional disorder in this area. The core issue lay in Viale Certosa, constructed in 1897 connecting the cemetery and the urban area, and its level crossings with existing highways and urban roads, resulting in a mix of regional transit traffic and urban internal traffic, and even funerary traffic. Highway traffic from directions such as Varese, Como, etc., and branch line traffic from places like Bergamo, Turin, etc., was forced to converge on Corso Sempione. At nodes like the roundabout, funerary traffic, transit traffic, and local commuter traffic intersected chaotically. This completely subverted the principle of a hierarchical road system emphasized by neoclassical planning. The consequence was that secondary roads were

overburdened, the continuity of Corso Sempione as a regional transportation axis was fragmented, and traffic efficiency was low (Figure 3-22) [45].

It is evident that the two main types of cemeteries in Milan during this period exhibited different evolutionary paths for the morphology of the urban edge during the same phase. On the one hand, Musocco Cemetery largely remained outside the scope of urban planning, maintaining its stability and causing low interference to the city. On the other hand, the Monumental Cemetery, however, was retained and integrated into the built-up area during the



Figure 3-22 Traffic Organization of Musocco Cemetery, Milan, 1934

urban development process, becoming linked with surrounding elements that constituted strong physical barriers. By virtue of its special land use, it continuously influences the morphology and land use transformation of adjacent plots.

**3.4.2.3 Building Type**

The relative location of cemeteries and urban built-up areas can be regarded as a reflection of concepts of life and death during a specific period. As the preceding analysis showed, the two types of cemeteries bore distinctly different values and social functions: the Monumental Cemetery, as a permanent monument for the elite, was fully preserved within the urban built-up area, whereas Musocco Cemetery was positioned as infrastructure to meet the city's large-scale funerary needs, being relocated to the urban periphery. In this context, this subsection aims to investigate the architectural type of Musocco Cemetery, focusing on analyzing its morphological characteristics driven by spatial economy.

In contrast to the permeability emphasized by the Monumental Cemetery, the boundary of Musocco Cemetery, from its completion, had as a core characteristic functional enclosure, and subsequently evolved from simple walls into composite columbarium spaces. The towers flanking its main facade portico highly concentrated multiple functions. The ground floor housed practical rooms such as inspection rooms, technical assistant's offices, and
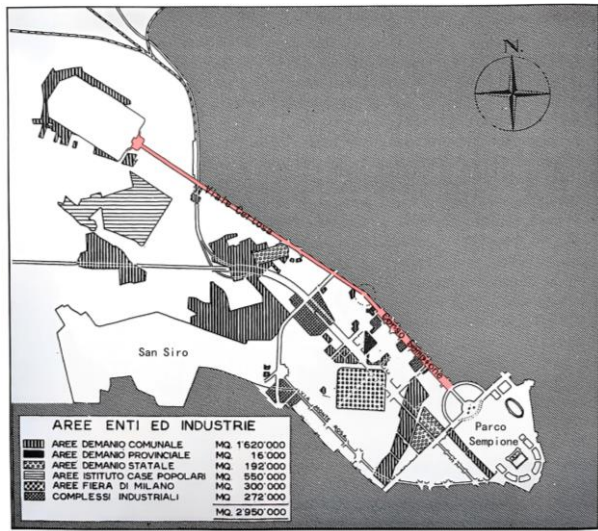
administrator's offices, the second floor served as staff residences, while the basement was used for storing ossuary urns (Figure 3-23).
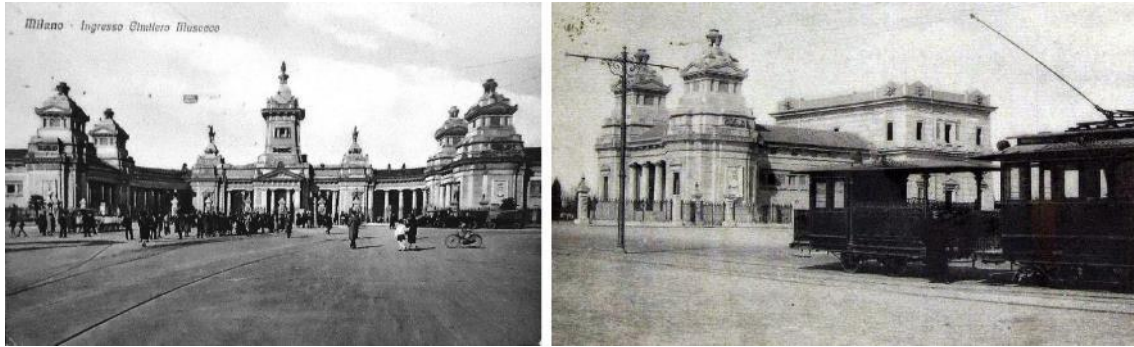


Figure 3-23 Historical Photos of Musocco Cemetery

The foremost consideration in the design of Musocco Cemetery was practicality, which contrasted with the Monumental Cemetery's emphasis on permeability. Upon initial construction, the cemetery facade only featured two-story functional buildings on both sides and a narrow portico serving as the entrance. The curved portico was set back, forming a small square surrounded by walls. The internal boundary was a 1-meter high stone railing. The external wall was 4 meters higher than the average water level, aimed at blocking views and addressing hydrological conditions. Surrounding ditches were used to manage groundwater. The overall boundary primarily focused on meeting the basic functions of funerary infrastructure, with little consideration for landscape attributes (Figure 3-24).
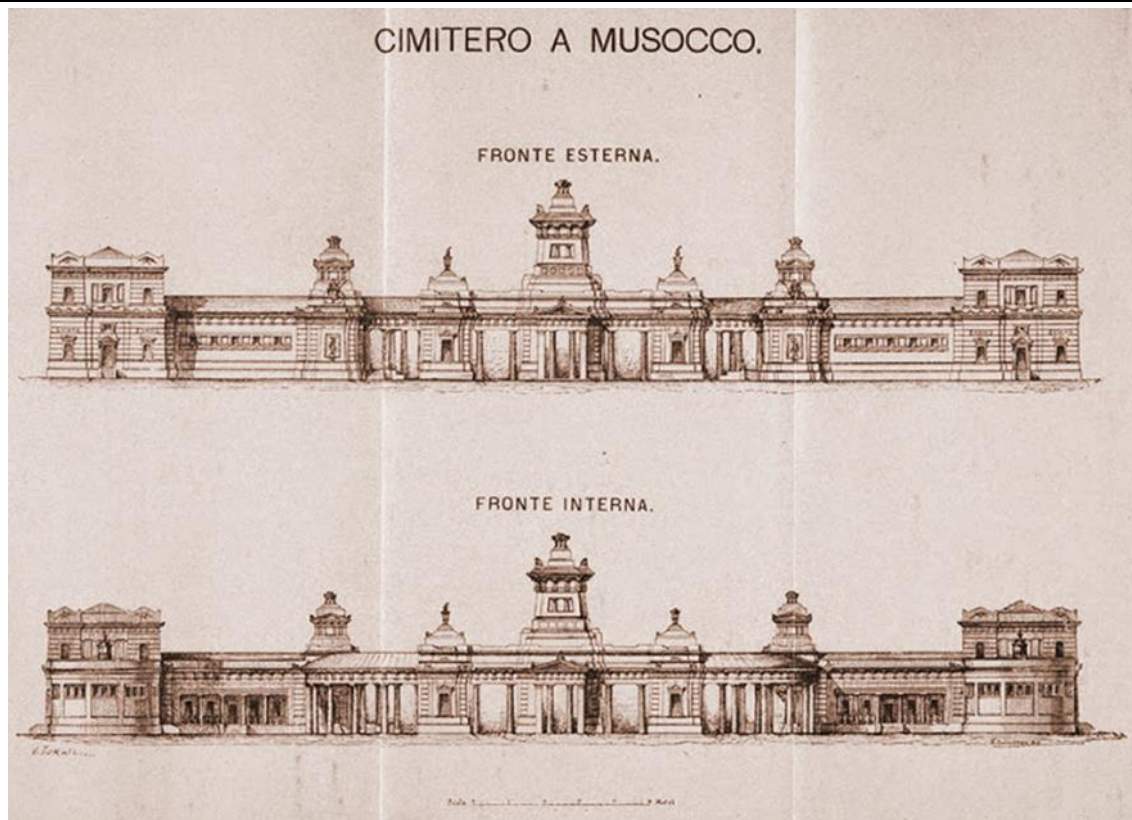
Figure 3-24 Front Portico Elevation, Musocco Cemetery, Milan 1895

From the 1930s onwards, as columbarium spaces surrounding the cemetery perimeter were gradually constructed and replaced the original walls, the cemetery boundary type diversified, enclosure increased, and spatial density significantly increased. The increase in small family monuments led to the columbarium walls extending outwards, upwards or downwards, or stacking burial chambers along the walls, greatly expanding capacity. This resulted in the formation of three main columbarium types: a courtyard type at the northernmost end facing the Jewish cemetery area, an underground crypt type located at the intersection of the main axes and beneath the main building, and a linear building type along the periphery replacing the walls. These collectively constituted the formal characteristics of the densification of the edge space of Musocco Cemetery.

Concurrently, in contrast to the classical symmetrical polygonal plan of the Monumental Cemetery, the plan layout of Musocco Cemetery displayed the characteristic of a gridded burial area lacking a visual focus. The cemetery is vast, covering 400,000 square meters, nearly four times the size of the Monumental Cemetery. Its rectangular base's longest side exceeds one kilometer, traversed by two mutually perpendicular main axes intersecting around a circular piazza. The internal space is divided according to a strict Cartesian

coordinate system into 64 large sectors and 256 small sectors. Regarding functional layout, the vast majority of commemoration and auxiliary functions are concentrated in the auxiliary buildings at the front, while the main burial area is completely open, with no buildings inside. This layout forms an "dense outside, sparse inside" spatial structure -- the boundary and entrance areas are highly intensive, while the vast interior burial area is empty, regular, and repetitive (Figure 3-25).
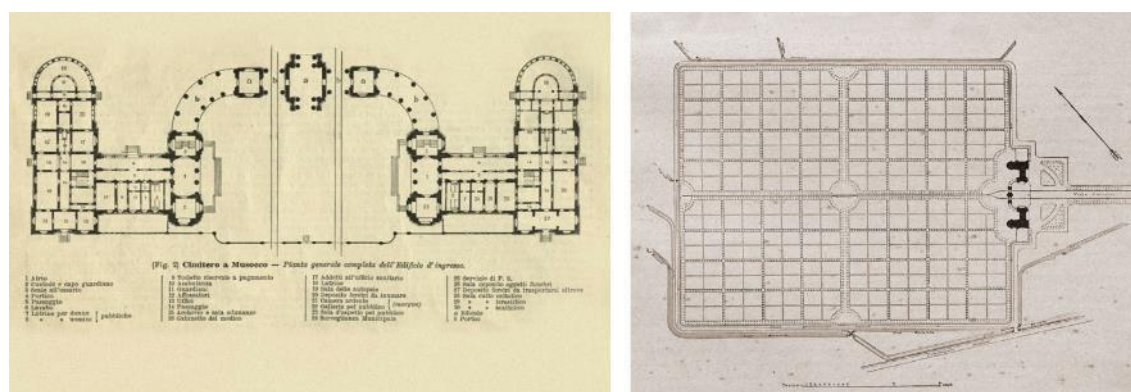


Figure 3-25 Plan of Auxiliary Buildings, Cimitero a Musocco, 1895 (Left); Site Plan (Right)

## 3.5 Rapid Construction Phase (1934–1964)

Into the 20th century, Milan's urban development was profoundly influenced by multiple factors including Fascist ideology, the wave of industrialization, social conflicts, and international changes. Its spatial morphology was consequently reshaped, manifesting as intensive development in the central area during the Fascist period of the 1920s and low-density, disordered sprawl in peripheral areas after the war in the 1940s. During this phase, the construction of Milan's main urban cemeteries was largely completed. Yet, accompanying the rapid expansion of the suburbs, the intended distance between cemeteries and the city was continuously being eroded, and the physical spatial separation between the living and the dead faced the risk of being breached. It is within this context that this section aims to explore the different impacts on Milan's urban development, by conducting a comparative analysis of urban cemetery types formed during different historical periods (those that have disappeared, those that still exist) and their relationships with built-up areas.

3.5.1 Overview of Urban Pattern

The Albertini Plan (Piano Albertini) of 1934 and the 1953 General Master Plan (Piano

Regolatore Generale, PRG) shaped Milan's 20th-century urban pattern under different historical contexts. The former served the Fascist regime and real estate speculation, reshaping the face of the city center; the latter, meanwhile, addressed post-war disordered sprawl and promoted suburban development. The main characteristics of the urban pattern during this period include (Figure 3-26):
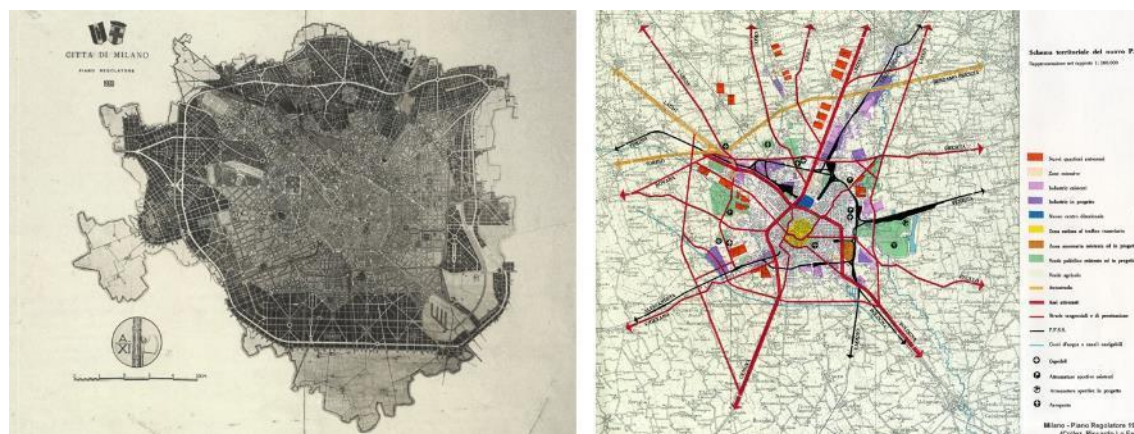


Figure 3-26 Piano Albertini, 1934 (Left); General Master Plan (Piano Regolatore Generale), 1953 (Right)

(1) Spatial polarization. In contrast to the planning strategy connecting the city center and peripheral areas from the late 19th to the early 20th century, the urban structure during this period exhibited the spatial characteristic of a binary opposition between the city center and peripheral areas. Within this, the urban status of the central area was significantly elevated after the Fascist party took power. In the Albertini Plan, most public resources required for construction were focused on internal renovation within the city, by constructing numerous public municipal projects to celebrate the glory of the regime. Furthermore, the plan introduced a new type of seven to eight-story buildings, displacing residential types and urban functions unable to afford high rents through a process of substitution, accelerating the development of the tertiary sector in the city center. In the peripheral areas, the Albertini Plan envisioned an outward expansion of 10,000 hectares based on the radial road network in the peripheral areas to accommodate large-scale residential development for over 3.5 million future residents, and establishing a ring road on the city's outermost periphery to alleviate Milan's increasingly severe traffic problems at this stage. In reality, the newly constructed peripheral roads (such as Viale Forlanini, Via Palmanova, Viale Zara, etc.) formed a dense orthogonal grid with the existing radial road network, and further finely divided the land into readily buildable plots to serve real estate speculation. By this point, Milan was divided into

two distinctly different poles: a central area combining administration, offices, and high-value buildings; and peripheral working-class residential areas with finely divided plots, forming a spatial structure characterized by block layouts ranging from compact to loose.

(2) Functional suburban tilt. Urban functional zoning underwent readjustment during this period, with public services and infrastructure shifting towards the suburbs. The 1953 General Master Plan introduced the concept of functional zoning and used this as a basis to adjust the planning for administrative services, industrial zones, independent residential areas, and large parks and green spaces, on one hand dispersing administrative functions concentrated in the city center, on the other hand providing social services to the suburbs, introducing the metro network system and constructing large public green space projects and social housing projects, etc. These functional adjustments strengthened the synergy between urban residential development and industrial development, and suburban area development, promoting the overall development of peripheral areas.

### 3.5.2 Cemetery Morphological Characteristics

#### 3.5.2.1 Fringe Belt Morphology

Milan's urban development in the 20th century unfolded amidst the upheaval of Fascist ideology, industrial expansion, social conflicts, and international changes, resulting in an imbalance in the binary relationship between the city center and the suburbs. The population grew dramatically due to the continuous influx of industrial immigrants, increasing from over 1.2 million on the eve of World War II to a peak of nearly 1.7 million in the late 1960s, with the primary increase concentrated in the suburbs. The proportion of resident population in the city center decreased from nearly one-third in 1931 to slightly over 8% in 1967. Concurrently, the number of residents in the far suburbs leaped from 350,000 to 1.05 million, with the proportion rising from 35% to 62% [46] , highlighting the significant outward migration of the city's population center.

This unprecedented scale of suburban growth was propelled by multiple factors: industries and employment in Milan's city center continuously migrated to the northern suburbs, forming industrial clusters along the outer railway ring; housing construction in the far suburbs flourished under private capital and government-led public housing projects, within which, the Albertini plan designated numerous readily buildable small plots in the

suburbs, reducing land acquisition costs and encouraging private investors to participate in suburban development. Furthermore, the planning for government-led public housing projects also favored placing large public housing projects in far suburban areas. This spatial strategy not only resulted in a large number of residential areas being built in the periphery but also made private landowners adjacent to or surrounded by new communities direct beneficiaries; the Milanese government bore significant infrastructure investment costs, providing development benefits for surrounding plots. Simultaneously, the construction of municipal projects, including large green parks and sports fields, also drove up the market value of surrounding land. With the linked layout of factories, worker residential areas, and railway goods nodes, the northern suburbs transformed from an agricultural zone into an industrial cluster zone integrating production, residence, and transport.

In the process of rapid suburban development, particularly in the areas where northern industrial and residential expansion was most significant, built-up areas gradually encroached upon the fringe area where Musocco Cemetery is located, and the relationship between cemeteries and urban morphology also gradually became defined: the Monumental Cemetery was completely surrounded by built-up areas; its high-intensity morphological framework formed with the goods yard to its north made it resistant to disintegration, becoming a remnant fragment of the former Spanish Walls fringe belt. The previously undeveloped land between Musocco Cemetery and the city center was replaced by a dense radially extended road network, forming a built-up area infill pattern with density decreasing outwards from the core -- the closer to the city center, the higher the proportion of residential buildings within the built structures, and the greater the building density. The area around Musocco Cemetery exhibited new fringe belt spatial characteristics.

The urban fringe belt that formed during this period was dominated by the combined result of the migration of industrial areas towards the outer ring railway line and the reorganization of public service functional zoning, presenting an arc-shaped fringe belt morphology composed of Musocco Cemetery, which occupies extremely large plots, large industrial clusters, large residential areas, and suburban parks. Specifically, large residential areas were primarily concentrated in the western and northwestern parts of the city and exhibited a trend of development away from the city's historical center. This area, due to the completion of Musocco Cemetery in the previous phase, already possessed basic road

planning, and large areas of undeveloped land resources provided a substantial spatial basis for urban development. Concurrently, the newly constructed large residential areas placed higher demands on supporting services in surrounding areas. Facilities such as sports fields and educational venues emerged successively. The renowned San Siro Stadium underwent multiple expansions between 1937 and 1960, eventually becoming a large venue capable of accommodating 85,700 people. The adjacent racecourse also covered an area of 140 hectares, together constituting important cultural and recreational space in the northwestern suburban area. Meanwhile, the industrial base was primarily concentrated in the Bovisa area, where three railway lines intersect, with chemical companies, including the Metallurgic factory Broggi and Paint factory Piatti, gathered here, and gradually developing into an important industrial center for Milan's chemical and steel sectors. This new "second fringe belt" not only provided more public space but also altered Milan's traditional urban structure, giving rise to new urban landscape components (Figure 3-27).
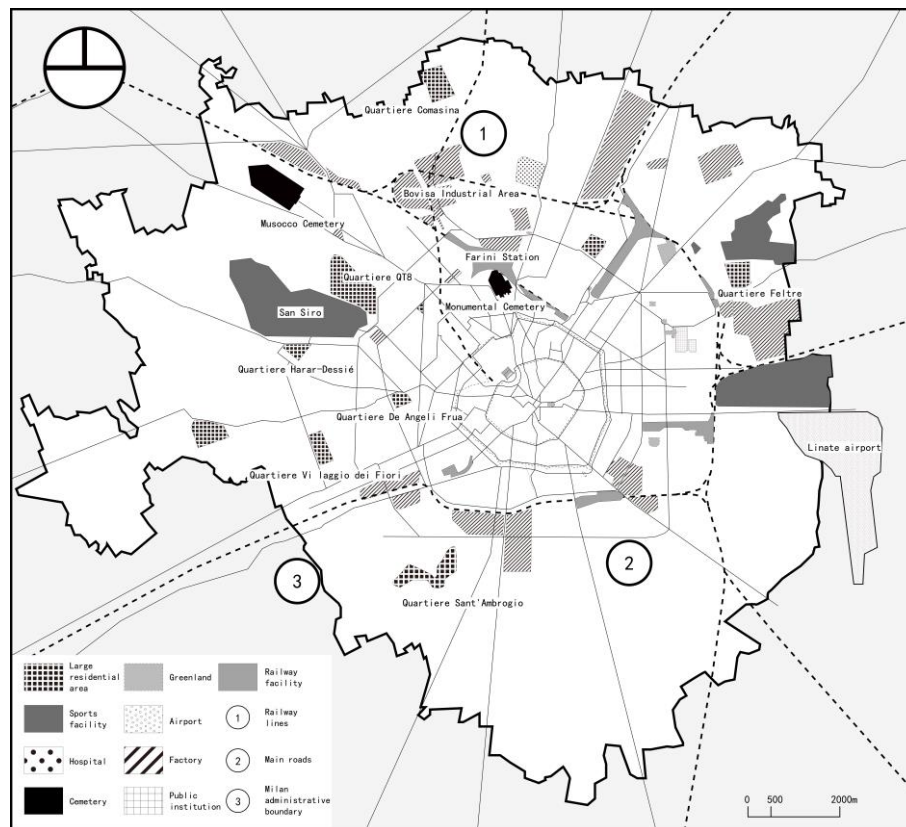


Figure 3-27 Spatial Distribution of Milan's Urban Cemeteries, 1964

**3.5.2.2 Street Block Pattern**

The three types of cemeteries with different morphologies and attributes (early suburban

cemeteries, Monumental Cemetery, Musocco Cemetery) have been deeply integrated into the urban built environment. They are not only funerary facilities of specific historical periods but, more importantly, based on their respective functional positioning and spatial characteristics, have become key spatial elements in shaping the urban fringe belt morphology and have exerted differentiated impacts on surrounding areas. Although the early suburban cemeteries have disappeared, their special attributes have caused their former sites to continuously influence surrounding areas. Furthermore, the Monumental Cemetery and Musocco Cemetery are located within urban fringe belts from different historical periods, and the surrounding built environment and morphology vary depending on the cemetery type. Therefore, this subsection aims to place these three types of cemeteries under the same time dimension, observing the differences in their relationship with surrounding urban morphology.

