Redevelopment and Design of Turin Tobacco Factory under the Urban Equalization Policy

A Dissertation Submitted for the Degree of Master

Candidate：Yuan Zhen

Supervisor：SCUT-POLITO co-supervisors

South China University of Technology

Guangzhou, China

分类号：TU98 **学校代号：10561**

学 号：202221006449

华南理工大学硕士学位论文

基于城市均衡政策的都灵烟草厂再开发设计研究

作者姓名：原桢 指导教师姓名、职称： 导师组

申请学位级别：建筑学硕士 学科专业名称：建筑学

研究方向：城市设计

论文提交日期： 2025 年 4 月 19 日 论文答辩日期： 2025 年 5 月 26 日

学位授予单位：华南理工大学 学位授予日期： 年 月 日

答辩委员会成员：

主席：殷实

委员：周剑云 戚冬瑾 李玲玲 Elena Guidetti

摘 要

在全球城市化进程中，土地发展权的流转、交易与补偿机制已逐步演化为兼顾社会公平、经济发展与环境治理的核心政策工具。面对复杂更新场景中多主体协作与发展权分配难题，各国逐步探索将土地发展权机制制度化与空间化的途径。本研究聚焦于意大利的“城市均衡政策”，拟解决的核心问题是：城市均衡政策如何通过建筑权机制调控土地再开发过程，并进一步引导城市空间设计？本研究旨在探讨意大利城市均衡政策如何作用于土地再开发与城市空间形态的转变，进而构建“政策—开发—设计”策略框架，以理论与实践结合的方式评估其适用性与价值。通过该框架，本文尝试揭示均衡政策如何实现建筑权的合理配置与空间调控，从而回应复杂城市更新中的多元公共目标。

理论研究部分系统梳理了土地发展权制度的国际经验及其制度演化路径，深入分析了意大利城市均衡政策的制度起源、操作机制与空间策略，并在此基础上提出其制度创新的三维度均衡：在空间维度上，通过建筑权流转优化空间资源配置；在性质维度上，引导土地复合使用以打破传统用途划分；在结构维度上，通过交易机制协调多方利益实现社会公平。这部分研究是目前国内尚未系统展开的领域，体现了本研究的理论贡献与原创价值。同时，本研究选取三个具有代表性的实践案例，分别从城市总体规划层面（米兰 PGT）、城市设计层面（罗马 Acilia-Madonnetta）、政策实施操作层面（帕多瓦市实施细则）切入，全面呈现城市均衡政策的多层级应用方式，并为后续传导框架的建构提供理论与经验支持。

在上述理论基础上，本文进一步构建了“政策—开发—设计”三层级的逻辑框架，系统梳理了城市均衡政策中建筑权制度如何作用于土地开发模式，再进一步转化为空间设计策略。在借鉴城市设计理论的基础上提出四大设计策略——复合型功能组织、适应性建筑空间、多元共享型公共空间、人本导向型出行系统，强调设计层面对制度目标的转译能力，确保空间实践具有可操作性与理论支撑。

实践部分以都灵烟草厂更新为研究案例，构建了“校园主导型”与“校城协同型”两类不同目标导向下的设计方案，以验证所提出框架的可适用性与策略有效性。前者强调在既有制度限制下实现功能优化与生态补偿，后者则引入建筑权的跨区转移与多主体协同开发，探索制度机制在高强度开发语境下的引导作用。两种方案分别体现了城市均衡政策在不同更新目标场景中的调控路径，说明本文构建的传导框架在复杂地块更

新中具有良好的适应性与可操作性，并能够服务于不同公共目标下的空间策略实现。

综上所述，本文在理论层面系统梳理并深入研究了意大利城市均衡政策的制度体系、操作机制与空间调控路径，揭示其如何通过建筑权制度实现空间、性质与结构三维度的均衡调控，为国内相关城市更新制度与政策研究提供了一定的参考价值；在方法层面，提出“政策—开发—设计”三段式传导框架，构建以建筑权机制为核心的空间策略体系，回应制度导向下土地开发与城市设计的联动需求；在实践层面，以都灵烟草厂更新项目为案例，通过构建两种开发模式，对该框架在复杂城市更新语境下的适应性与政策转译能力进行了验证。研究成果有助于探索以建筑权机制为基础的城市空间治理路径，为中国优化土地开发制度与提升公共空间品质提供借鉴与启发。

关键词：意大利城市均衡政策；土地发展权；土地再开发；城市设计

Abstract

In the context of global urbanization, the mechanisms of transferring, trading, and compensating land development rights have gradually evolved into key policy tools that balance social equity, economic development, and environmental governance. Confronted with the challenges of multi-stakeholder coordination and the distribution of development rights in complex urban renewal scenarios, many countries are exploring ways to institutionalize and spatialize development rights. This study focuses on Italy’s "Urban Equalization Policy" and addresses the core research question: how does this policy regulate land redevelopment through the mechanism of building rights, and further guide urban spatial design? The aim is to investigate how Italy’s urban equalization policy influences the transformation of land redevelopment patterns and urban spatial structures, and to construct a "Policy–Development–Design" transmission framework that evaluates the policy’s applicability and effectiveness through the integration of theory and practice. By doing so, the study attempts to reveal how the equalization policy achieves rational allocation and spatial regulation of building rights in response to diverse public objectives in urban redevelopment.

The theoretical section reviews international experiences with land development rights and their institutional evolution, and offers an in-depth analysis of the origins, operational mechanisms, and spatial strategies of Italy’s urban equalization policy. Based on this analysis, the study identifies three key dimensions of institutional innovation: spatial, by reallocating resources through the transfer of building rights; functional, by promoting mixed-use development and breaking conventional zoning constraints; and structural, by balancing multi-stakeholder interests to achieve social equity. This institutional research—currently underexplored in domestic academic contexts—constitutes the theoretical foundation and originality of this study. Furthermore, three representative case studies are selected to illustrate the multi-level application of the equalization policy: the Milan PGT (strategic planning level), Rome’s Acilia-Madonnetta project (urban design level), and the Padua implementation guidelines (operational level), each providing empirical support for the construction of the subsequent transmission framework.

Building upon this theoretical foundation, the study proposes a three-tiered framework—Policy–Development–Design—that systematically traces how the building rights mechanism influences land development models and is further translated into spatial design strategies. Drawing upon established urban design theories, the study outlines four key strategies: composite functional organization, adaptive architectural spaces, shared public space systems, and people-oriented mobility networks. These strategies emphasize the capacity of spatial design to translate institutional objectives into operable and theory-informed urban practices.

The practical component of the research centers on the redevelopment of the Royal Tobacco Factory in Turin, with two design scenarios—university-led redevelopment and university–city collaborative redevelopment—developed to assess the adaptability and effectiveness of the proposed framework. The first scenario emphasizes functional optimization and ecological compensation within existing institutional constraints, while the second introduces cross-district transfers of building rights and collaborative investment to support high-intensity, mixed-use development. The comparison illustrates how the framework adapts to different redevelopment goals and validates the equalization policy's regulatory capacity in diverse urban contexts.

In conclusion, this study systematically analyzes the institutional structure, operational mechanisms, and spatial implications of Italy's urban equalization policy. It reveals how the policy achieves balanced regulation across spatial, functional, and structural dimensions through building rights mechanisms, offering valuable insights for institutional and policy research in urban renewal. Methodologically, the study proposes a replicable transmission framework—Policy–Development–Design—centered on building rights, to guide integrated land development and urban design. Practically, through the case of the Turin redevelopment project, it demonstrates the framework's applicability in complex urban settings and its potential to translate policy objectives into spatial strategies. These findings contribute to the broader exploration of building rights-based spatial governance models and offer referential value for future practice in sustainable urban development.

Keywords: Italian Urban Equalization Policy; Land Development Rights; Land Redevelopment; Urban Design

Contents

Figure List

Table List

Chapter 1 Introduction

1.1 Research Background

1.1.1 Global Challenges in Land Governance and the Rise of Development Rights Systems

With the rapid acceleration of global urbanization, land governance systems are facing multiple challenges. On the one hand, urban development demands increasingly greater land supply; on the other hand, issues such as uneven spatial resource allocation, imbalanced distribution of land value increments, and the ambiguous roles of government and market actors in land management have become increasingly prominent[1-3]. This structural imbalance in land governance not only constrains sustainable urban development but also exacerbates socioeconomic disparities[3]. Moreover, traditional land expropriation mechanisms tend to concentrate land value appreciation in the hands of the government or developers, with original landowners and the public receiving limited benefits from planning adjustments and urban expansion. This "low compensation–high selling price" mechanism frequently triggers distributive injustice and social conflict[4-5]. Under the current system, original land right holders—such as farmers or collective economic organizations—find it difficult to fairly share the considerable value generated during land conversion, leading to a loss of social legitimacy and mounting governance pressure[6]. In addition, some existing land parcels remain underutilized for extended periods due to complex ownership structures or restrictions on development intensity, further exacerbating the problem of land resource misallocation and waste[7].