By the late 19th century, the suburban cemeteries in Milan's immediate suburbs had all been officially closed, and the remains within them were transferred to Musocco Cemetery for reburial. The closure of these suburban cemeteries released development land in surrounding areas, and their former sites were converted into buildings, streets, or used for widening adjacent plots. Having undergone multiple rounds of morphological changes, these former sites, as "weak" morphological elements, were gradually erased, leaving behind only churches or parts of walls as morphological traces. As an example, San Gregorio Cemetery, after being officially closed in 1864 according to the Public Health Law, it was incorporated into the road network of the Beruto Plan. Since the ownership of the public cemetery belonged to the Milan government, being of public nature and non-tradable, its former site was not privately developed but was converted into a public school with lower street density, forming a distinction from the surrounding dense residential fabric.

According to the 1964 cemetery morphology analysis map, one can compare the impact of three types of morphological elements on the urban structure: the historical Spanish Walls, the Central Station, and the former suburban cemetery sites. The Spanish Walls, as physical and conceptual boundaries, exerted a regional impact on urban morphology, dividing the inner city area characterized by a mixed land use pattern and diverse building forms from the outer city area characterized by predominantly residential function and homogeneous morphological types. The Central Station, conversely, exhibited a linear impact, forming a commercial axis along the municipal arterial road extending towards the city center. While the

impact of the former suburban cemetery sites was most localized and unique, forming patches of low-density public land within dense residential areas. It can thus be seen that urban cemeteries, as fringe belt elements, together with the walls and railway stations, constituted the basic framework of Milan's northern suburban morphology. Their influence varied in scale and type, collectively shaping the complex urban morphology of the heterogenized fringe belt (Figure 3-28).
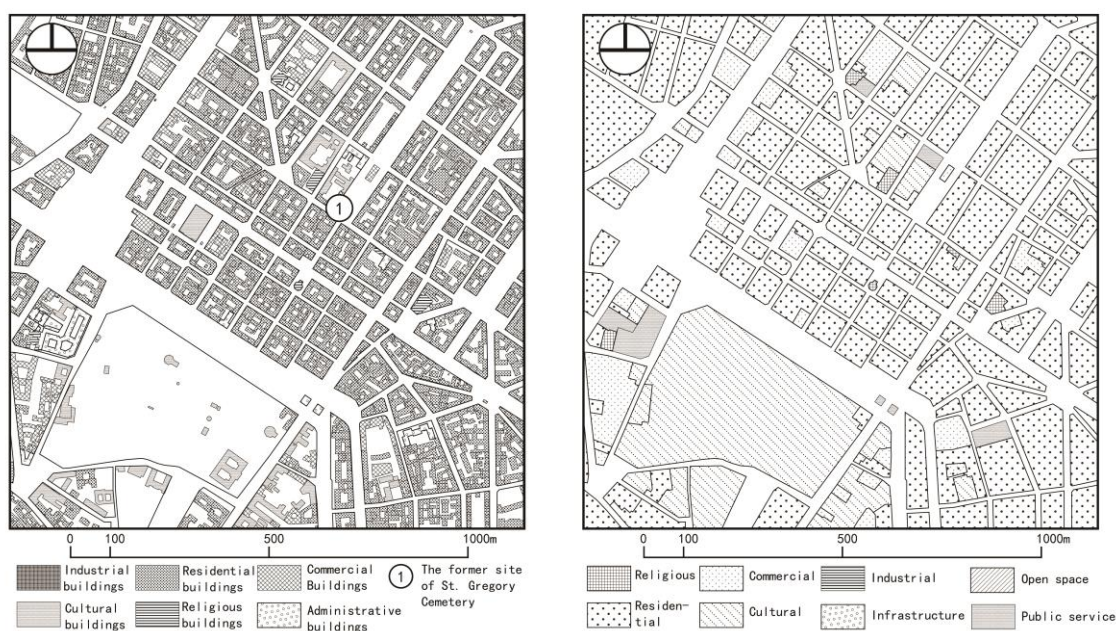


Figure 3-28 Morphology of the Cimitero di San Gregorio Site, Milan 1964: A. Building Morphology; B. Land Use

As another type of urban cemetery located around the historical Spanish Walls, the morphological evolution process of the Monumental Cemetery spanned multiple different urban development phases, ultimately presenting the characteristic of a collage of morphological types from different periods. These primarily included the high-density traditional residential area south of the cemetery forecourt, the low-density industrial area west of the cemetery, and the newly expanded residential areas from this period. The industrial area formed in the "consolidated" area around the Monumental Cemetery and Farini Station in the previous phase has gradually migrated outwards under the pressure of real estate market speculation in this period and is being refilled by residential or commercial buildings. This change is most noticeable north of Farini Station, and this area is forming a new secondary center. Conversely, the evolution of the industrial area west of the Monumental Cemetery has almost stagnated. Although new residential buildings are continuously emerging in the far northwestern suburbs, the area and building morphology of

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the industrial area west of the cemetery have largely remained unchanged. This stagnant state precisely reflects the attribute of the Monumental Cemetery as a "fixation line" -- a persistent physical barrier -- that even if surrounding functions change, it still restricts the transformation and development of adjacent areas (Figure 3-29).
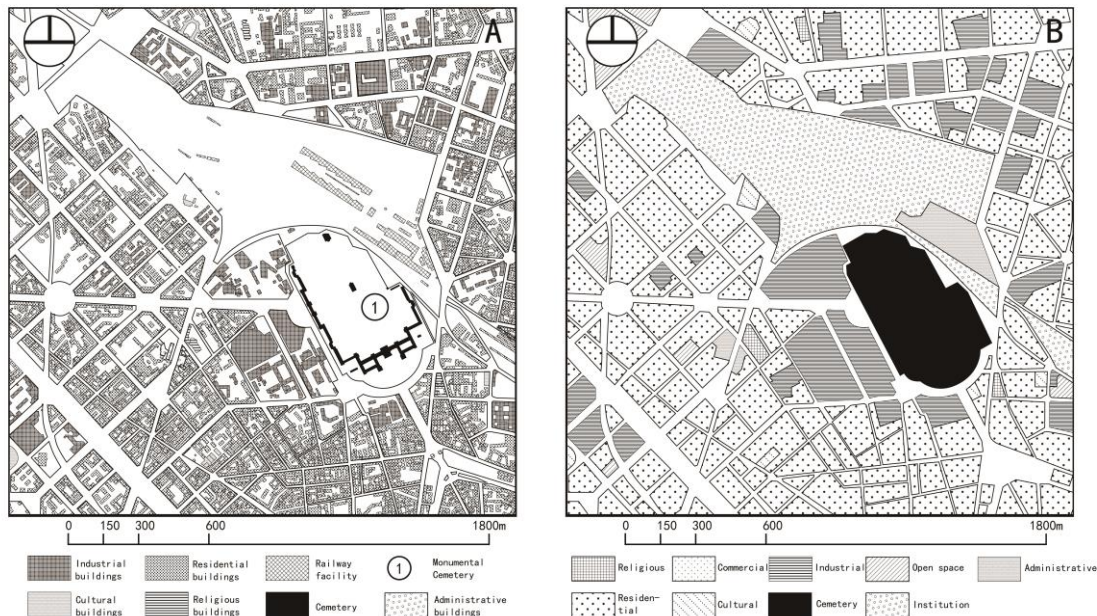


Figure 3-29 Morphology of Milan's Monumental Cemetery, 1964: A. Building Morphology; B. Land Use

During this period, Musocco Cemetery, along with surrounding industrial areas and large residential developments, together formed Milan's new urban fringe belt. The 1964 Musocco Cemetery morphology analysis map clearly illustrates the built environment around it at this time. By 1964, the cemetery forecourt was filled with numerous residential buildings, and continuous industrial areas had formed on the northeast side near the railway. Concurrently, the cemetery itself was surrounded by planned green space, forming a transition zone between it and the built-up area, helping the cemetery achieve a relatively stable balance with the urban area at that time (Figure 3-30).
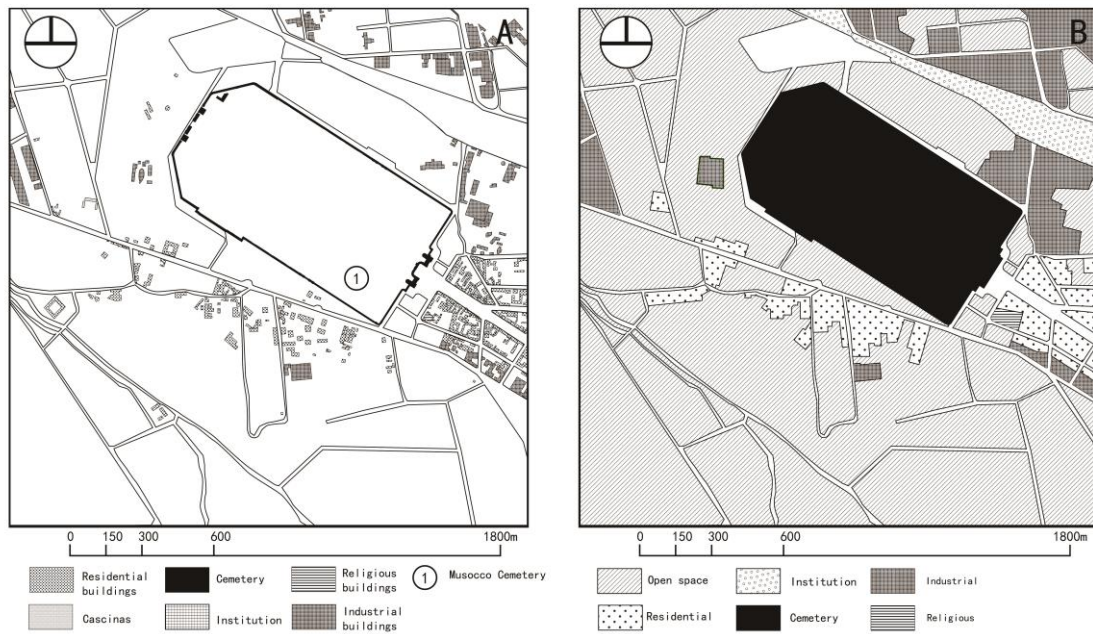
Figure 3-30 Morphology of Milan's Cimitero a Musocco, 1964: A. Building Morphology; B. Land Use

### 3.5.2.3 Building Type

Compared to the rapid urbanization process of street blocks around the cemeteries, the architectural types of the Monumental Cemetery and Musocco Cemetery did not fundamentally change. This subsection will focus on the expansion processes of the two cemeteries in the first half of the 20th century, by analyzing the dynamic adjustments of their plan layouts, revealing the implicit conflict between "space for the living" and "space for the dead" during the process of industrialization.

The Monumental Cemetery underwent two expansions. The first began in 1913, to meet the needs of the Jewish community for independent burial, adding exclusive areas outside the original boundary towards the south and east, forming a nested structure of "main burial area - subsidiary areas", achieving functional connection through independent entrances, walkways, and green belts. The second expansion in the 1930s was significantly larger in scale, reaching a total area of 25 hectares, expanding along the west side, and divided into different functional units according to religious and cultural traditions. The expansion continued the linear layout of the columbarium on the west side; the newly constructed continuous columbaria redefined the western boundary, while the original wall was transformed into an internal green buffer zone. These two asymmetrical expansions disrupted the geometric symmetry of the initial plan and severed the original layout of the western circular square (Figure 3-31).

In contrast to the Monumental Cemetery, Musocco Cemetery, situated on the urban edge

with less development resistance, underwent three systematic expansions in 1913, 1924, and 1934, eventually reaching a total area of 68 hectares. Its expansion strategy adhered to the principle of continuing the initial rectangular grid, for instance, expanding burial sections based on the original northern layout, with a narrowing at the northern end and the addition of a simple entrance. Regarding boundary treatment, the expanded areas continued the columbarium enclosure system, with only narrow gatehouses at the new-old connection points. The demolished old walls were replaced by internal roads, extending the main axes and establishing circular nodes, integrating the new and old spaces into a unified grid system (Figure 3-32).

The expansion methods of the two cemeteries reflected different urbanization pressures: The Monumental Cemetery, due to its proximity to the center, its expansion was a "filling-in" encroachment upon urban underutilized space, leading to the collapse of its own symmetry and blurred functional boundaries. Musocco Cemetery, on the other hand, relied on suburban land reserves and maintained spatial order through geometric expansion. Both together reveal the passive adaptation of "space for the dead" to the demands of "space for the living" during this period; the asymmetrical growth of the Monumental Cemetery and the boundary simplification of Musocco Cemetery are essentially concrete manifestations of the concepts of functional zoning and the competition for land resources in urban planning.



Figure 3-31 Monumental Cemetery Site Plan Comparison, 1901 and 1965

Figure 3-32 Cimitero a Musocco Site Plan Comparison, 1901 and 1965

## 3.6 Summary

This chapter, using a historical urban morphology research method, traces the process of development and evolution of Milan's urban cemetery morphology at various levels since the 19th century. During the stagnation phase of the early 19th century, church cemeteries, influenced by regime change and hygiene concepts, began to migrate outside the Spanish Walls, forming suburban cemeteries characterized by spatial exclusion, reinforcing the edge characteristics of the peripheral areas. In the initial planning phase after the unification of Italy in the mid-19th century, the Monumental Cemetery rose as an urban monument, connected to the city center by an avenue, becoming a focal point for development in the northwestern suburbs, while concurrently, suburban cemeteries were forced to close due to conflict with built-up areas. In the subsequent planning adjustment phase, Musocco Cemetery in the far suburbs was constructed. Against the dual backdrop of railway system reorganization and the expansion of Milan's urban boundary, cemeteries became important elements defining the new edge areas. Concurrently, the Monumental Cemetery was retained and embedded within the built-up area due to its special socio-cultural attributes, forming fragments of the old fringe belt. In the rapid construction phase of the 20th century, driven by Fascist planning and post-war reconstruction, Musocco Cemetery, along with surrounding industrial areas, large residential developments, and urban green spaces, together formed the new fringe belt.

# 4. Mechanisms of Milan's Urban Cemetery Morphological Evolution

## 4.1 Regularities in the Morphological Evolution of Milan's Urban Cemeteries since the 19th Century

Based on the longitudinal analysis of urban cemetery morphological characteristics in Chapter 3, this chapter combines various sources such as " The Origin and History of Milanese Cemeteries and Funerary Services" (Origini e vicende dei cimiteri di Milano e del servizio mortuario), historical maps, and field research to select 6 representative cemetery projects, focusing on conducting a horizontal comparison from the perspective of constituent elements to reveal the evolutionary regularities of urban cemeteries (Figure 4-1).
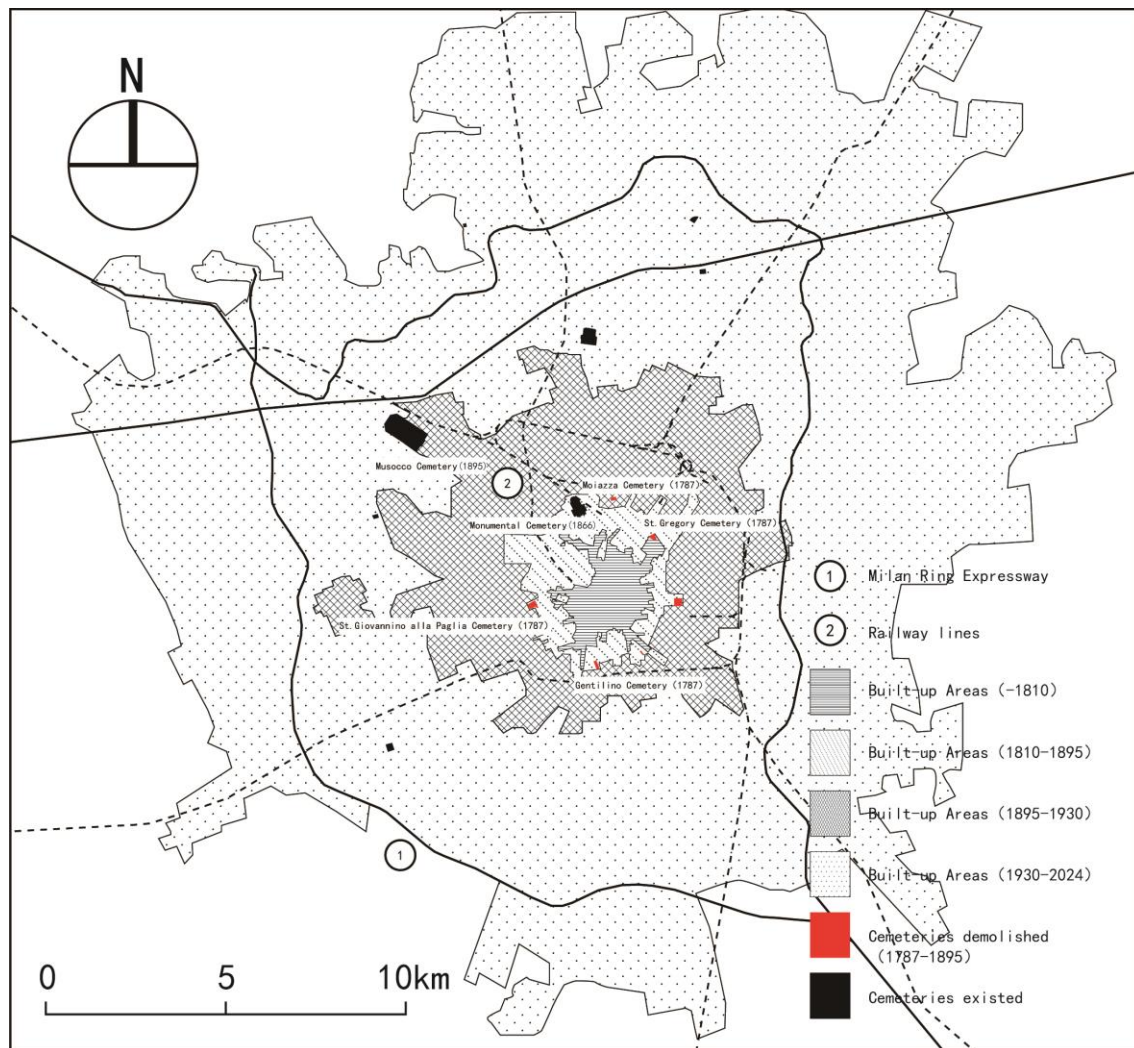


Figure 4-1 Map of Milan's Urban Cemetery Distribution since the 19th Century

### 4.1.1 Regularities in the Spatial Distribution of Urban Cemeteries

Milan, as a typical city of concentric development centered around the Spanish Walls, cemeteries have left continuous spatiotemporal imprints on the city's historical geographical pattern. In order to study the overall relationship between Milan's cemeteries and urban development, this subsection adopts the equal sector analysis method in urban space, standardizing the urban expansion data in various directions, and performing overlay operations and spatial statistical analysis on the quantity of land change in each period and sector (Figure 4-2) [47]. By describing the differences in the expansion speed across different orientations in each period, analyzing the dynamic relationship between the spatial differentiation of urban expansion and the spatial distribution of urban cemeteries.