In response to these challenges, Western countries have proposed various land development rights (LDR) systems to optimize land resource utilization and ensure equitable development. The United Kingdom first introduced the concept of Land Development Right in the Town and Country Planning Act of 1947[8], asserting that all development rights belong to the state. Any change in land use requires government approval and the payment of associated fees to facilitate the public recapture of land value appreciation[2]. While this approach ensures state control over land development, it also limits market flexibility and hampers urban regeneration efficiency. In contrast, the United States adopts a more market-oriented approach by decoupling development rights from land ownership and enabling their free trade in the form of transferable development rights (TDR). This TDR mechanism allows landowners in restricted development zones—such as ecological reserves or heritage areas—to sell their development rights and transfer building entitlements to higher-density areas, thereby optimizing land resource allocation without compromising market interests[9-10]. France, meanwhile, combines stringent controls on development density with a government-guided market transaction system to ensure that a portion of land development gains is returned to public finance[6].

1.1.2 Formation and Development of Italy's Urban Equalization Policy

In the 1980s, Italy faced land resource governance dilemmas similar to other European countries. Strict land use controls made land development inflexible, and urban renewal projects were constrained by cumbersome administrative approval processes, making it difficult to quickly adapt to urban development needs[11]. Additionally, the distribution of land value increments was extremely unbalanced, with the government bearing enormous costs for public infrastructure construction while private landowners gained significant benefits from planning adjustments, further exacerbating market inequities[12-13]. At the same time, many old industrial areas in Italian cities faced renewal difficulties due to complex property rights, long-term land vacancy, and limited development intensity, while the traditional government acquisition model could no longer meet modern urban development needs due to high fiscal costs and lengthy approval processes[14]. Therefore, drawing on the experience of European and American land development rights systems, the Italian government proposed "Urban Equalization " (Perequazione Urbanistica) Policy in the 1980s to establish a more equitable and efficient land development system.

Under this policy framework, building rights (Diritto Edificatorio, DE) became the core concept, essentially viewed as land development rights in the Italian context. Building rights refer to the legal development interests owned by landowners under established planning and policy constraints, which can be transferred between different plots to achieve balanced allocation of land development interests[15]. Unlike traditional land development models, equalization policy does not rely on direct government land acquisition but rather achieves flexible adjustment of development intensity in different areas through the confirmation and market-based trading of building rights. Through building rights allocation, the government optimizes land resource utilization, reduces fiscal burden, and improves the supply capacity of public resources. Compared with the systems in the UK, US, and France, Italy's equalization policy emphasizes the combination of "marketization of land development rights" and "sharing of land value increments," creating a more balanced interest distribution mechanism among landowners, developers, and the government in urban renewal processes, thereby constructing a more sustainable land development model.

1.1.3 Background of Brownfield Redevelopment

With the transformation of industrial sectors and the shifting focus of urban development, many former industrial districts across European cities have gradually lost their original production functions. These areas now face multiple challenges, including inefficient land use, residual pollution, and complex ownership structures. Despite their advantageous locations and historical significance, redevelopment in such areas often proceeds slowly due to a lack of effective mechanisms for coordinating stakeholder interests, resulting in low spatial vitality. How to promote functional restructuring and spatial regeneration of these brownfield sites has become a pressing issue in urban renewal.

As a significant part of Italy's industrial heritage, the Royal Tobacco Factory in Turin once symbolized the city’s manufacturing prosperity during the twentieth century. However, with the decline of the manufacturing industry, the area gradually fell into disuse, becoming a typical example of “low-efficiency urban land.” Its low land use efficiency, fragmented property rights, and lack of public space hinder the effectiveness of traditional government-led expropriation and comprehensive redevelopment models. The project involves multiple actors—including the municipal government, universities, private developers, and local residents—making interest coordination particularly complex.