Its primary quantitative indicator is Spatial Expansion Intensity ($I_{ue}$), which refers to the expansion intensity of urban land over different time periods within the same city. It reflects the extent of urban land expansion over these periods and can be used to study the intensity of urban land expansion. The formula for calculation is: $I_{ue} = (A_{t2} - A_{t1}) / (A_{t1} \times \Delta t) \times 100\%$ In the formula,



Figure 4-2 Equal-Sector Analysis Map of Built-up Area Expansion Since the 19th Century

$I_{ue}$ represents the urban construction land expansion intensity index, $A_{t1}$ and $A_{t2}$ respectively represent the urban construction land area during time periods t1 and t2, and $\Delta t$ indicates the time interval in years from t1 to t2.

It needs to be clarified that the built-up area in each phase in this subsection is derived from calibrating and calculating data from historical urban maps and related materials since the 19th century, and a certain degree of error exists. Therefore, the results generated are only a type of generalized research conclusion. Specifically (Figure 4-3):

(1) Urban cemetery projects constructed from the late 18th to the early 19th century were evenly distributed around the various city gates, showing an overall trend of construction away from the city center. The spatial distribution of urban cemeteries in this period was closely related to the state of urban development stagnation, built-up areas concentrated
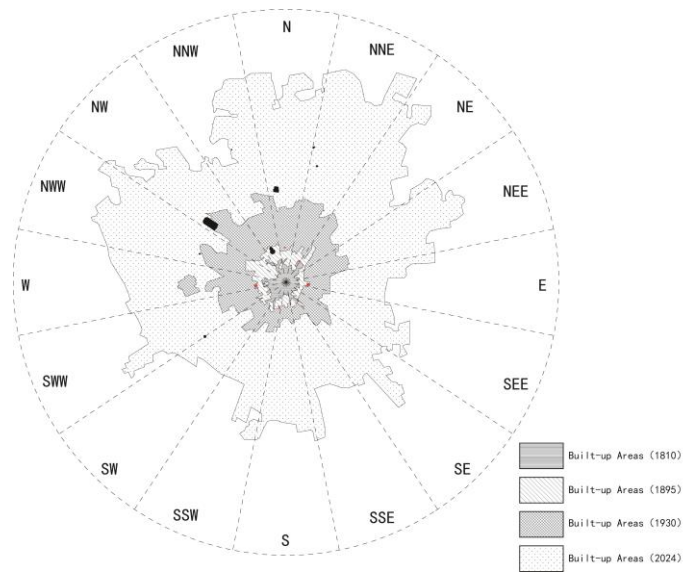
within the walls, and scattered residential areas in the periphery at that time. Cemetery site selection primarily considered the convenience of arrival from all directions, without needing to consider the impact on the surrounding sparse built-up areas.

(2) Only one urban cemetery project was constructed between 1810 and 1895; the number was significantly lower compared to the previous phase. Its location was also on the periphery of the Spanish Walls, and, with urban expansion, exhibited a trend of construction bordering the city center. The urban cemetery constructed during this period is located in the northwestern part of the city. At this time, the NWW and NE directions were the primary expansion directions of Milan, forming two clear expansion wings, while the NNW direction, where the urban cemetery is located, was a secondary expansion direction of the city, reflecting that the cemetery location during this period had a certain pulling effect on urban development. In this context, mature infrastructure around the city (such as roads, squares) provided a spatial basis for urban development.

(3) The urban cemetery constructed between 1895 and 1930 is located in the northwestern part of the city, is singular in number and far from the core urban area. Unlike the trend of construction around the Spanish Walls in the previous two phases, the urban cemetery in this period again exhibited a construction pattern of migrating towards the urban edge. At this time, the NE and NEE directions were the primary expansion directions of the city; the NW direction, where the urban cemetery is located, was a secondary expansion direction. Combined with the analysis in Chapter 3, the urban expansion morphology during this period had a strong correlation with the distribution of railways and their surrounding industrial areas. Furthermore, the construction of the urban cemetery, to some extent, promoted the construction of the transportation road network in the NW direction, contributing to the overall urban expansion morphology of Milan at this time.

(4) The pattern of Milan's urban cemeteries from 1930 to 2024 has been largely stable, with no new large peripheral cemeteries added, and the cemeteries built in the early 19th century were completely removed during this period. The primary expansion directions of Milan during this period were concentrated in the N, NE, and NEE directions. At this time, the relationship between the spatial distribution of cemeteries and urban expansion exhibited characteristics different from the previous three phases. As no new large cemeteries were created on the urban edge to define the boundary, the direct link between cemeteries and the

overall urban development trend, and their dominant role in shaping the new edge, weakened accordingly.

In summary, there exists a complex and interconnected relationship between the spatial distribution of Milan's urban cemeteries and urban development since the 19th century. Cemetery site selection both reflected the overall trend of urban construction in a specific period -- from being far from the core during the stagnation phase, to being close to the old edge during the expansion phase, and then moving towards the new edge during the large-scale expansion phase. Its construction itself also had an impact on urban development, either as pulling points or as local impediments. This type of site selection was often constrained by geographical conditions such as land area, soil, etc., and the need to maintain a distance from built-up areas. This distance could either reserve space for future urban expansion or form insurmountable physical barriers. As no new cemeteries are built on the urban edge, the role of cemeteries in defining and shaping the city's latest edge has gradually weakened.
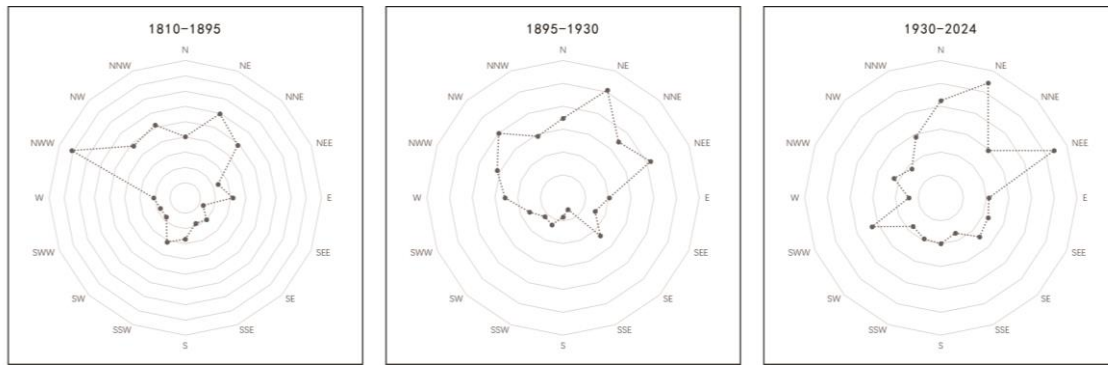


Figure 4-3 Urban Expansion Intensity by Phase and Orientation

## 4.1.2 Regularities in Cemetery Morphological Evolution

### 4.1.2.1 Regularities in Fringe Belt Evolution

In order to further understand the correlation between cemeteries built in Milan since the 19th century and the urban form pattern, this subsection will combine the evolution process of Milan's urban fringe belts with the spatial distribution of cemeteries and correlate them one-to-one. By combining the spatial distribution of cemeteries with the evolution process of urban fringe belts, exploring how "space for the dead" and the "city of the living" influence each other. Overall, Milan's urban area has formed three layers of concentric fringe belts spreading outwards from the historical center (inner, middle, outer) (Figure 4-4). The evolution of cemetery fringe belts can be broadly divided into the following three types:

(1) Early cemeteries constructed around the Spanish Walls conflicted with the city's urgent demand for development land during subsequent urban expansion phases. With the decrease in the city's military defense functional requirements, the walls were demolished at the end of the 19th century and converted into an inner ring road. Coupled with the concurrent
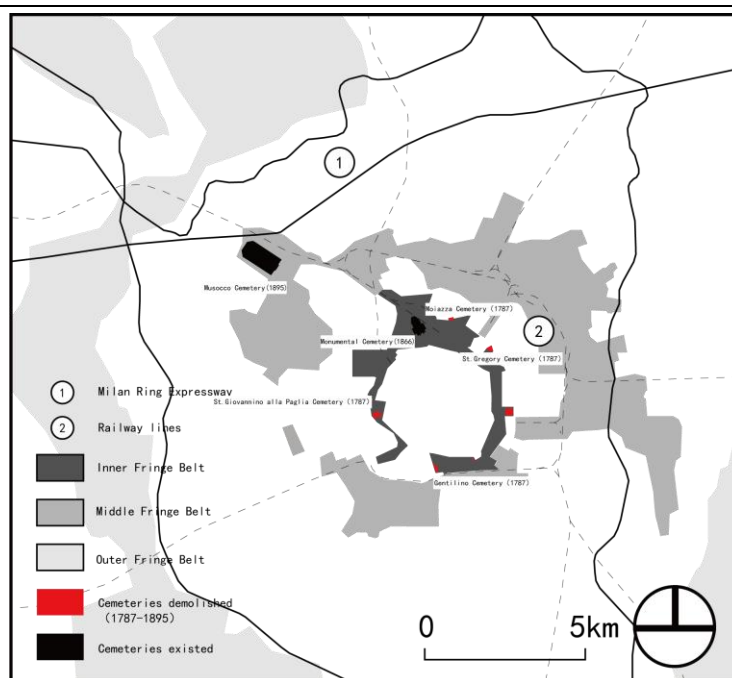


Figure 4-4  Milan Fringe Belt Morphology

advancement of transportation infrastructure and outer city construction, these cemeteries relatively close to the city were forced to be entirely closed and thoroughly cleared. The role of cemeteries as physically defining "fixation lines" was consequently lifted, and the original NIMBY effect rapidly diminished to disappearance. This resulted in the heterogenization of the fringe belt, with the original cemetery elements being absorbed by land of different use types, with residential land use being the most active among them. Subsequently, the former cemetery sites were replanned with municipal roads, establishing a grid framework and gradually infilling buildings. This functional separation led to the disappearance of the original morphological imprints of the cemetery fringe belt in the reshaping of the outer city area.

(2) The Monumental Cemetery constructed in the mid-19th century was retained on its original site due to political, social, and other factors and did not relocate with urban expansion. It is located between the inner fringe belt dominated by the Spanish Walls and the middle fringe belt dominated by the reorganized railway system, exhibiting the edge morphological characteristics of a development transition phase. The cemetery and the railway system together constitute a high-intensity fringe belt framework, constraining the balanced development and normal traffic in surrounding areas. This discontinuous area was not disintegrated after being surrounded by built-up areas; on the contrary, the special effects of the cemetery continued to assimilate surrounding areas. Although the reorganization of the

railway system led to the migration of industrial areas that originally developed along the old railway lines, compared to surrounding areas, the development of areas near the cemetery appeared slower, and a large number of industrial facilities are still retained around the cemetery, forming specific fringe belt patches.

(3) The fringe belt of Musocco Cemetery located in the far suburbs has not yet been breached by built-up areas, gradually combining with surrounding public green spaces, stabilizing on the urban edge. By the end of the 19th century, with the reorganization of the railway system and the removal of the northwestern railway fixation line, built-up areas began to expand northwestwards. Planning for the location of new cemeteries became more conscious to avoid potential conflicts and contradictions. Benefiting from the development of the public transportation system, large urban cemeteries during this period were located in far suburban areas accessible by tram. While offering transportation convenience, it was beneficial for increasing capacity and not occupying land for production and urban development, reducing interference with the city. Furthermore, abundant surrounding land conditions provided development conditions for the future combination of urban cemeteries and surrounding green spaces. From the 20th century onwards, large urban parks began to be constructed in the areas around the cemetery, together with the cemetery forming the green system of the city's outer ring. By combining large urban cemeteries with far suburban green spaces, cemeteries were hidden within the green landscape, once again becoming a component of the new fringe belt and stabilizing, entering a period of stability and internal adjustment (Figure 4-5).
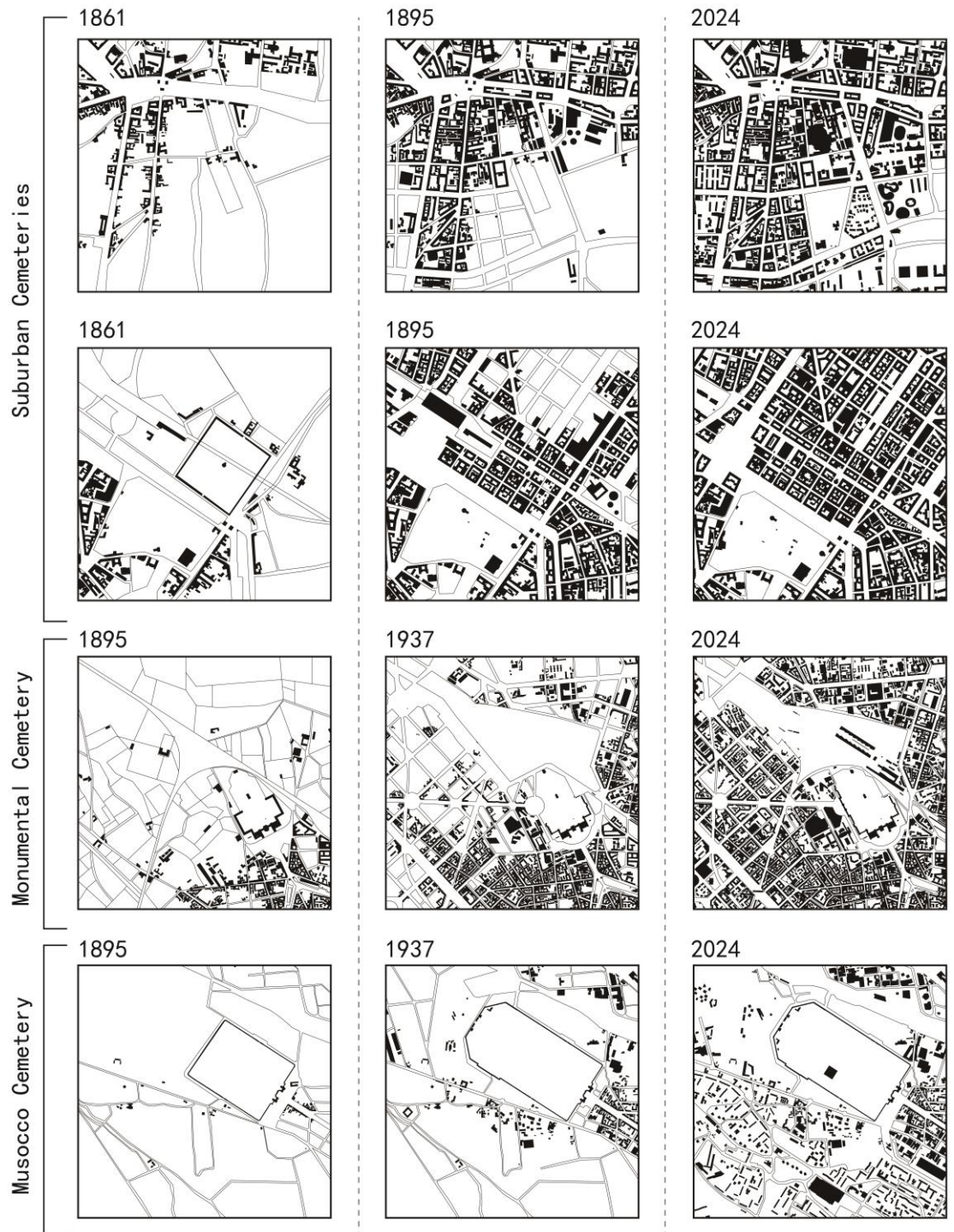
Figure 4-5 Patterns of Milan's Urban Cemetery Morphological Evolution

**4.1.2.2 Regularities in Street Block Morphology Evolution**

From the analysis above, it can be seen that urban cemeteries, as key components of the urban fringe belt in different periods, by virtue of their unique socio-political attributes, have had a profound impact on the interaction patterns and spatial generation modes of the fringe

belt and the city. Building on this understanding, this subsection will explore the evolutionary regularities of cemetery morphology at different scales through mesoscale evaluation and syntax analysis.

(1) Regularities in Street System Evolution

This paper employs syntax analysis to explore the degree of local and global integration of urban cemetery locations within the urban network. Syntax analysis comprises two key indicators: global integration is used to describe the integration pattern of the entire spatial network, calculated by measuring the degree of connectivity between a node and all other nodes in the system; local integration, on the other hand, focuses on reflecting community-level interaction, and its measurement results can be related to microscopic activities such as pedestrian flow, area vitality, and possibility of interpersonal encounters [48].

From the late 18th to the early 19th century, newly built cemeteries in Milan relocated from the city center to the periphery, directly affecting their accessibility and global spatial integration level. The global integration map derived from syntax analysis shows that, compared to existing church cemeteries from the same period, there was no significant difference in the global integration of the environment where the newly built suburban cemeteries were located; both were adjacent to major municipal arterial roads connecting the city center and the periphery, with relatively high global integration levels. This indicates that the suburban cemetery areas had high accessibility for vehicles. The local integration map, conversely, reveals that the local integration value of the environment where the newly built suburban cemeteries were located was relatively low, and the surroundings were highly fragmented, while the local integration value of church cemeteries was higher. This reflects that pedestrian accessibility conditions in the suburban cemetery areas were not ideal; the location prioritized the convenience of motorized traffic but was far from public activities and pedestrian interaction. The results of the syntax analysis validated the motive behind the cemetery relocation: the change in spatial layout was aimed at excluding urban cemeteries from public view and hindering any form of spontaneous interpersonal interaction around them. This spatial characteristic of prioritizing vehicle accessibility while sacrificing pedestrian and local interaction is precisely the embodiment of its isolation intent.

The newly constructed Monumental Cemetery in the mid-19th century is located in the northwestern suburbs. Its construction brought positive changes to the accessibility and spatial

integration of this area. Comparing the urban network global integration maps of 1801 and 1895, one can observe a clear improvement in the global integration of the northwestern area. This is primarily attributable to the denser regional road network resulting from the construction of the Monumental Cemetery, particularly the connection of the arterial road directly leading to the cemetery with outer roads, significantly improving the overall accessibility of this area. Furthermore, the local integration map indicates that, compared to 1801, the local integration of the peripheral areas where urban cemeteries were located in 1895 was higher. This change indicates that at this time, whether it was the Monumental Cemetery or the still-existing suburban cemeteries, pedestrian activity around their fringe belts was denser, and also reflected a decrease in society's NIMBY sentiment towards cemeteries.

Musocco Cemetery, constructed at the end of the 19th century, is located in the far northwestern suburbs of the city. Based on syntax analysis from 1937, Musocco's global integration value did not significantly decrease due to its distance from the city center, and its accessibility to the city center remained at a relatively moderate level. However, the local integration value of its environment was low, reflecting the actual situation that the cemetery is located in the far suburbs and is not easily accessible to pedestrians. Meanwhile, although the road network structure around the Monumental Cemetery constructed in the previous phase was relatively complete, it showed obvious "dead end" phenomena near the cemetery facilities. Comparing with the 1937 global integration map, it can be clearly seen that the road network in the northwestern area where the Monumental Cemetery is located is relatively irregular, and its overall spatial system integration level is significantly lower than that of the eastern area with a complete orthogonal street network. This is directly attributed to the obstruction caused to the road network by the large area of impassable land occupied by the cemetery and the goods yard to its north.

Presently, the two existing large urban cemeteries in Milan are surrounded by a dense urban road network. The global integration of their surrounding areas has increased compared to earlier historical periods. The road network around the Monumental Cemetery is relatively complete, with an orthogonal grid clearly defining the boundaries of the space occupied by the cemetery and the goods yard. In contrast, the global integration value around Musocco Cemetery still needs improvement, with road structure optimization around it mainly focused

on the arterial roads connecting the city center, and the cemetery itself has not been well integrated into the overall road network. From the local integration map, the local accessibility around both cemeteries shows low values, which may reflect their barrier effect as large fixation areas on local connections; this is particularly true for Musocco, as it still exists as a peripheral element in its environment.

In summary, the impact of Milan's urban cemeteries on the evolution of the street system is complex and dynamic. In the early stages of urban expansion, as large municipal projects, they built radial roads connecting the city center, could improve the level of regional infrastructure in a short period, playing a certain initial driving role, especially in suburbs lacking a complete road network. However, with the deepening of urban development and the improvement of surrounding road networks, the large area occupied by cemeteries gradually became an obstacle to traffic connections, their positive driving role in regional morphological development gradually weakened, limiting the development of surrounding areas (Figure 4-6).
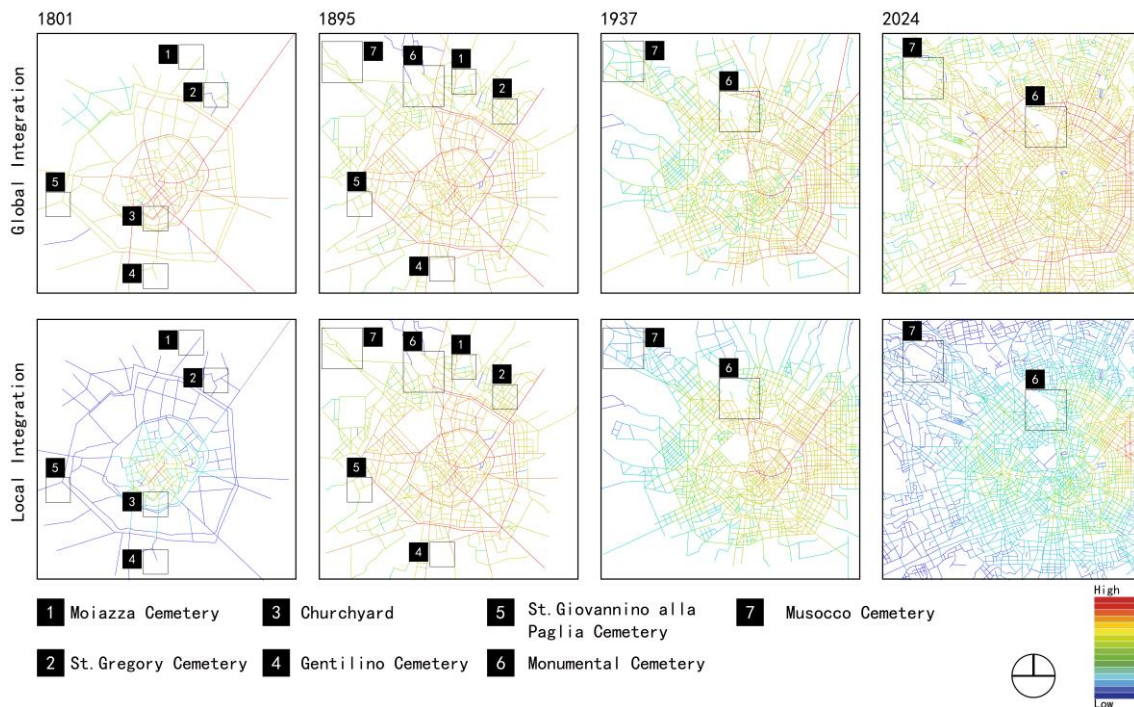


Figure 4-6 Milan Integration Analysis Map, 1801-2024

(2) Regularities in Land Use Evolution

In order to further study the impact of urban cemeteries on the transformation of surrounding plots, this paper performs a preliminary classification of the land use patterns around typical urban cemeteries and their surrounding street blocks in Milan during various

periods (Figure 4-7). Overall, the land use evolution patterns around Milan's urban cemeteries exhibit two opposite types:

Suburban cemeteries constructed in the early 19th century exhibited a land use pattern characterized by uniform external infill and internal mixed development. More specifically, before the suburban cemeteries were removed in the early 19th century, their surrounding areas had already formed a dense road network framework composed of small blocks, and were uniformly filled with residential or mixed residential/commercial functions, forming relatively independent residential clusters. The presence of the cemeteries did not interfere with
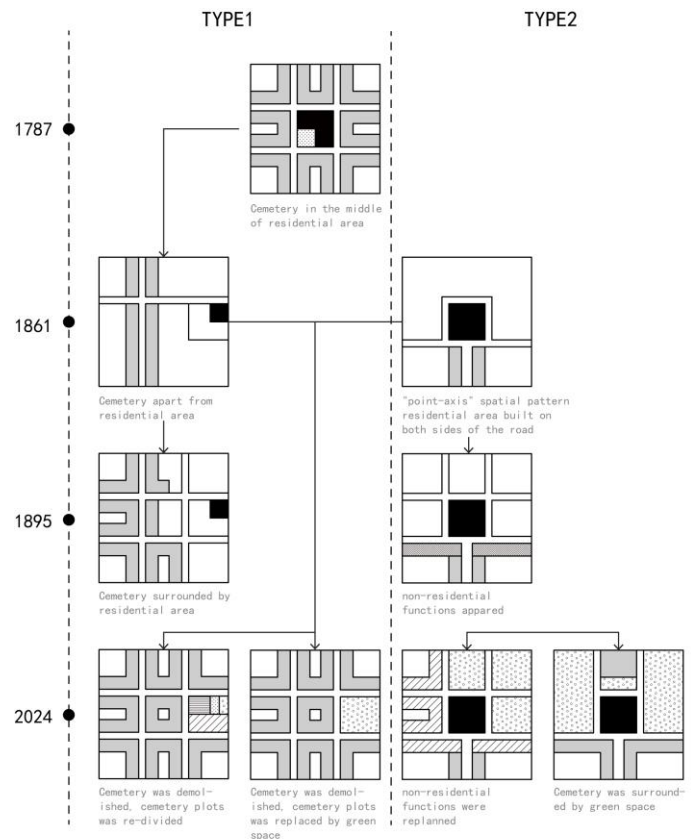


Figure 4-7 Evolution of Land Use Patterns around Milan's Urban Cemeteries since the 19th Century

surrounding land use types, only delaying the construction progress. After the cemeteries were demolished, their former sites were mostly under government jurisdiction. Larger cemetery plots were re-divided into small plots of comparable scale to the surroundings and filled with different public service functions, ultimately forming mixed land use characteristics within the former site area.

After the mid-19th century, significant changes occurred in the structure of large urban cemeteries and their surroundings, with the emergence of a "point-axis" spatial pattern connecting cemeteries with a linear road. The internal function of these cemeteries remained stable and singular, namely funerary function, while the functions of the external surrounding areas exhibited an evolutionary pattern of diachronic replacement. Compared to the internal area, the land use pattern around the cemeteries gradually differentiated over time. In the early stages of cemetery construction, residential function first replaced agriculture, appearing on both sides of the municipal arterial road aligned with the cemetery axis. In the next

development phase, the function of street blocks near the cemeteries further differentiated, with the emergence of non-residential functional areas, primarily industrial. At this time, market-price sensitive residential functions showed a tendency of being located away from the cemeteries, while functions such as industry were relatively closer. Entering the 20th century, with urban deindustrialization, surrounding industrial functions were replanned, transforming into innovation industry and green landscape areas, further promoting the diversification of land use patterns around the cemeteries.
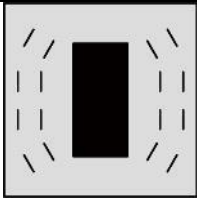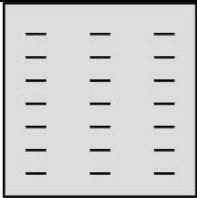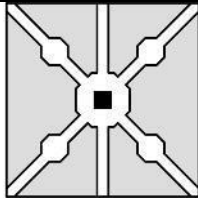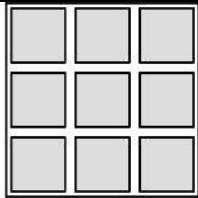
**4.1.2.3 Regularities in Building Type Evolution**

The previous subsection examined the relationship between cemeteries and the city as a whole, the fringe belt, and surrounding street blocks, clarifying the impact of cemeteries as key morphological elements on the evolution of urban morphology. Building on this foundation, this subsection will turn to a detailed analysis of the cemetery's own morphology, deeply interpreting its constituent characteristics through constituent element research.

(1) Regularities in Planar Layout Evolution

Since the 19th century, the planar layout of Milan's urban cemeteries has undergone an evolution from simple to complex and back to simple (Table 4.1), while their occupied area has continuously increased (Figure 4-8).

Table 4.1 Main Types of Planar Layouts for Milan's Urban Cemeteries, 1787-1895

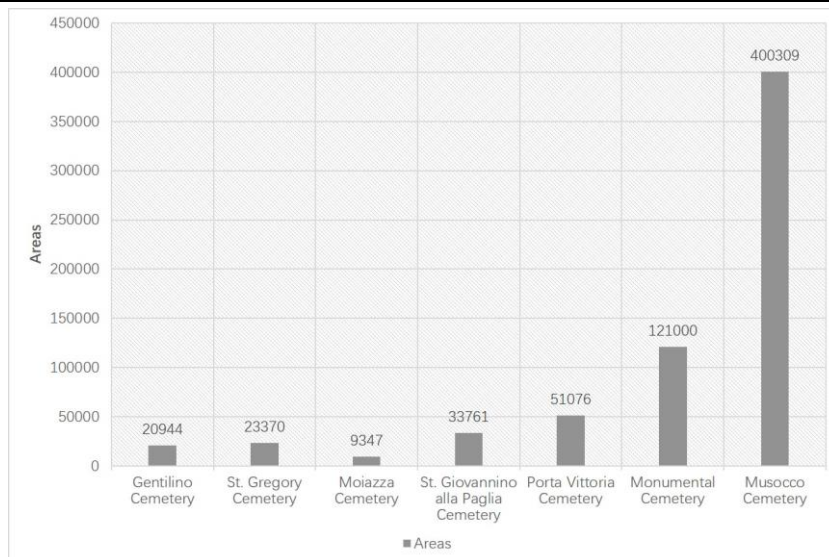| Church-led type | Array type | Classical Symmetric type | Grid type |
|---|---|---|---|
|  |  |  |  |

Figure 4-8 Change in Occupied Area of Milan's Urban Cemeteries since the 19th Century

The planar layout of suburban cemeteries constructed from the late 18th to the early 19th century was the result of the combined influence of the land conditions, political environment, and hygiene concepts of their location. Unlike the church cemeteries which were often irregular in shape due to being limited by surrounding physical boundaries, suburban cemeteries relocated to the vast area outside the Spanish Walls were not subject to rigid constraints, and their plans were mostly ideal rectangles. The rationalist ideas of the Austrian government standardized the neat arrangement of internal walls and gravestones, forming a linear layout. Concurrently, hygiene factors promoted the separation of the church for funerary rites from the cemetery, forming a layout of a rectangular cemetery juxtaposed with a small chapel.

The Monumental Cemetery constructed in the mid-19th century, its form evolved from a simple single rectangle to a complex system organized by a central axis. The planar design was dominated by the popular Neoclassical composition rules of the time, using a key axis (portico-church-crematorium) to control the internal road network and node arrangement, forming a centrally symmetrical plan with prominent wings. Compared to suburban cemeteries with a linear layout, the Monumental Cemetery composed and systematized its plan, becoming a model for monumental cemeteries.

Musocco Cemetery, constructed at the end of the 19th century, returned to a planar form dominated by spatial economy. Although its area further increased, it simplified the combination of the church and cemetery, concentrating the church and all subsidiary functions

at the entrance, with the central space entirely used for burial, forming a massive cemetery volume. Its plan retained only the basic grid form to maximize burial efficiency (Table 4.2).

Table 4.2 Table of Planar Layout Methods and Total Building Occupied Area for Milan's Urban Cemeteries since the 19th Century

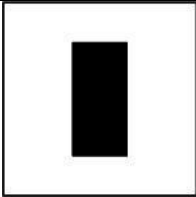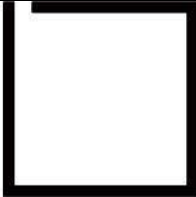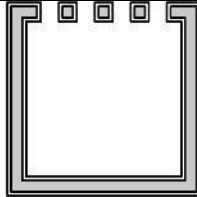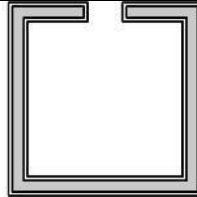| Name of Cemetery | Built years | Types of Layout | Areas （㎡） |
|---|---|---|---|
| Gentilino Cemetery | 1787 | Array type | 20944 |
| St. Gregory Cemetery | 1787 | Array type | 23370 |
| Moiazza Cemetery | 1786 | Array type | 9347 |
| St. Giovannino alla Paglia Cemetery | 1787 | Array type | 33761 |
| Porta Vittoria Cemetery | 1787 | Array type | 51076 |
| Monumental Cemetery | 1866 | Classical Symmetric type | 121000 |
| Musocco Cemetery | 1895 | Grid type | 400309 |

(2) Regularities in Management Boundary Evolution

Compared to the reflection of specific funerary cultural concepts in the planar layout of cemeteries, the management boundary, as the interface for daily interaction between the living and the dead, can more intuitively reflect the societal concepts of life and death at that time. Since the 19th century, the boundaries of Milan's urban cemeteries have undergone a significant evolution from single to composite (Table 4.3).

The initial boundary of suburban cemeteries built in the late 18th century was consistent with early church cemeteries, initially just using simple wooden fences to prevent people from crossing. It was only changed to brick walls after being re-expanded in the early 19th century. At this time, the basic function of the cemetery boundary was mainly to prevent intentional damage to the cemetery, and at the same hand, the enclosed walls could also block people's view, forming a hard physical boundary between the living and the dead. The Monumental Cemetery, built in the mid-19th century, had a boundary that showed obvious composite attributes. The front boundary gradually opened up, forming an architectural entrance with arcades. At the same hand, the interfaces on both wings of the cemetery were combined with columbaria; the columbarium walls themselves served as physical boundaries. This

combination of boundary and burial function reflected a change in the perception of the relationship between the dead and the living. Musocco Cemetery, built at the end of the 19th century, inherited the columbarium boundary type and increased its height, enhancing the boundary's capacity. Entering the 20th century, in addition to traditional hard boundaries like walls and columbaria, as urban cemeteries integrated with green space systems, the boundaries further composited with surrounding green belts. This formed a soft boundary that filtered sightlines, effectively reducing the visual interference of the cemetery on the surrounding environment.

Table 4.3 Types of Management Boundaries for Milan's Urban Cemeteries, 1787-1895

| No boundary | Closed boundary | Opened boundary | Combination boundary |
|---|---|---|---|

In general, since the 19th century, the morphological evolution of urban cemeteries in Milan at various stages is a reproduction and representation of the city's socio-political power. The planar layout of cemeteries reflects the process of the gradual secularization of cemeteries, and their management boundaries show the dynamic relationship between the living and the dead. This evolution process visually presents the functional transformation process of urban cemeteries from "tool of isolation" to "cultural carrier" and then to "regional infrastructure".

## 4.2 Analysis of the Driving Forces of Milan's Urban Cemetery Morphological Evolution since the 19th Century

The formation and evolution of Milan's urban cemetery morphology have always been influenced by the combined effect of multiple factors such as policies and regulations, social background, economic development, and design concepts. Given this, this section aims to, through in-depth research into urban development history, systematically review and summarize the multiple driving forces affecting the changes in cemetery morphology.

4.2.1 Direct Driving Forces of Milan's Urban Cemetery Morphological Evolution

As the direct driving forces of Milan's urban cemetery morphological evolution, policies

and regulations and design concepts have had a profound impact on the development of cemeteries and their surrounding urban form. Starting with the 1804 Edict of Saint-Cloud, the morphology of Milan's urban cemeteries began its first systematic transformation. While a series of urban plans such as the 1889 Beruto Plan, the 1912 Pavia-Masèra Plan, and the 1934 Albertini Plan jointly established the basic pattern of Milan's urban spatial expansion since the late 19th century.

**4.2.1.1 Policies and Regulations**

The promulgation of the 1804 Edict of Saint-Cloud marked a fundamental shift in traditional Italian funerary practices, directly promoting historical change in the morphology of Milan's urban cemeteries. This decree reshaped the funerary space pattern through two core provisions: First, the Saint-Cloud Edict prohibited burial activities in churches and attached cemeteries, requiring newly built cemeteries to maintain a legal distance from built-up areas. This provision spatially separated the close link between religious sites and funerary functions, creating conditions for the birth of independent suburban cemeteries in the suburbs. Secondly, the Saint-Cloud Edict abolished the form of collective burial, establishing citizens' right to own independent graves and private monuments. This provision not only changed the physical form of burial but, while simultaneously, through innovation in property rights system, laid the institutional foundation for the subsequent formation of the ordered, individualized spatial structure of the Monumental Cemetery. This dual change from burial method to spatial ownership became the starting point for the evolution of modern cemetery morphology.

The 1807 medical control ordinance stipulated the minimum distance between cemeteries and residences, boundary forms, and site conditions required for building cemeteries, directly impacted the urban form around suburban cemeteries. Subsequently, related decrees were continuously deepened, among which, based on the 1852 Brussels International Congress on Hygiene (Congresso generale d'igiene), established basic funerary hygiene standards, including the Civil Funeral Ordinance of May 13, 1867, the Death Confirmation Norms of July 9, 1868, the Funeral Personnel Management Regulations of February 26, 1869, regulations related to Columbarium design of September 29, 1874, and the revised management system related to funeral activities in 1875, etc. [44] . These decrees made

clear provisions regarding death reporting and verification, corpse custody and burial, funeral classification and transport, body preservation and dissection, ash placement, cemetery operations, and financial supervision. These detailed regulations not only prompted the diversification of subsequent cemetery subsidiary function building types but also marked the formal shift of funerary power from religious institutions to the municipality, achieving the secularization of funerary management.

**4.2.1.2 Urban Planning and Architectural Design Concepts**

Overall urban planning is another factor that has a direct impact on the morphological evolution of urban cemeteries. Under the support of Italy's first urban planning legal system in 1865, a series of spatial plans further integrated cemetery development into the overall urban framework. The 1889 Beruto Plan, by building a network connecting traditional urban areas, laid the development framework for Milan for the next few decades, and specifically impacted cemetery morphology: it removed suburban cemeteries around the Spanish Walls to free up space; simultaneously, using Neoclassical methods, it integrated the Monumental Cemetery into the urban axis system formed by Corso Sempione and Piazza d'Armi, making it an urban element with both monumental function and spatial landmark status. The subsequent 1912 Pavia-Masèra Plan (Piano Pavia-Masera), on the other hand, responded to the traffic changes brought by industrialization, coordinating the city's relationship with railway lines. On one hand, guiding the formation of industrial areas and worker housing clusters around the Monumental Cemetery, and on the other hand, creating a cemetery-railway fringe belt, directly impacting the morphological evolution of the cemetery area.

In addition, architectural design concepts of 19th-century urban cemeteries were also key factors driving the evolution of cemetery morphology. Design practices in French and Italian academic systems during this period viewed cemeteries as ideal carriers of collective social will. Their concepts, centered on historicist aesthetics and meritocratic values, not only shaped Neoclassical funerary architecture theory but also directly provided design references for the evolution of Milan's cemetery morphology. French theorist Francesco Milizia, in his work " *Principles of Civil Architecture* " (Principj di architettura civile), advocated that cemeteries should "*educate the living and future generations, inspiring their virtue and happiness with the example of illustrious figure*s" [49] , which played an important role in the

creation of the Italian monumental cemetery type. Milan's Monumental Cemetery is precisely a representative work of this design concept.

4.2.2 Indirect Driving Forces of Milan's Urban Cemetery Morphological Evolution

Continuous population growth directly pushed up the demand for cemetery spatial capacity in the city, prompting the continuous expansion of cemetery occupied area. Economic development, on the other hand, drives the continuous expansion of built-up areas in the suburbs and stimulated a wave of regional real estate speculation. These processes indirectly affected the development pace and pattern of areas around cemeteries, as well as the location selection for new cemeteries. Meanwhile, the overall societal concepts of life and death not only influenced the spatial distance between cemeteries and living areas but also posed different requirements for funerary space, thereby determining the basic form and internal layout of cemeteries. The above interconnected social, economic, and cultural elements collectively constitute the indirect driving forces for the morphological evolution of Milan's urban cemeteries.

**4.2.2.1 Social Background**

(1) Population Growth

Cemeteries, as spaces planned for burying and commemorating the dead, reflect long-term changes in the relationship between life and death space in the city. Population size is a key factor influencing cemetery morphology, especially capacity.

After experiencing the period of urban development stagnation from the 18th to the early 19th century, the population of Milan saw a substantial increase in the mid-19th century. According to population census data, between 1715 and 1816, the population of Milan only increased by 11,005 people, growing by about 4% compared to a century before. The population growth rate only gradually and smoothly increased until 1816. In 1861, the total population of Milan doubled based on that of 1816, reaching nearly 270,000 people. Subsequently, in 1901, the total population of Milan reached nearly 540,000 people, nearly 4.5 times the 120,000 in 1715 (Table 4.4). Simultaneously, with the expansion of the population base, the urban mortality rate in Milan showed a trend of annual decrease. According to statistics, the mortality rate reached 4.6% in 1785; this value remained until a significant decline appeared in 1830, decreasing to 2.5% by 1895 (Figure 4-9).

Against this background, whether it was church cemeteries within the city walls, or suburban cemeteries newly built at the end of the 18th century and expanded in the early 19th century, not only could not meet the city's needs in terms of area, but also, with urban expansion, the locations of these early cemeteries were surrounded by dense populations, making it difficult to properly manage the increasing number of remains in limited space, highlighting their insufficient capacity and conditions. Given this, large urban cemeteries began to be concentratedly built in the suburbs of Milan, prompting the appearance of Monumental Cemetery and Musocco Cemetery. Their combined total burial area reached 521,309.20 square meters, with huge design capacity. As of today, nearly two-thirds of Musocco Cemetery's capacity remains unused, fully meeting the needs of future urban development.

Table 4.4  Table of Milan Population Data, 1715-1967

| Years | Total Population | Population of Downtown | Population of Suburb |
|---|---|---|---|
| 1715 | 123595 | 110595 | 13000 |
| 1750 | 123618 | 110118 | 13500 |
| 1768 | 124681 | 112892 | 11789 |
| 1785 | 129758 | 118148 | 11610 |
| 1796 | 133869 | 114469 | 19400 |
| 1816 | 139453 | 121600 | 17853 |
| 1861 | 269297 | 196109 | 73188 |
| 1871 | 291802 | 199009 | 92793 |
| 1881 | 357000 | 214004 | 142996 |
| 1901 | 539596 | 245568 | 294028 |
| 1911 | 698775 | 234782 | 464047 |
| 1921 | 834618 | 255440 | 579178 |
| 1931 | 992036 | 225453 | 766583 |
| 1951 | 1276521 | 193903 | 1082618 |
| 1961 | 1582534 | 159908 | 1422626 |
| 1967 | 1678944 | 136918 | 1542026 |
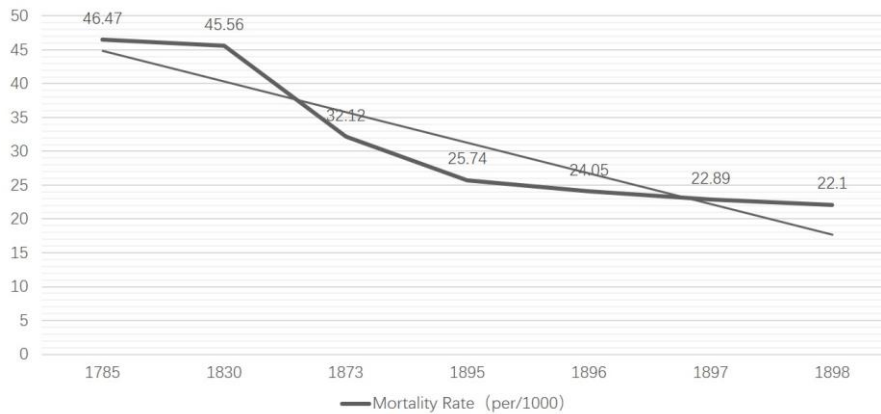
Figure 4-9 Trend in Milan Mortality Rate, 1785-1898

(2) Social Structure Change

The rise of the Italian bourgeoisie in the 19th century not only brought about changes in social structure, but the evolution of their family structure and concepts also had a critical impact on cemetery form.

With the improvement of the urban economic level, the bourgeoisie gradually grew in the early 19th century, becoming a new force challenging the old aristocratic order and actively pursuing class status. As a place to commend and remember outstanding urban figures, the Monumental Cemetery naturally became a stage for the bourgeoisie to display their and their family's achievements.

The influence of the bourgeoisie on urban cemetery development lies in two points: First, urban cemeteries at that time were built with joint investment from private and government capital. Because Italy had just completed unification in the mid-19th century, its government power was far weaker than other European countries, adopting a public-private partnership model when constructing large municipal projects. Therefore, the bourgeoisie had significant influence over urban cemetery design proposals. Second, the bourgeoisie's core concept of family directly prompted the creation of new types of monuments within cemeteries [21].

In order to highlight internal family relationships, emotional connections, and hierarchical order within the cemetery space, they presented new demands for private monuments. This demand directly shaped the form of the Monumental Cemetery: a batch of family-themed monuments and independent small chapels (edicola) came into being. These buildings were diverse in form, occupying key positions in the cemetery's planar layout,

powerfully reshaping the overall image of the Monumental Cemetery (Figure 4-10).



Figure 4-10 Edicola in the Monumental Cemetery

Through the architectural practice using this type of architectural language, the bourgeoisie directly promoted the transformation of cemetery morphology since the 19th century, changing it from a pure burial place into a memorial space carrying class culture and family narratives.

(3) Change in Funerary Management Entity

At the end of the 18th century, Milan, under the authoritarian rule of the Austrian government, began funerary custom reforms, transferring the responsibility for the management of funerary activities from the church to the municipality through legislation. This shift challenged the traditional monopoly of the clergy on death affairs, while simultaneously profoundly influenced the spatial model of cemeteries.

In this process, every adjustment to the spatial structure of the cemetery clearly reflected the change in the management entity behind it. First, the change in the funerary management entity caused urban cemeteries to evolve from single Catholic burial areas into a composite layout allowing for the coexistence of multiple denominations. With Italy's unification in the 19th century, most cemeteries were brought under the system of public jurisdiction, and the law explicitly required setting aside burial areas for non-Catholic groups such as Protestants and Jews. This measure differentiated the internal layout of cemeteries, breaking the religious spatial model of the "campo santo" (holy field) since the Middle Ages, promoting the

transformation of cemeteries towards secularized, multi-denominational "cimiteri" (public cemeteries) [21]. Second, the power struggle between the church and the state over cemetery management directly shaped the conflicting characteristics in the evolution of cemetery morphology. The church attempted to maintain its spiritual authority by controlling funerary rites, while the municipality advocated for the secularization of funerary rites, by setting up municipal staff rooms in urban cemeteries and promoting the hygienization and standardization of corpse reception and processing procedures through law, incorporating funerary rites into political planning. The action of Milan's Monumental Cemetery converting the church on the main facade into a Hall of Fame visually demonstrated this conflicting process.

(4) Appearance of Modern Cremation

The "revival" of modern cremation and the rise in cremation rates are one of the significant factors influencing cemetery morphology. Cremation gave rise to new forms of burial, driving changes in cemetery building morphology. It is noteworthy that the cremation facility completed at Milan's Monumental Cemetery in 1876, as Europe's first modern crematorium, not only marked a breakthrough in funerary technology but was also a key force driving the transformation of urban cemetery spatial morphology (Figure 4-11).

The Monumental Cemetery crematorium was designed by architect Carlo Maciachini, integrating a new industrial-technology building type into the traditional funerary space in a Neo-Greek style. The appearance of cremation challenged the Catholic tradition of burial, being located separately from the Catholic burial area within the cemetery, forming new cremation and ash placement sections, breaking the traditional
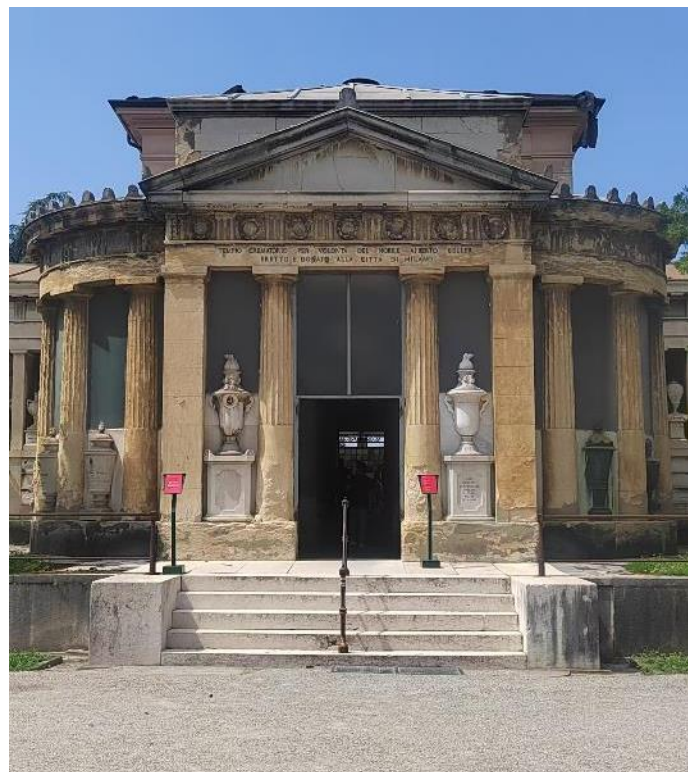


Figure 4-11 Milan Monumental Cemetery Crematorium

cemetery's singular spatial structure centered around burial. The institutional promotion of cremation also triggered innovation in cemetery architectural typology. The renovation of the Milan crematorium in 1896 by architect Augusto Guidini, by introducing more efficient cremation machinery and standardized ash storage racks, transformed the technical advantages of cremation into spatial efficiency, and also promoted the subsequent shift in the boundary type of large urban cemeteries from single-layer walls to multi-layer spaces with composite columbarium functions.

It's worth noting that despite Italy being one of the first European countries to promote cremation, it faced resistance due to the influence of the Catholic Church. Between 1900 and 1910, there were only 4,122 cremations in Italy, compared to approximately 7.3 million deaths during the same period, resulting in a cremation rate of about 0.055%. Although this was a threefold increase from the 0.017% recorded between 1880 and 1889, it remained a niche practice. Cremation only began to gain popularity after the Second Vatican Council in 1963, when the Church abolished its canonical prohibition on cremation. By 1995, the number of cremations exceeded 15,000, reaching 137,000 in 2015. Between 2000 and 2015, the proportion of earth burials remained stable at around 33%, while cremation rose from 5% to 21%, though still significantly lower than in most other European and East Asian countries [50].

**4.2.2.2 Economic Development**

Broad economic activity is one of the basic drivers of urban morphological evolution, a point that has been strongly confirmed in Milan's historical process since the 19th century. With the alternation of a series of economic stages such as industrial transformation, the Great Depression, and the "Italian economic miracle", Milan experienced multiple construction cycles, the city continuously expanded outwards, thereby driving the constant changes in urban cemetery morphology.

(1) Industrial Transformation

The industrial transformation of Milan at the end of the 19th century was one of the primary drivers of its urban expansion. On one hand, the industrialization of suburban areas promoted the process of urban expansion, and on the other hand, the development of industry prompted a large influx of foreign technical immigrants into suburban areas, promoting the

prosperity of the housing market and the construction of public service facilities in those areas.

Before the period of rapid urban expansion, because of lower transportation and food storage costs, the area outside the Spanish Walls was long dominated by agricultural production and agricultural product trade industries. It was not until the 18th century that facilities related to agricultural product processing, such as mills, felt factories, and textile workshops, appeared in the outer areas. By the second half of the 19th century, agriculture in suburban areas began transforming into industry. In the 1860s, large workshops for metals, machinery, natural gas, fertilizers, chemicals, and cheese trade appeared in the outer areas. With the improvement of the outer railway system, large manufacturing factories such as foundries and metallurgical plants were successively completed and clustered around railway lines and stations, completely changing the industrial landscape of the area.

Against the backdrop of industrialization, the number of immigrants in Milan surged at the beginning of the 20th century, breaking the population balance between the center and the periphery. Between 1901 and 1911, the total population residing in the city center decreased from the original 45.5% to 33.6%, with nearly 170,000 people relocating to suburban areas. By 1967, this value had dropped to 8%. The number of residents in the suburbs grew from 13,000 in 1715 to 1.05 million in 1967, nearly eightyfold (Figure 4-12).
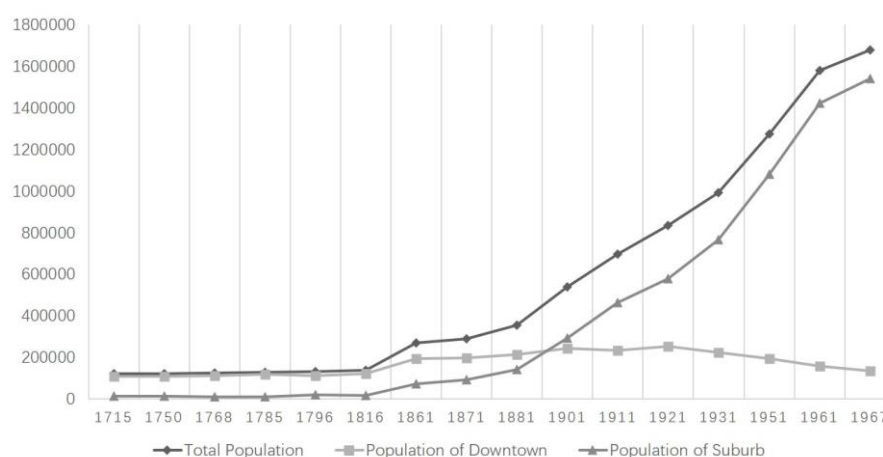


Figure 4-12 Milan Population Change Chart, 1715-1967

Suburban industrialization directly expanded the physical boundaries of the city. The resulting rapid and large-scale suburbanization indirectly shaped the fringe belt morphology around cemeteries, and ultimately solidified a dual urban pattern of functional division: a central urban area dominated by administrative and service industries, and peripheral areas dominated by industrial and residential development.

(2) Real Estate Speculation

At the end of the 19th century, the process of urban industrialization attracted a large number of immigrants to suburban areas, simultaneously bringing an unprecedented boom in the real estate market in that area. This process rapidly reduced the distance between cemeteries and residential areas, causing the evolution process of cemetery morphology to diverge (Figure 4-13).

For a long period in the 19th century, rents in suburban areas were far lower than in the city center, attracting new urban immigrants to rent here. The large housing demand created favorable conditions for the real estate market boom in this area in the mid-19th century. Between 1871 and 1881 alone, nearly 500 buildings were constructed in the outer areas, the vast majority of which were residential buildings, including small apartments, for use by those who could not afford high rents and were forced to leave the city center, as well

Figure 4-13 Map of Real Estate Price Distribution in Milan's Suburban Areas, 1887

as those who moved from the countryside [46]. From the 1887 Milan suburban area real estate price map, it can be seen that the most popular areas at this time were concentrated near railway hubs in the eastern part of the city. Among which the early San Gregorio cemetery was built outside Porta Venezia, and it was completely demolished in the conflict with the expansion of the built-up area. This also directly reflects the intense contradiction between cemeteries and urban development.

### 4.2.2.3 Funerary Concepts

The evolutionary process of Milan's urban cemetery morphology since the 19th century is a concrete manifestation of the fluidity of societal concepts of life and death. As a special
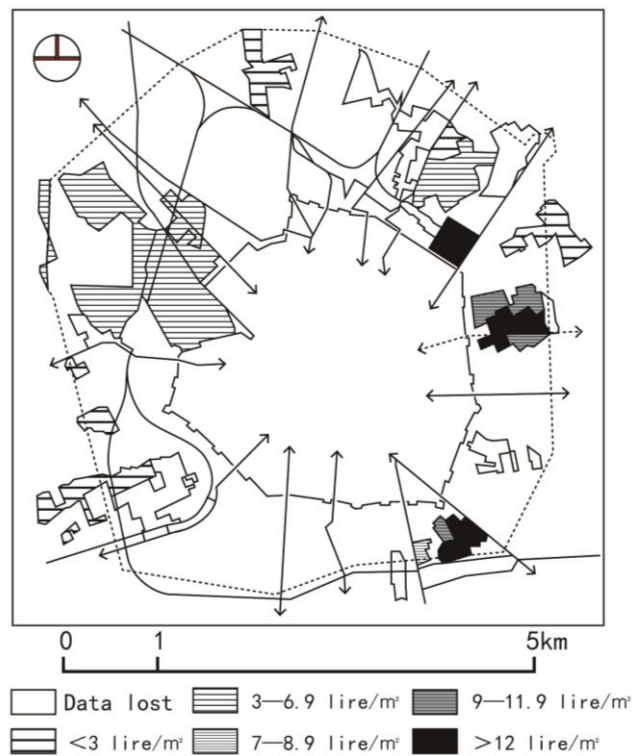
place carrying concepts of life and death and memorial culture, the impact of rationalism brought by the Enlightenment on traditional religious concepts, and the ideology formed during the process of nation-state building, have together profoundly reshaped the funerary spatial model of Milan's urban cemeteries.

In terms of concepts of life and death, the decline of Christian influence and the rise of Enlightenment rationalism in the 18th and 19th centuries jointly promoted changes in the funerary spatial model. Historian Michel Vovelle wrote in the 1970s, pointing out that the shift in attitudes towards death from the 18th to 19th centuries might be related to the relative decline of Christianity [51]. The Enlightenment broke the close connection between the "imagination of death" and the theory of Christian redemption since the Middle Ages. Death was first observed as an objective natural phenomenon, and the resulting hygiene risks prompted urban managers to reject the tradition of church burial. Driven by medical concepts, cemeteries were gradually moved from around churches in the historic city center to outside the city at the end of the 18th century. Through physical isolation, achieving the "separation of the dead from the living", laying the basic form of 19th-century suburban cemeteries, and completing the transformation from sacredness to technicality.

By the mid-19th century, funerary culture showed a tendency towards politicization, and Italy's unification further endowed cemeteries with more complex ideological functions. Nineteenth-century Italy, in the historical context of foreign rule, regime changes, and national independence movements, transformed urban cemeteries into important carriers for building collective memory and national identity. The egalitarianism of the Napoleonic era, the historicism of the Austrian Restoration period, and the legitimacy demands of the unified nation-state successively shaped the symbolic meaning of cemeteries: from early monumental architecture as a symbol of regime legitimacy, to a material carrier of martyr worship during the Risorgimento, and then to collective monuments integrating local identity after unification. The morphology of urban cemeteries has always changed with different funerary concepts, and ultimately completed its meaning construction as cultural symbols and political tools under the dual discourse of secularization and nation-state building.

## 4.3 Summary

This chapter used the comprehensive morphological analysis method to deeply discuss

the multi-scale mechanisms of cemetery morphological evolution: At the urban level, the spatial distribution evolution regularities of cemeteries are closely related to the direction of urban expansion, reflecting urban construction trends and also reserving a spatial basis for expansion; the evolution regularities of the cemetery fringe belt can be divided into three categories: alienation and erasure, retention in situ forming patches, and hidden in green spaces achieving stability; At the plot morphology level, it analyzed the impact of cemeteries on surrounding street systems and land use patterns; At the building level, it explored the evolution of cemetery planar form from simple to complex and back to simple, and the regularity of boundaries changing from single hard to composite flexible.

This chapter further explored the driving forces of cemetery morphological evolution. Direct driving forces mainly include policies and regulations and urban planning concepts, which directly shaped the morphology of cemeteries and their surrounding environment. Indirect driving forces include population growth, social structure changes (such as the rise of the bourgeoisie), the introduction of cremation technology, the process of suburban expansion, and changes in funerary cultural concepts, etc. These factors collectively constitute the background and driving forces influencing changes in cemetery morphology.

# 5. Cross-Cultural Comparison of Cemetery Morphology in Milan and Different Cities

## 5.1 Cross-Cultural Comparison of Cemetery Morphology in Milan and Different Cities

5.1.1 Purpose and Scope of Cross-Cultural Comparison

Cross-cultural studies originate from cultural anthropology, emphasizing comparative cultural research [52]. Different countries or regions, influenced by their historical and geographical patterns, form their unique languages, customs, and cultural concepts, exhibiting significant regional differences. And cross-cultural research is comparing different cultural phenomena in different cultural contexts to find similarities and differences in the social behaviors, psychological characteristics, and developmental regularities behind these phenomena, expanding the depth and breadth of the topic through repeated comparison.

Cemeteries, as indispensable components of any human settlement, are deeply involved in the formation and evolution process of human settlements, even becoming important drivers of settlement morphology evolution during certain special periods. This dimension is particularly interesting for cross-cultural comparative research [24]. There are clear differences in cemetery site selection, burial area morphology, and building types between the Christian world represented by Europe and Islam, Hinduism, and Buddhism. Furthermore, when European colonial periods exported Christian burial forms overseas, burial layouts in local and colonial areas also differed due to different cultural contexts. Even within the Christian world, morphological differences are also quite significant due to different historical and geographical patterns and different evolutionary periods.

Urban morphology theory provides a common framework for cross-cultural comparison of this complex phenomenon. Firstly, in the temporal dimension, although there are differences in the starting points and spans of funerary space evolution history across countries or regions due to different cultural processes, however, by introducing the concept of "fringe belt", it can map different evolutionary periods to comparable, unified morphological evolution cycles, describing the different histories of cemetery morphological

evolution with a basic framework of repeated "expansion period - stagnation period". Secondly, in the spatial dimension, the theoretical framework composed of inner, middle, and outer multi-layered fringe belts provides a morphological reference for describing the distribution of cemeteries in different historical and geographical patterns. The relative relationship between cemeteries and cities can thus be accurately described and compared.

In view of this, this chapter will select urban cemeteries from different cultural backgrounds as research objects for comparative study. As mentioned above, although cultures in different countries or regions form their own systems and their urban morphology also exhibits different characteristics, however, their historical processes are somewhat similar, and there are also dynamic relationships between cemeteries and urban morphology. This chapter will conduct comparative analysis from the urban level and the street block level respectively, attempting to use a complete comparative research model to achieve the purpose of cross-cultural comparative research.

5.1.2 Case Selection and Feasibility Analysis of Cross-Cultural Comparison

In order to enhance the comparability of urban cemetery morphology in different countries or regions in cross-cultural research, this chapter will try to ensure that different cases have a certain degree of similarity in different cultural contexts when selecting case areas, ensuring similarity in city size, urban development history, and their relative urban status in their respective countries, land area, and population levels within the cases. This helps when using urban morphology research methods to obtain comparable analysis content, to show the similarities and differences between cases. In addition, in terms of the cultural background of case selection, areas with significant cultural differences will be chosen as much as possible to ensure that the analysis of urban cemetery morphology influenced by different concepts of life and death can yield richer results.

According to different reference factors, this chapter finally selected Cairo (Egypt), Nanjing (China), and the main research subject Milan (Italy) as objects for cross-cultural study. Before conducting comparative research, first, a feasibility analysis needs to be conducted for cross-cultural, cross-regional comparative research, thus proving that the three are comparable to a certain extent at the same level:

(1) The development of the three cities has similar political, economic, and cultural

conditions, are comparable in urban level in their respective regions, and also have a certain degree of similarity in population density. From a political perspective, all three cities have historically existed as administrative capitals. Among which Cairo is the capital of Egypt and Cairo Governorate, and also the largest city in Africa, and also a center of Islamic culture. Nanjing was the capital of various Chinese dynasties, kingdoms, and the Republic of China government from the 3rd century AD until 1949, and has long been a cultural, political, and economic center. Milan, on the other hand, is the largest city in northern Italy and briefly became the capital of Italy during Napoleon's rule, and has been Italy's economic and cultural center since the 19th century.

(2) The modernization processes of the three cities show a common feature based on external force intervention – their modernization all began with changes triggered by external shocks. Cairo began the process of transition towards modernization during the Napoleonic invasion period from 1798 to 1801. The European urban planning system and administrative management model introduced during the French colonial rule directly promoted the transformation of the traditional Islamic city towards modernization through the construction of new roads, public buildings, and modern municipal facilities. Similar to Cairo, Milan experienced the rule of the Austrian Empire and the First French Empire successively from the late 18th to the early 19th century. The introduction of French rationalist planning ideas profoundly reshaped Milan's urban spatial fabric, laying the foundation for its shift from a medieval urban pattern to a modern industrial city. Nanjing's modernization, on the other hand, took the signing of the Treaty of Nanjing in 1842 as a historical turning point. As one of the first treaty ports forced open, the influx of foreign capital and the input of Western technology broke the closed pattern of the traditional capital city, becoming the starting point of Nanjing's modernization reform.

(3) The morphological characteristics of the three cities show significant commonalities. Their development processes were not interrupted by external forces, consistently maintaining the historical continuity of the urban spatial structure. Both Nanjing and Milan formed concentric expansion patterns centered around a wall system; two layers of walls framed the basic framework of modern urban development. Cairo's urban morphology, constrained by geographical conditions, formed a unidirectional development model. Although there are differences in the morphological evolution models of the three cities, they all experienced

complete urban morphological development cycles. Their urban fabric is essentially the result of the layering and superposition of spatial forms from different historical periods, and different construction cycles in history have left similar imprints in their modern urban morphology in the form of fringe belts.

Overall, the three cities of Cairo, Nanjing, and Milan have similarities in urban hierarchy, modern historical development, and urban construction patterns. More importantly, the morphological evolution of all three cities underwent dramatic changes within similar time spans. During the process of industrialization, all experienced rapid urbanization and dramatic expansion of land area, which led to intense functional conflicts and land contradictions between urban construction and cemetery land. These multiple factors collectively constitute the common background for the morphological evolution of cemeteries in the three cities, making cross-cultural comparison possible.

## 5.2 Comparison of Cemetery Morphological Evolution Models in Different Cities

5.2.1 Morphological Evolution Process and Driving Force Mechanisms of Cairo's Urban Cemeteries

### 5.2.1.1 Morphological Characteristics

Cairo's urban cemeteries are indispensable components of its urban structure. They can be traced back to 642 AD, arising with Fustat, the predecessor of Cairo, and continuously influencing the evolution of urban morphology. According to records, Cairo's first urban cemetery was built east of Fustat and continuously relocated as the city developed northward.

In 969 AD, the Fatimid Caliphate built the palace city (Al-Qahira) north of Fustat and walled it. Outside these walls, new cemetery areas developed and gradually formed Cairo's main burial zones. Today's Southern Cemetery (the Southern Cemetery), as Cairo's oldest existing cemetery area, developed in the northern area of the early Fatimid city and continues to this day. Another main burial area -- the Eastern Cemetery (the Eastern Cemetery), formed during the Mamluk Sultanate (14th-15th centuries), located on the east side of the city, where historically six sultans built mausoleums, significantly increasing the scale and form of the area. Furthermore, the Mamluk period also saw the formation of the Northern Cemetery (Bab-el-Nasr) north of Bab al-Wazir. The boundary of this cemetery once extended southward to

the Cairo North Wall, but its southern part was first removed to set up a wall monument buffer zone, and was later demolished a second time due to urban road widening, making it today an independent, reduced-boundary cemetery area within the city. These three main independent cemetery areas collectively constitute the overall morphology of Cairo's urban cemeteries and were listed as a World Heritage site by UNESCO in 1979 [53].

(1) Urban Level

Morphologically speaking, Cairo's cemetery fringe belt, especially the Eastern Cemetery area, has long acted as a strong fixation line, significantly inhibiting urban development towards the east. After being surrounded by built-up areas, it formed a unique embedded fringe area within the urban structure.

Before the 18th century, the urban morphology evolution characteristics of Cairo showed a trend of southward-to-northward migration, migrating northward from the earliest urban core Fustat City located upstream of the Nile to Al-Qahira on its northeast side. Simultaneously developing was also the Port of Bulaq (Bulaq Port) located in the north near the east bank of the Nile. These three relatively independent areas constituted the basic framework of 18th-century Cairo urban morphology. Before the 18th century, the direction of urban development was jointly determined by the uncontrollable Nile flood plain on its west side and the Saladin Wall surrounding the city. After the basic urban pattern was established in the 11th century, the empty area between the built-up area and the two natural barriers was filled by cemeteries.

The late 18th to mid-19th century was a stagnation period for Cairo urban development. During this period, Cairo's political situation was turbulent, and urban planning focused on the military control of the city's internal spatial. Urban outer areas were almost not developed during this time [54]. Cemeteries and the difficult-to-build Mokattam hills area (the Mokattam hills) together constituted the morphological fringe area of this period, but land contention with built-up areas had not yet begun. The second half of the 19th century was a period of Cairo urban expansion. The focus of urban development shifted towards the west side of the historic city center, and here a new modern urban core was replanned, forming an overall east-west juxtaposition pattern of old and new Cairo districts. At this time, the cemetery area (especially the vast Eastern Cemetery) became the dominant element obstructing urban expansion towards the east.

Entering the 20th century, the construction of the public transportation network laid the foundation for further urban expansion. Cairo's urban areas rapidly expanded in all directions. Nasr City (Nasr City) was built on the northeast side of the historic city center, while large industrial zones on the north and south sides of the city were also successively completed, forming a city pattern with clear functional zoning. During this period, urban cemeteries were already embedded within built-up areas. Their morphology was completely preserved due to their special cultural attributes, forming heterogeneous elements in Cairo's modern urban structure (Figure 5-1).
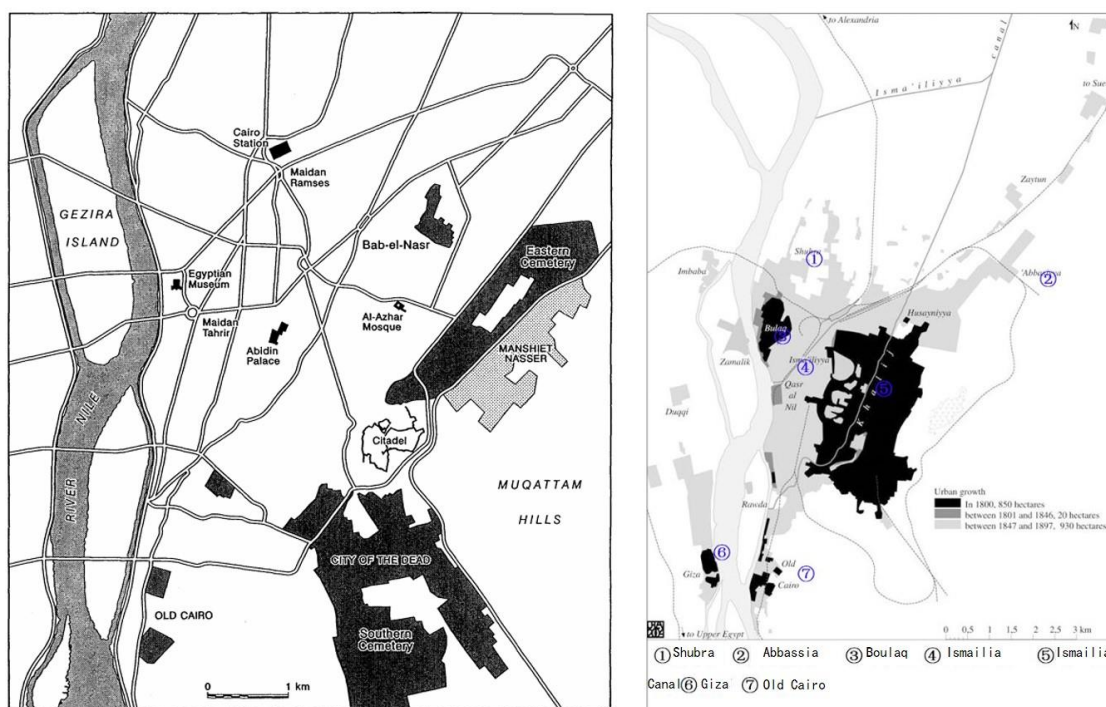


Figure 5-1 Distribution of Cairo Urban Cemeteries (left); Analysis of 19th Century Cairo Urban Expansion (right)

(2) Street Block Level

At the street block level, the relationship between Cairo cemeteries and urban morphology since the 20th century shows strong mixed characteristics. Taking the Eastern Cemetery as an example, its morphological characteristics are specifically manifested as a hybrid state of interconnected urban roads and internal cemetery roads, and overlapping residential and cemetery areas.

The morphological evolution of the Eastern Cemetery mainly occurred during the period of rapid population increase in Cairo in the mid-20th century. During this period, the cemetery expanded from the original Qaytbay area northward and southward to include the Bab

AlWazeer, AlMigawreen, and AlGhafeer areas, forming the current pattern of four distinct cemetery morphological areas juxtaposed. Among these, the northernmost AlGhafeer area of the cemetery has a relatively regular morphological structure, mainly consisting of row-like rectangular grids. The central Qaytbay area, on the other hand, exhibits a state of residential and funerary area mixture, with relatively large and sparse plots, to meet the daily needs of the living. While the southern AlMigawreen area is divided into four large blocks by two main intersecting internal roads, with funerary buildings filled disorderly within them, forming a relatively dense cemetery morphology. The southernmost Bab AlWazeer is bordered by main urban roads on three sides, showing mixed morphological characteristics (Figure 5-2).
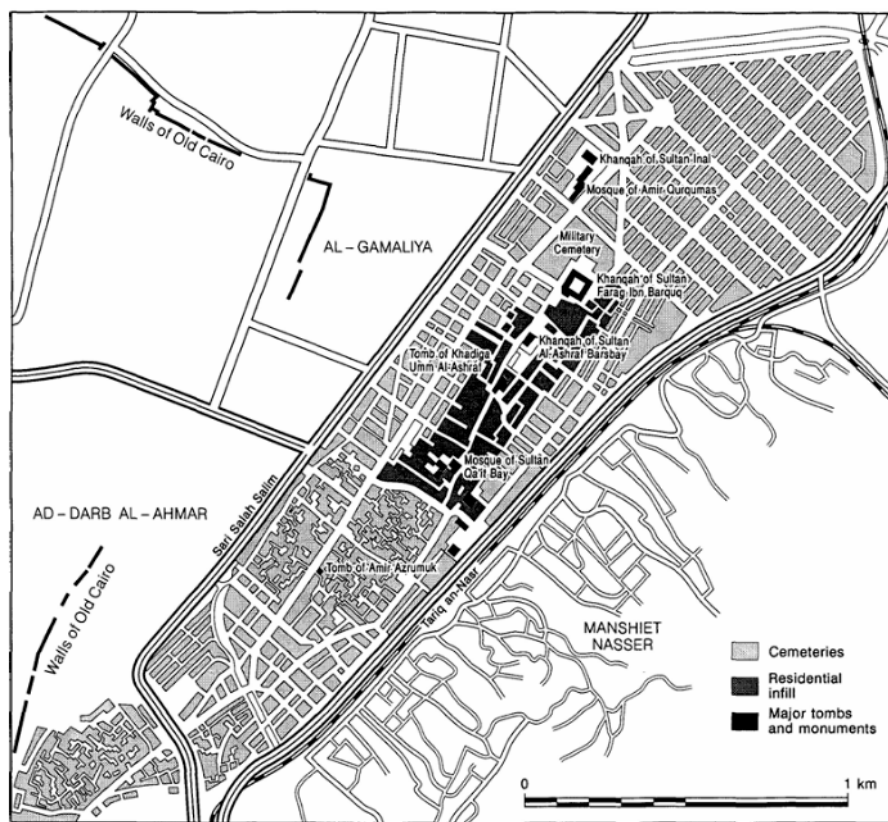


Figure 5-2 Morphological Zones of Cairo Eastern Cemetery

The boundary of the Eastern Cemetery was earliest defined by Sultan Ahmed Street, which runs north-south through the cemetery, and the railway line on its east side. Among which Sultan Ahmed Street was formerly a royal road connecting Cairo and Mecca; its importance promoted the development of commercial and residential functions along the way [25]. As the scale of the cemetery expanded in the 20th century, Sultan Ahmed Street and the residential areas along it were surrounded by the cemetery, becoming internal roads of the cemetery.

Subsequently, two urban expressways were built on the east and west sides of the cemetery, forming a morphological framework that obstructed further cemetery expansion. To connect these two expressways and improve regional accessibility, in the second half of the 20th century, several east-west urban roads were built on the cemetery site. These roads crossed the funerary areas and further divided their plots, forming an interwoven road network system.

Since the 20th century, as the distance between built-up areas and the cemetery gradually decreased, a fringe area with a sparse road network and extremely large plot sizes formed between the cemetery and the city, which included a green space park, university campus, government institutions, and newly built residential areas on the southwest side of the cemetery. In the second half of the 20th century, built-up areas broke through the constraints of the cemetery fringe belt, continuing to expand eastward, forming dense residential areas on the east side of the cemetery. Within the cemetery, land use further differentiated, with residential, commercial, and small-scale industrial areas highly mixed with funerary functions, even leading to a large number of residents living within the cemetery [54]. In this area, the boundary between the dead and the living was completely eliminated here (Figure 5-3).
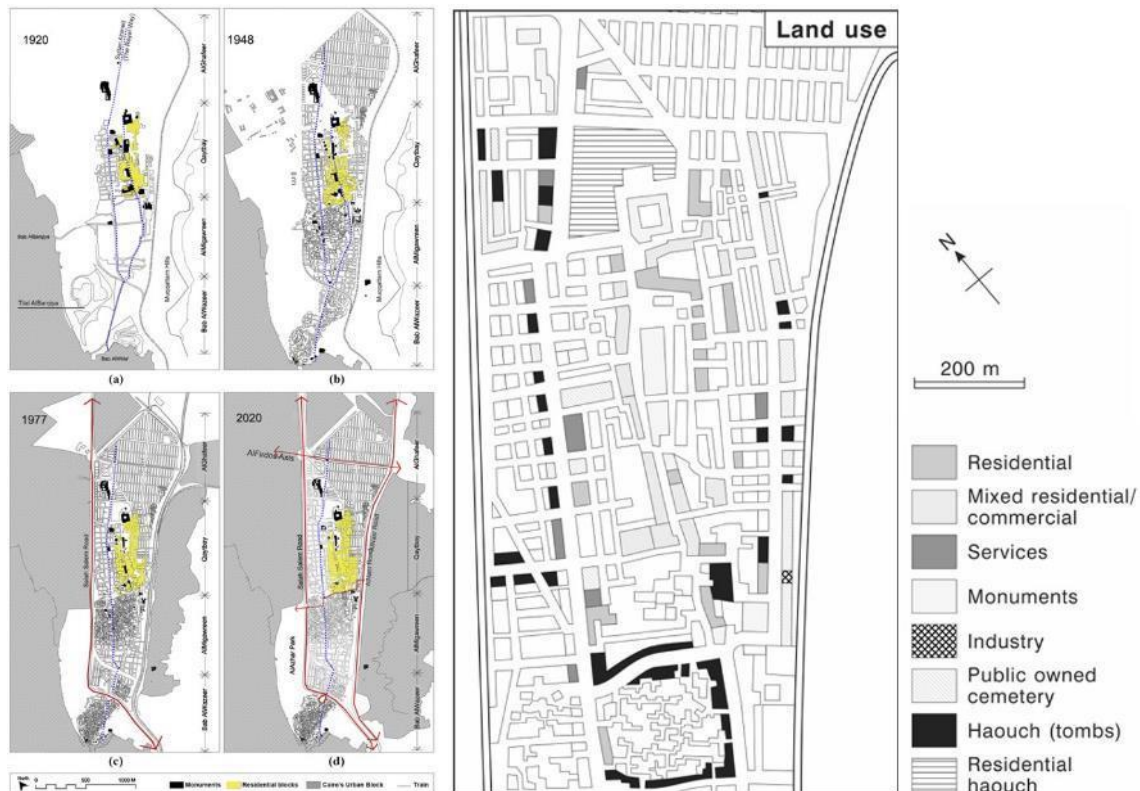


Figure 5-3 Cairo Eastern Cemetery Street System (left); Land Use Patterns (right)

**5.2.1.2 Main Driving Force Mechanisms**

From a geographical perspective, the selection of Cairo's urban cemeteries was constrained by the Nile River's floodplains to the west and the Muqattam Hills to the east. The city initially expanded northward into the relatively flat and commercially thriving river plains. The undeveloped areas between the city and the hills, being suitable for cemetery construction and use, naturally became the space for the cemeteries' north-south expansion.

Social factors have also had a profound impact. Rapid urbanization in Cairo since the 20th century attracted a large population, indirectly increasing the scale of the cemeteries. Simultaneously, the high population density led to a severe housing supply-demand imbalance. As the city expanded eastward, a large number of impoverished immigrants chose to reside in the cemetery areas due to the extremely low cost of living. Statistics from 1986 show that approximately 179,057 people lived in the cemetery areas [55]. This phenomenon transformed Cairo's cemeteries into "cities within a city," mixing burial and secular activities, which further propelled the evolution of their form and reflected an unprecedented spatial coexistence of the living and the dead.

The informal economy within the cemeteries also drove land use transformation, shifting them from purely funerary and residential spaces to mixed-function economic zones, accelerating their commercial restructuring. The unique "death economy" chain within the cemetery space includes traditional industries like tombstone production and sacrificial offerings, while also giving rise to economic activities such as waste recycling and small handicrafts. These economic behaviors encouraged residents to continuously expand or modify buildings to accommodate production and storage needs, indirectly influencing the evolution of the cemetery's form. Furthermore, with the expansion of the city center, the commercial value of cemetery land significantly increased, leading to the illegal development of some areas for warehousing, small factories, and other uses, further encroaching on cemetery boundaries and exacerbating the disorganization of their spatial form.

Moreover, the absence of policy and planning intervention has impacted the continuity of the cemetery's form. Although Egypt's Law No. 119/2008 explicitly protects the "urban fabric" of cemeteries, in practice, the policy focus leaned towards protecting individual historical buildings, neglecting the integrity of the overall spatial form. This resulted in the demolition of numerous historical tombs during the expansion of AlFirdous Highway. Urban

development plans also failed to recognize the importance of the cemetery's form; the Cairo 2050 strategy even proposed demolishing the historical fabric of the eastern cemeteries to replace them with parks and tourist facilities. This reflects a cognitive bias regarding heritage value and directly affected the cemetery's historical spatial structure.

5.2.2 Morphological Evolution Process and Driving Force Mechanisms of Nanjing's Urban Cemeteries

**5.2.2.1 Morphological Characteristics**

Nanjing is an important historical capital of China. During the Southern Tang dynasty, walls were built north of the Inner Qinhuai River, surrounding the southern part of the city, forming the core of Nanjing City [56]. Subsequently, the city wall was further expanded during the Ming dynasty, extending outwards towards the north and east sides of Nanjing City, forming the Ming city wall that exists today. Additionally, for defense purposes, an outer Ming city wall was built about 25 kilometers from the city [57]. Based on this, the three layers of walls together constituted the framework for the morphological evolution of modern Nanjing.

The development of Nanjing's urban cemeteries was relatively late, influenced by multiple aspects such as the country's social form and political system, among others. The scale of commoners' cemeteries was far less than the imperial tombs within the city. Before the unified planning of urban cemeteries in the early 20th century, people generally set up graves in the form of scattered burials in the areas of Gulou and Qingliangshan in the northwest, which were still suburban areas within the city walls. Due to its proximity to the densely populated southern urban area, the Yuhuatai area outside Zhonghua Gate also became an important concentrated burial ground [58]. During the Republic of China period, due to insufficient land availability and insufficient funding allocation, plans for relocating graves were never carried out, and phenomena like "shallow burial of discarded corpses" and "temporary storage of coffins above ground" were also common in the city [59]. Not until after the founding of the People's Republic of China in 1949 did the Nanjing Municipal Government carry out unified planning for funerary spaces. After successive renovations and new constructions, currently, there are 118 urban cemeteries in Nanjing, with a total land area of 597.86 hectares.

(1) Urban Level

At the urban scale, Nanjing's urban cemeteries, as a "weak" fringe belt element, show a development trajectory from urban edge – embedded within built-up areas – finally retreating to the more distant suburbs. In the vast majority of cases, the evolution of cemetery morphology continuously migrates outwards accompanying urban expansion.

Nanjing's urban cemeteries in the 20th century were located in areas outside the city walls and relatively far from the urban area, scattered in a concentric manner, and had not yet formed a systematic fringe belt morphology. At this time, Nanjing's urban development was relatively slow, with a large number of undeveloped plots still within the urban area inside the Ming city walls. Within the city, there were several funeral homes providing funerary services, acting as interfaces for daily contact between the living and the dead. Not until the 1960s did the Nanjing government uniformly plan urban cemeteries, establishing 5 cemeteries including Huangshan, Huashenmiao, Gangzicun, Shipopomiao, Dongdashan in the southern suburbs of the city and north of the Yangtze River. They were adjacent to the outer city wall but far from the city center, and were not yet bordering built-up areas.

At the end of the 20th century, Nanjing's urban areas entered a phase of rapid construction. The city rapidly expanded northward aided by the construction of industrial areas in the north. Simultaneously, the concentrated distribution of cemeteries on the south side of the city slowed down the pace of southward urban development to a certain extent; the spatial cemetery clusters formed a control line with an inhibitory functional role.

With urban areas spreading southward at the end of the 1990s, the evolution pattern of the cemetery fringe belt diverged. Some cemeteries closer to the main urban area, such as Yuhuagongde Garden, Jinling Overseas Chinese Permanent Cemetery, and Guangdong Zhuang, were preserved due to political and cultural reasons and became embedded within the built-up areas, forming discontinuous fringe belts around the main urban area. Another part of the cemetery fringe belt areas closer to key highways and railways experienced significant land alienation phenomena; graves within 300 meters of both sides of the roads were all cleared without leaving any significant morphological imprints.

Entering the 21st century, new cemetery fringe belts gradually formed in the more distant suburbs of the city. Newly planned cemeteries were relocated outside the range of the outer city wall, relying on the Niushou Mountain and Zijin Mountain ranges in the distant suburbs to maintain their stability and low interference with the city, while also reserving enough

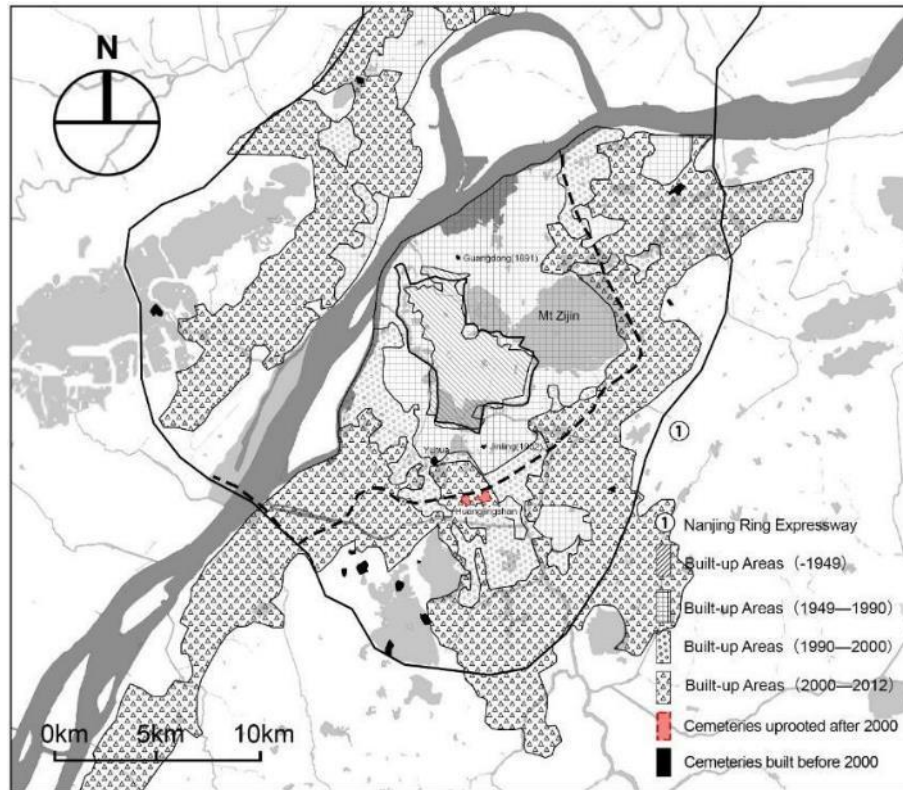space for urban construction land (Figure 5-4).



Figure 5-4 Distribution of Nanjing Urban Cemeteries

(2) Street Block Level

At the street block level, Nanjing's urban cemeteries, due to their negative NIMBY attribute, have become fixation lines obstructing the development of surrounding areas. Their influence on surrounding morphology is not limited to within the cemetery boundaries but radiates to surrounding areas through the "inauspicious" social psychology, functioning simultaneously with the surrounding urban fringe belts. This collective NIMBY phenomenon leads to inefficient conversion of land resources around cemeteries. When the pressure for land demand during a period of urban prosperity exceeds a critical point, it forces the rapid disintegration of the cemetery fringe belt. Taking Liyushan Cemetery and Huangshan Cemetery as examples, the former, as a bottleneck in the planning and construction of new urban areas, delayed the construction process of surrounding areas. The latter, on the other hand, was completely removed during the construction of large transportation infrastructure.

Specifically, Liyushan Cemetery was planned and constructed in the 1970s, adjacent to the Nanjing Ring Expressway, located within the range of Nanjing's outer fringe belt. The cemetery is backed by Qingshan (Green Mountain) to the north and is connected to the

Jiangning Funeral Home on the south, forming the basic pattern of its cemetery morphology. Before the cemetery area became planned construction land, the surrounding area was large areas of undeveloped forest land and farmland. During the city's southward expansion in the 21st century, an industrial area with a sparse road network and large plots formed on the west side of the cemetery, while villages were sporadically distributed on the south side.

The conflict between Liyushan Cemetery and the built-up area primarily intensified after the planning and development of Qinglongshan International Ecological Park in 2013. The industrial area on the east side of the cemetery was designated as planned construction land, and the agricultural land on the south side was subdivided by a planned road network grid and rapidly filled with high-rise residential areas. The conflict between the cemetery and the built-up area is concentrated in the dead-end road at the southern end of Linqi Road: the original planned road network should have passed through the existing funerary land to connect the northern industrial park and the eastern logistics park, forming a complete system. However, due to the resistance to cemetery relocation and adjustment, the planned road construction has still not been carried out, and only a few public service institutions have been built around the cemetery. This clearly indicates that the cemetery area has effectively acted as a fixation line, restricting the balanced development of the city (Figure 5-5).
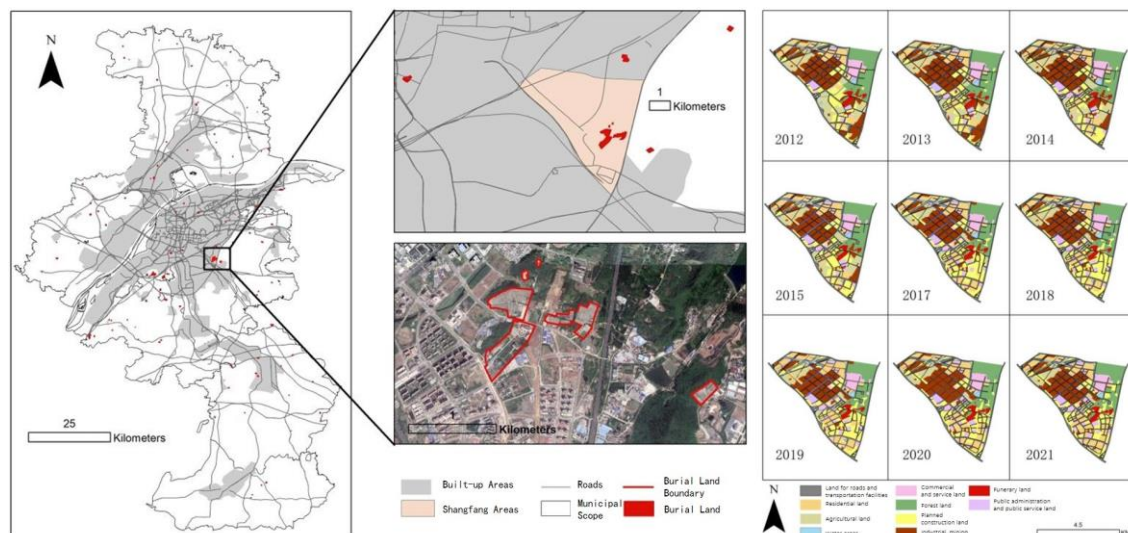


Figure 5-5 Liyushan Cemetery Location (left); Land Use Around the Cemetery, 2012-2021 (right)

Huangshan Cemetery was located north of the Outer Qinhuai River, at the border of Yuhuatai District and Jiangning District, outside the outer city wall in the south of Nanjing. It was a collection of two cemeteries, Huangshan and Gangzicun, and was once Nanjing's

largest cemetery cluster, with a total area of about 91,000 square meters and over 100,000 graves.

Before the construction of Nanjing South Railway Station in 2008, this area long showed typical urban fringe belt characteristics, i.e., a mixed state of factories, villages, and cemetery areas. In 2010, due to the needs of Nanjing South Railway Station construction, Huangshan Cemetery was basically leveled and relocated elsewhere. After completing the overall grave relocation and plot leveling, the roads on the original site of the cemetery were replanned, establishing a grid road framework connecting surrounding roads and gradually filling in buildings. After Nanjing South Railway Station was put into use in 2011, the land in the fringe belt area was rapidly converted into residential and commercial/office land. This shows that when land use was re-released, the fringe belt was absorbed by different functional land uses, resulting in alienation phenomena and changes in functional morphology occurred, and this conversion was usually towards residential buildings [26].

This process marked the complete dissolution of Huangshan Cemetery's function as a physical boundary with its relocation, and its long-standing NIMBY effect rapidly subsided. By 2020, the construction of new buildings in the vast majority of street blocks and plots in this area was basically completed, and a complete urban construction cycle was essentially finished (Figure 5-6).
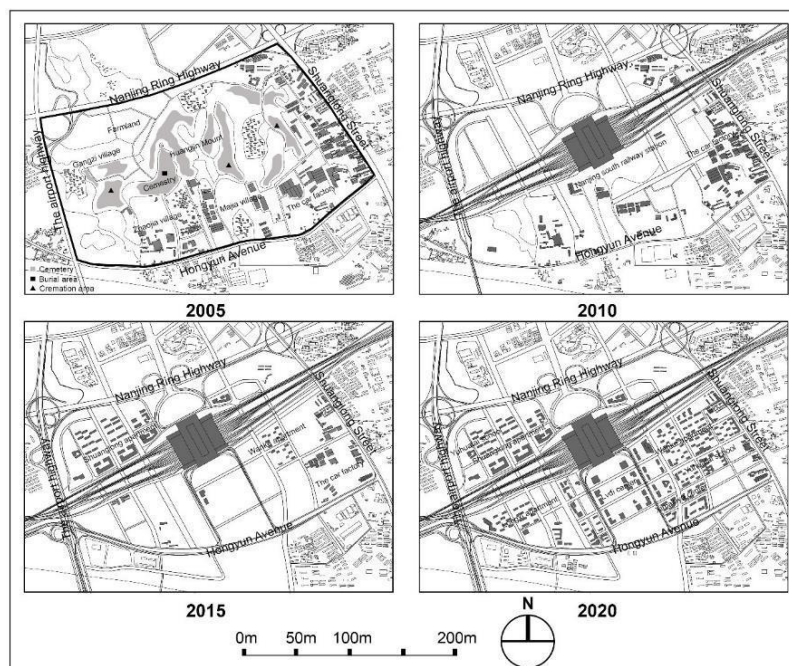


Figure 5-6 Huangshan Cemetery Area Morphological Change Process Before and After Relocation, 2005-2020

### 5.2.2.2 Main Driving Force Mechanisms

One of the primary drivers behind the evolution of Nanjing's urban cemetery landscape has been the transformation of burial practices. The standardization of funerary activities led to a shift from small graves scattered near residential areas to centralized urban cemeteries. In the 1960s, the Nanjing municipal government initiated funerary reforms to "promote cremation and reform earth burial," aiming to "civilize" funeral customs by addressing blind superstition regarding spirits and various myths surrounding death. This measure, to some extent, restricted traditional earth burials within and around Nanjing's city walls.

In 1991, the Nanjing government issued the "Nanjing Funeral Management Implementation Measures," designating the city as a cremation-only area, marking the standardization and legalization of funeral management. While alleviating land scarcity and solving the problem of extensive human and material resource consumption due to outdated funeral customs, this also promoted the construction of columbarium cemeteries outside the city. The reform of funerary practices ended traditional burial forms, leading to the emergence of new types of funeral buildings like funeral homes and crematories. Furthermore, it's worth noting that the reform of old customs, including funeral rituals, was not solely driven by land use requirements and sanitation considerations, but also aimed to establish new lifestyles and ideologies. By aligning citizens' living customs with the overall cultural landscape of the new nation, it fostered a sense of "civic consciousness" among residents and promoted the systematization of funerary space, forming the current basic funerary spatial pattern dominated by funeral buildings and columbarium facilities.

Secondly, from a market perspective, the relocation patterns of cemeteries were completely altered, exhibiting discontinuous characteristics at the morphological level. Authority and private capital played a decisive role in the evolution of Nanjing's urban cemetery form, with the demands of urban development driving the promulgation of relevant land policies. In July 1998, the State Council issued the "Notice on Further Deepening the Reform of the Urban Housing System and Accelerating Housing Construction," announcing the complete cessation of in-kind housing distribution and the implementation of monetized housing allocation starting from the second half of the same year. The housing system reform shifted housing from previous collective allocation to free purchase, leading to an increasing demand for commercial housing and soaring sales prices. This pushed the city to expand

outwards, breaking through historical city walls and natural barriers. Even if large cemeteries posed a development impediment, urban planning would force their relocation to re-establish urban boundaries.

From the perspective of life and death concepts, social psychology has endowed cemeteries with NIMBY attributes, leading to the characteristic of fixed boundaries for cemeteries. On one hand, traditional Chinese beliefs in "Feng Shui burial" often led to conflicts over Feng Shui during grave relocation. On the other hand, Chinese people generally avoid discussing death, and the collective NIMBY phenomenon constitutes a special psychological state of Chinese society towards graves. The land use characteristics of surrounding areas reflect cemeteries as de facto fixed boundaries, which are also fixed boundaries in social psychology, inhibiting the development of surrounding areas.

## 5.3 Comprehensive analysis of Different evolution models

Overall, the general historical process of cemetery morphological evolution in Milan, Cairo, and Nanjing shows similarities. This provides an important basis for analyzing their spatial development and makes it possible to discuss the convergence and divergence of their evolution processes. Based on this similarity, a comparative analysis of urban cemetery morphological evolution models can be conducted from three interrelated levels: Firstly, at the spatial morphology level, this subsection will place the cemetery development processes of the three different cities under the same morphological framework, comprehensively analyzing the morphological value of urban cemeteries in different cultural contexts. Secondly, at the land use level, it will compare the evolution patterns of land use nature of the three cities' cemeteries and their surrounding land, to understand the specific value of cemeteries in relation to urban socio-economic development. Finally, combining the driving forces of cemetery morphological evolution, it will delve into the key role played by cemeteries as spaces of life and death in the collective society at the socio-psychological level.

5.3.1 Spatial Morphology Level

(1) Urban Level

In terms of spatial layout, the urban cemeteries in Milan, Cairo, and Nanjing all experienced a similar evolutionary process of being initially at the urban edge and then

embedded within built-up areas, and all show a close dynamic relationship with urban development. Differences are reflected in their specific spatial evolution models. Cairo's cemeteries' response to urban expansion is mainly reflected in the expansion of their scale by encroaching upon undeveloped land in the fringe areas. Milan and Nanjing, on the other hand, are more similar in their spatial distribution regularities: the site selection of cemeteries in both cities aligns with the evolutionary trajectory of urban morphology; whenever the city expands outwards in a concentric manner, new cemeteries are built in the new fringe areas. Despite similar site selection patterns, the site selection logic of Milan and Nanjing cemeteries differs due to differences in historical and geographical conditions. Large urban cemeteries in Milan, due to their form and hygiene requirements, tended to be located in flat open areas. Nanjing's large urban cemeteries, on the other hand, ultimately always relied on mountains to maintain their stability and low interference with the city; therefore, the natural hills in the suburban areas became a key factor influencing Nanjing's cemetery planning (Figure 5-7).
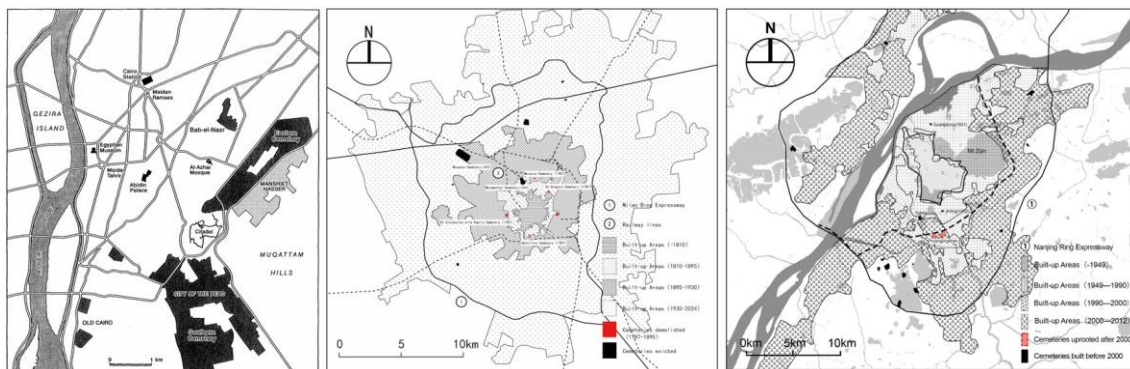


Figure 5-7 Spatial Distribution of Urban Cemeteries in Cairo, Milan, and Nanjing

(2) Street Block Level

In the urban spatial structure, the cemeteries of the three cities all form a cemetery fringe belt through specific spatial organization, and all constrained the balanced development of surrounding street blocks during periods of urban expansion. The difference lies in the varying morphological stability of the cemetery fringe belts in different cities.

Cairo's urban cemetery fringe belt covers the largest area, and its morphological structure is relatively loose. During Cairo's urban expansion, the cemetery fringe belt became an obstacle to the eastward and southward expansion of built-up areas, forming a difficult-to-cross fixation patch. Its fixation effect prompted the formation of a fringe belt area composed of various large public institutions between the cemetery and the city. At the same hand,

Cairo's cemetery fringe belt also has a certain degree of permeability; its loose morphological structure absorbed different types of public transport and commercial/residential buildings, making it a "grey space" between the living and the dead. The scale and permeability of Cairo's cemetery fringe belt have allowed its morphology to maintain its stability for hundreds of years.

Milan has two types of cemetery fringe belts. One type is formed by large centralized urban cemeteries, which have relatively stronger morphological intensity compared to Cairo. Milan's cemetery fringe belt, with its strong management boundaries, forms a completely independent area within the city, keeping the "unhygienic" issues of the cemetery within a specific range. This type of cemetery fringe belt has been preserved during rapid urban expansion and redevelopment, achieving a relatively stable balance with the current urban areas. Another type is formed by small suburban cemeteries. Although this type of fringe belt was demolished during urban expansion, its plot boundaries and key morphological elements – churches – were preserved, so its morphological imprint also has long-term continuity.

Compared to the high-intensity fringe belt morphology of Cairo and Milan, Nanjing's urban cemetery fringe belt covers a relatively small area and lacks strong physical boundaries. Its restrictive effect on surrounding areas primarily relies on the NIMBY effect within the Chinese cultural context, resulting in the formation of an invisible fixation line. This special attribute, on one hand, makes the local inhibitory effect of Nanjing's cemetery fringe belt on surrounding area development higher than even Milan and Cairo, significantly delaying the development and transformation of surrounding street blocks. At the same hand, it significantly reduces the stability of its fringe belt morphology; it is quickly removed when urban interests conflict, and large plots left in urban areas often leave no significant morphological imprints (Figure 5-8).
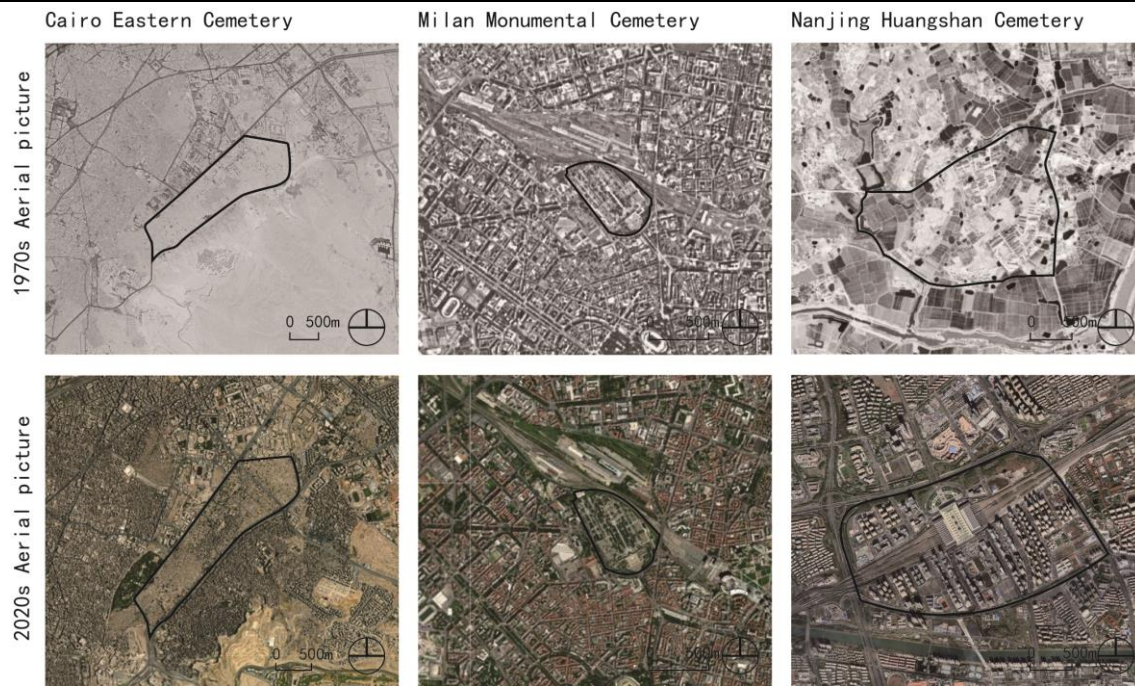
Figure 5-8 Comparison of Aerial Photos of Cairo, Milan, and Nanjing Cemetery Areas in the 1970s and 2020s

## 5.3.2 Land Use Level

From a land use perspective, the cemeteries in Milan, Cairo, and Nanjing and their surrounding land use types have all undergone cyclical evolution, but there are significant differences in their land resource conversion models and efficiency.

The land conversion of Cairo's urban cemeteries occurs within the cemetery, showing characteristics of high interweaving and mixing of residential and non-residential functions. It is worth noting that the land resource conversion mechanism in Cairo's cemetery areas is relatively special. As "informal" settlements within the city, they have absorbed a large number of impoverished people over centuries of evolution. Due to their relatively loose morphology, with urban roads running through them, the residential areas of the living and the graves of the dead along the way often contend for land. Some funerary buildings along main roads are occupied by homeless people and evolve into residential buildings. Furthermore, the concentration of residential functions in the cemetery area has given rise to other subsidiary functions, ultimately forming a complex internal mixed-use pattern.

Compared to the coexistence of Cairo's cemeteries and residential areas, the early land conversion model of Milan's urban cemeteries was primarily based on overall relocation. After the cemetery was relocated, the functions remaining on its original site, together with

the converted functional morphology of the surrounding area, were re-integrated into the urban fabric. The land conversion of Milan's cemeteries usually results in public institutions or landscape green space. It is worth noting that when the cemetery was relocated, some funerary functions were still preserved – some remains were moved into the crypts of the remaining churches. Another type of conversion model occurs around Milan's large urban cemeteries. Affected by the cemetery facilities, the surrounding land use is generally dominated by functions with low human activity, such as industrial areas, social institutions, and green buffer zones, reflecting the negative impact of the cemetery on the conversion of surrounding plots.

For Nanjing's urban cemeteries, the land conversion after cemetery relocation shows a characteristic pattern: low efficiency of land resource conversion, and land use conversion primarily to residential use. The relocation of Nanjing's urban cemeteries is often a complete change. When the land use is re-released, the living quickly occupy the land of the dead, and completely erase any traces of the original site. Furthermore, when cemeteries are re-established in the distant suburbs, their surrounding land use patterns will again function simultaneously with the urban fringe belt, forming slowly developing industrial parks and undeveloped construction reserve land around the cemetery (Figure 5-9).
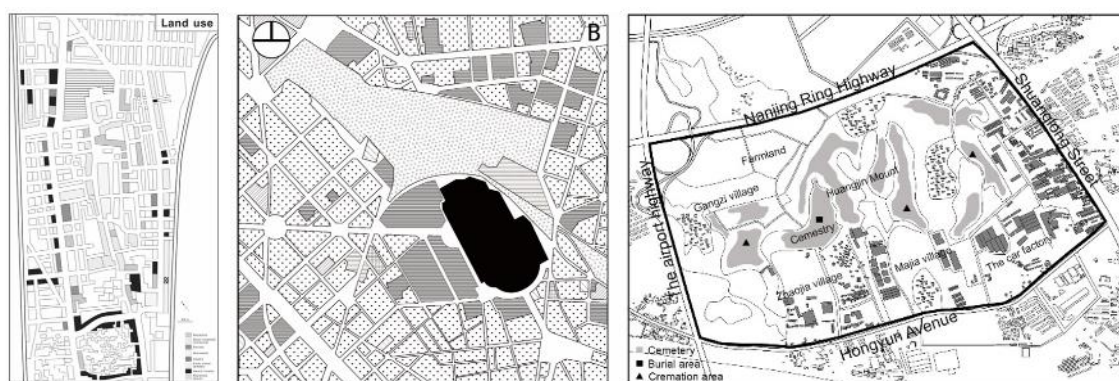


Figure 5-9 Comparison of Urban Cemetery Land Use Patterns in Cairo, Milan, and Nanjing

## 5.3.3 Socio-Psychological Level

At the socio-psychological level, residents' concerns about hygiene, safety, and supernatural phenomena around cemeteries have always existed, whether in Cairo's urban cemeteries where the living and the dead coexist, or in Milan, which underwent earlier funerary reforms; this psychological defense line always exists. The specific differences between the three cities are reflected in the evolutionary patterns of the relationship between

social psychology and their funerary spaces.

Cairo's urban cemeteries, having undergone centuries of adaptation with the city, have formed highly stable funerary spaces, and their morphological type has deeply entered the collective unconscious of Cairo's urban residents. The uninterrupted evolutionary process of cemetery morphology has raised residents' fear threshold for death, making funerary spaces a natural part of daily life. This psychological acceptance has allowed Cairo's cemeteries to become active elements, participating in and even driving the formation and transformation of settlements; the concentration and expansion of informal residential areas within the cemetery are good examples.

 For Milan, on the other hand, influenced by Enlightenment thought and the Renaissance, funerary spaces related to death have, to some extent, been disciplined into a product of technical management and state power, reducing citizens' NIMBY psychology towards spaces of death. After the intimate relationship between churches and the dead in Christianity abruptly changed to the spatial exclusion of the dead in suburban cemeteries, the Monumental Cemetery, through its magnificent plan form, repaired the distance between death and daily life. At the same hand, its standardized morphology also limited its further expansion. Towards the end of its morphological evolution, these large urban cemeteries became musealized morphological elements.

Compared to the stable evolution of Cairo's urban cemetery morphology, and the standardization of Milan's urban cemetery morphology, the development of Nanjing's urban cemeteries started relatively late, and the form of cemeteries, being an appropriation of Western cemetery forms, resulted in a lack of continuity in morphological evolution. Their form is also relatively simple, mostly driven by land use efficiency, lacking landscape planning. Combined with traditional Chinese concepts of life and death, people are quite reserved about the dead. Cemeteries have become important NIMBY spaces in the city characterized by "urgent need"  and "strong resistance"  (Figure 5-10).

Figure 5-10 Urban Cemetery Scenes in Cairo, Milan, and Nanjing

Overall, the evolutionary models of urban cemeteries in Milan, Cairo, and Nanjing reflect different planning choices made by different cities under different cultural contexts and historical development stages when facing the same urban issue. It is not possible to simply determine which city's cemetery development method is superior, as the morphology of urban cemeteries in different cities is the sum of all social relations, and even more, the result of continuous confrontation and compromise between the living and the dead in the process of contending for spatial resources. What needs attention is that urban cemeteries have their unique morphological value in different cultural contexts. Their spatial structure and characteristics not only show continuity but also reflect long-term cultural changes. It can be said that, compared to any other material morphological element, urban cemeteries can more directly reflect long-term conceptual changes in society. Therefore, future urban morphological studies should pay more attention to funerary spaces and their complex spatial relationship with the cities of the living.

## 5.4 Summary

This chapter primarily, through the interpretation of various factors, conducted a cross-cultural comparative analysis of urban cemetery morphological evolution models in Milan, Cairo, and Nanjing.

The first section, before conducting a cross-cultural comparison of urban street block morphology under a cross-cultural perspective, established a framework for the cross-cultural comparison of urban street block morphology. By clarifying the purpose and scope of cross-cultural comparison, it summarized the comparative dimensions and elements for urban cemetery morphology across cultures. And by dividing different cultural dimensions, it determined the three cities with different cultures but similar urban morphological processes

as comparative objects. Then, in the second section, it sorted out the similarities and differences in the morphological evolution processes and the driving forces and mechanisms behind them for urban cemeteries in Cairo and Nanjing, obtaining key factors for cross-cultural comparison of urban cemetery morphology. Finally, the third section, based on the aforementioned research approach, conducted an in-depth comparative analysis of the morphological evolution models of urban cemeteries in the three cities from the levels of spatial morphology, land use, and socio-psychological aspects. This part aimed to reveal the patterns of urban cemetery morphological evolution in different cultural backgrounds and emphasize their unique morphological value.

# 6. Conclusion

## 6.1 Main Conclusions

Urban cemeteries, as a special component of urban morphology, have not yet had their borne socio-morphological value fully explored. As the starting point of modern funerary reform, the complete evolutionary process of Milan's urban cemetery morphology since the 19th century fully demonstrates the dynamic relationship between cemetery morphology and urban development, possessing extremely high research value. This paper, using the research method of morphological typology, conducted an in-depth interpretation of its morphological evolution. The main conclusions include the following aspects:

(1) From the analysis results of urban cemetery morphological evolution process, urban cemeteries are direct participants in morphological evolution.

At the urban level, cemeteries, as a special fringe belt element, participated in shaping the fringe belt characteristics of Milan's urban development at different stages. Early suburban cemeteries relocated outside the urban area strengthened the fringe attribute outside the city wall, forming the initial state of the outer periphery with surrounding undeveloped land. When the city began to expand outwards, newly built Monumental Cemeteries actively shaped the fringe belt morphology, guiding and integrating the development of surrounding areas through axial avenues. Suburban cemeteries, on the other hand, were passively embedded within built-up areas and interfered with the integration of the fringe. In the planning adjustment phase, old suburban cemeteries were closed, and the old fringe belt underwent alienation. The Monumental Cemetery, on the other hand, and the freight station north of it formed discontinuous fringe belt patches. At the same time, Musocco Cemetery was established in the distant suburbs, and industrial areas and large public facilities migrated outwards during the same period, redefining the urban edge, and were fully integrated into the "second fringe belt" in the subsequent construction phase.

At the street block level, cemeteries profoundly influenced the evolutionary process of surrounding morphology, directly reflected in the decreased efficiency of land use conversion in their surrounding street blocks. When cemeteries gradually bordered built-up areas, compared to the rapid development and conversion of surrounding plots into commercial and

residential land, the areas around cemeteries showed a certain lag due to issues like hygiene, traffic, etc. After cemeteries were relocated, their sites were re-filled with roads and public service functions, forming land use characteristics with single land use nature in the surroundings and mixed functions in the center.

At the building level, the evolution of cemetery building types shaped urban space and interfaces. From the simple geometric plans and standardized gravestones of suburban cemeteries to the Monumental Cemetery adopting a grand symmetrical layout with clear axes, combined with courtyard and garden models, urban cemeteries gradually evolved into urban open spaces. At the same hand, their management boundaries also transformed from early enclosed walls to traversable arcades, and then to flexible boundaries integrated with green spaces, showing characteristics of integration with built-up areas.

(2) From the analysis results of urban cemetery morphological evolution mechanisms and driving forces, urban cemeteries are a result of the interaction between social factors and material space.

The driving forces behind the morphological evolution of Milan's urban cemeteries since the 19th century can be summarized as direct and indirect driving forces, among which direct driving forces include policies, regulations, and planning and design ideas, which are manifestations of hierarchical relationships and directly determine the socio-morphological type of cemeteries as spatial exclusion or power reproduction. Economic activities and social relations, on the other hand, influence cemetery morphology in more diverse and complex ways. On one hand, economic development and population growth influenced the scale of cemeteries; on the other hand, cemeteries also constrained surrounding economic activities through their "fixation line" effect.

(3) From the cross-cultural comparative analysis results of urban cemeteries, urban cemeteries have their specific morphological value in different cultural contexts.

The evolution models of cemeteries in the three cities reflect planning choices under different cultural backgrounds and historical stages. They are not only material forms but also embodiments of the spatial game between the living and the dead and long-term conceptual changes, possessing unique morphological value. Under different cultural contexts, although the cemeteries in the three cities were all embedded within built-up areas from the urban edge, they showed significant differences in spatial morphology, land use, and socio-psychological

aspects: Cairo's cemetery morphology stably integrated into daily life; Milan's cemeteries tended towards standardization; Nanjing, on the other hand, due to cultural and developmental lag, became a strong NIMBY space. As unique material forms, cemeteries profoundly reflect the changes in the spatial relationship between the living and the dead and social concepts in different cultures.

## 6.2 Research Innovations

The research introduces a new perspective, treating urban cemeteries as special factors influencing the overall and regional morphological evolution of the city, rather than merely as objects passively adapting to urban development, thereby providing a new entry point for understanding urban morphological changes.

The research methods are relatively in-depth and multi-dimensional. By comprehensively interpreting the cemetery morphological evolution process across different periods and systematically analyzing the characteristics of morphological elements at various levels. This study particularly delves into the complex mutual influence relationships of cemetery morphology between different scale levels, revealing the complexity of their internal spatial structure.

The research has a large spatio-temporal span and relatively solid data. This study takes the beginning of Milan's urban development in the late 18th century as the starting point, systematically sorts out the morphological evolution characteristics of Milan's urban cemeteries over nearly two hundred years, and examines them within the context of urban development during the same period. It enhances the basic knowledge background related to urban morphology and cemetery types, possessing high academic significance.

By providing a research framework for cemetery morphology based on diachronic evolution and multi-scale analysis, the results of this study not only have high theoretical value but also provide a sufficient comparative basis and methodological reference for subsequent morphological analysis primarily focusing on cemeteries, possessing strong application prospects.

## 6.3 Research Limitations

Limited by the large spatio-temporal and cultural span, this study has certain deficiencies

in the depth and detail of analysis. Especially regarding the complex socio-cultural background behind cemetery morphology, only preliminary interpretations have been made so far. Future research needs to explore more deeply how these diverse background factors specifically influence the formation and evolution of cemetery morphology and reveal the complex interaction relationships between them.

This paper's research is mainly based on descriptive qualitative analysis. To improve the precision and objectivity of the research, quantitative analysis methods should be actively introduced in the future for supplementation and theoretical construction. For example, digital technology software like GIS can be used to process and analyze big data, thereby achieving a more systematic and precise quantitative analysis of cemetery morphological evolution patterns.

Finally, it is worth noting that the paper primarily focuses on the study of Milan's urban cemetery morphology. In the cross-cultural analysis with cemetery construction in China, the research on the morphological evolution of domestic cemeteries is relatively limited. Italy and China have significant cultural differences, and the successful experiences of Milan's urban cemetery construction cannot be simply appropriated; therefore, a more in-depth analysis is needed for further comparative analysis.

## 6.4 Future Outlook

This study used a hierarchical scale analysis method to systematically sort out the morphological characteristics of Milan's urban cemeteries since the 19th century and deeply explored the various factors influencing their morphology and their deep connections. Based on the completion of the above research, and recognizing the limitations of the existing work, future research on cemetery morphology can be expanded in the following key areas:

Cross-cultural comparative research is an essential path to deepening understanding. The significant differences in urban cemetery morphology since the 19th century across various cities have already begun to reveal the unique correlation between morphological development and specific socio-cultural and regional environments. Particularly in the Eastern context, the municipal cemetery, an imported system in China, exhibits a rather complex appearance during its localization process. To more clearly discern the actual roles of Eastern and Western cultural and regional factors in shaping cemetery morphology, and to

explore the collective social value of urban cemeteries, it is indispensable to conduct more in-depth case studies and comparative analyses of cemeteries in different cities and cultural backgrounds.

Simultaneously, there is a need to further deepen research into the morphology of urban cemeteries in China, especially studies on cemeteries in towns and villages. Their connection with the spatial development of towns and villages is more intimate, and the indigenous cultural cognition constructed by their local communities is more concrete and vivid compared to contemporary metropolises undergoing rapid urbanization. These are high-value samples for studying traditional Chinese cemetery morphology and its cultural connotations, requiring enhanced focus in subsequent research.

Furthermore, how to effectively apply the theoretical achievements of morphological research to urban practice is a significant future challenge. Although urban cemetery morphology research has constructed a broader perspective, the process of translating theory into practical application still needs to address the unresolved contradictions between tradition and modernity. With the rapid increase in the deceased population in the future, the planning and construction of cemeteries will become a top priority for government work. Research on such NIMBY facilities holds profound significance for optimizing spatial layout, enhancing land use efficiency, and attending to residents' physical and mental well-being. Specifically, the rational site selection and layout of cemeteries are crucial for coordinated regional development and spatial justice, tending towards synergistic planning with urban green space systems. Meanwhile, given that the NIMBY nature of cemetery land leads to low land conversion efficiency and potential environmental impacts (such as the "whitening" of mountainsides), promoting their ecological transformation, spatial regeneration, and composite use is increasingly critical for land conservation and ecological protection. Additionally, properly addressing residents' psychological concerns regarding hygiene, safety, and traditional Feng Shui is vital for promoting a revolution in funerary concepts, improving their negative socio-psychological impression, and fostering urban harmony.

At the same time, continuous attention needs to be paid to the collective value of memorial spaces. Memorial spaces consolidate group cohesion by drawing on shared beliefs, and corresponding funerary rituals, jointly participated in by family and community members, contribute to the integration of group consciousness. In Milan's Monumental Cemetery, the

integrative function of funerary rituals was achieved through spatial layout and formal planning. In comparison, after China's funerary reforms, funeral ceremonies have tended towards simplification; how the integrative function of memorial spaces and funerary ritual beliefs can be exercised needs further exploration. Future research should focus on exploring how to combine morphological theory with the actual spatial conditions of cities, learning from history to innovate, and achieving an effective translation from theoretical value to practical value.

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# Image Source

**Chapter 2**

Figure 2-1 Genealogy Chart of Urban Morphology Research: Samuels I S. Conzen's last bolt: reflections on Thinking about urban form[J]. Urban Morphology, 2005, 9(2): 136-144.

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Figure 2-5 San Cataldo Cemetery Conceptual Sketches: ROSSI A A Scientific Autobiography[M], Cambridge: The MI Press, 1981.

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**Chapter 3**

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https://www.discusmedia.com/maps/milan_city_maps/

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Figure 3-3 Morphology of Milan Churchyards, 1810: A. Building Morphology; B. Land Use: Drawn by the author

Figure 3-4 Morphology of Milan's Cimitero del Gentilino, 1860: A. Building Morphology; B. Land Use: Drawn by the author

Figure 3-5 Morphology of Milan's Cimitero di San Gregorio, 1860: A. Building Morphology; B. Land Use: Drawn by the author

Figure 3-6 Plan of Milan's Cimitero del Gentilino (Left); Illustration (Right), Figure 3-7 Plan of Cimitero di San Gregorio (Left); Illustration (Right): Plan Source: Tedeschi C. Origini e vicende dei cimiteri di Milano e del servizio mortuario: studio storico[M]. Casa Tip. Libr. Editr. Ditta Giacomo Agnelli, 1899; Illustration Source:https://www.storiadimilano.it/

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Mocarelli L. The long-term evolution of the suburbs of Milan[J]. Popolazione e storia, 2015, 16(1): 135-156

Figure 4-13 Map of Real Estate Price Distribution in Milan's Suburban Areas, 1887: The Milan of the Beruto plan: (1884-1889): society, urban planning and architecture in the second half of the nineteenth century [M]. Guerini e Associati, 1992. 132.

Table 4.1 Main Types of Planar Layouts for Milan's Urban Cemeteries, 1787-1895: Drawn by the author

Table 4.2 Table of Planar Layout Methods and Total Building Occupied Area for Milan's Urban Cemeteries since the 19th Century: Tedeschi C. Origini e vicende dei cimiteri di Milano e del servizio mortuario: studio storico[M]. Casa Tip. Libr. Editr. Ditta Giacomo Agnelli, 1899.

Table 4.3 Types of Management Boundaries for Milan's Urban Cemeteries, 1787-1895: Drawn by the author

**Chapter 5**

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Figure 5-2 Morphological Zones of Cairo Eastern Cemetery: Fahmi W, Sutton K. Living with the Dead: contested spaces and the right to Cairo's inner-city cemeteries[C]. In: World Sustainability Forum 2014– Conference Proceedings Paper. 2014.

Figure 5-3 Cairo Eastern Cemetery Street System (left); Land Use Patterns (right): Alsadaty A. Tracing morphological transformations in Cairo's historic cemeteries, a step toward urban conservation[J]. Open House International, 2022, 47(1): 135-151.

Figure 5-4 Distribution of Nanjing Urban Cemeteries, Figure 5-6 Huangshan Cemetery Area Morphological Change Process Before and After Relocation, 2005-2020: [26]Li, M. C., & Deng, H. Research on the Morphological Evolution of Chinese Urban Cemeteries during Rapid Urbanization: A Case Study of Nanjing [J]. Modern Urban Research, 2023, 94-99.

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