The urban equalization policy allows landowners to adjust development intensity across different parcels through tradable development rights. It also promotes the integration of commercial, cultural, educational, and residential functions by enabling changes in land use, thereby enhancing the efficiency of spatial resource allocation. Furthermore, the policy provides a benefit-sharing mechanism to ensure equitable distribution of land value appreciation among stakeholders, improving both the feasibility of development and its social acceptance. Therefore, this study takes the redevelopment of the Royal Tobacco Factory as a case to explore how the equalization policy can optimize land development models and propose sustainable urban regeneration strategies.

1.2 Research Objectives and Significance

1.2.1 Research Objectives

This study aims to investigate how Italy’s urban equalization policy influences land development models and to validate its impact through the spatial implementation of design strategies. By reviewing the theory and practical cases of land development rights and the equalization policy, the study establishes a “Policy–Development–Design” framework that illustrates how the equalization mechanism regulates development intensity, optimizes land use, and guides urban form through the trading of development rights. Based on this framework, the study applies it to the redevelopment of the Royal Tobacco Factory in Turin to explore the policy's applicability and spatial impact in concrete urban planning. Ultimately, the study evaluates the role of the equalization policy in optimizing urban spatial structures and enhancing the allocation of public resources, and offers recommendations for land governance reform in China.

1.2.2 Research Significance

（1）Theoretical Significance

This research offers theoretical insight into Italy’s urban equalization policy and its applications in land development and spatial planning, filling a gap in Chinese scholarship. While domestic studies often focus on British and American approaches to development rights and spatial equity, there has been limited research on Italy’s equalization framework, mechanisms, and practical models. This study systematically examines the policy's historical evolution, structural design, and implementation, providing a theoretical basis for understanding how the development rights system coordinates land development and spatial planning.

Additionally, the study constructs a complete framework linking equalization policy, development models, and spatial design, revealing the logic of how institutional mechanisms translate into design strategies. By validating this framework through empirical analysis, the study contributes to the theoretical capacity of urban design to respond to policy-driven development models.

（2）Practical Significance

Through a detailed analysis of the Royal Tobacco Factory redevelopment project, the study explores the operational pathways of equalization policies in land redevelopment and spatial renewal. It highlights the policy’s practical value in coordinating multi-stakeholder participation, enabling development rights transfer, and balancing public interests. Unlike traditional state-led expropriation or fully market-driven development models, the equalization policy offers an institutional alternative that achieves efficient allocation of development rights and rational land use without direct public spending, through mechanisms such as rights confirmation, transferability, and conversion coefficients.

The two design schemes proposed in this research respond to different development goals and policy scenarios, demonstrating the flexibility of the development rights system in both low- and high-intensity contexts. These strategies not only show how the system can be practically implemented but also how institutional objectives are transformed into spatial and functional design languages. The findings improve the adaptability and feasibility of urban renewal projects under complex land conditions and collaborative governance, offering replicable experience for policy translation and spatial design in similar scenarios.

1.3 Research Content and Methodology

1.3.1 Research Content

This study centers on how Italy's urban equalization policy can optimize land development models and spatial design, and it constructs a comprehensive path linking "equalization policy—land development model—spatial design." First, the study reviews international theories of land development rights, analyzing their roles in spatial governance to form a conceptual basis for Italy's equalization policy. It then systematically analyzes the core mechanisms of the policy—development rights confirmation, market circulation, and revenue sharing—while examining real-world case studies to assess its effectiveness. Chapter 4 builds a transmission framework from equalization policy to land development and spatial design based on the preceding theoretical analysis. Chapter 5 evaluates the Royal Tobacco Factory's development background and current conditions to provide a practical foundation for applying the policy. Finally, the study applies the strategic framework to the redevelopment project, visually validating the spatial effects of the equalization policy and offering practical recommendations.

1.3.2 Research Methodology

（1）Literature Research Method

This study employs literature review to examine the theoretical foundations of development rights and urban equalization policy. It collects domestic and international policy documents, academic research, and planning cases, focusing on Britain, the United States, and France, with particular attention to rights confirmation, market mechanisms, and revenue allocation. It also gathers Italian government documents, scholarly literature, and case studies to analyze the policy's origins, structure, implementation, and outcomes, summarizing key mechanisms.

（2）Case Analysis Method

The Royal Tobacco Factory in Turin serves as the primary case. The study analyzes land ownership, zoning, building morphology, socioeconomic characteristics, and development constraints to assess its challenges under traditional development models and evaluate the applicability of the equalization policy. It also refers to cases from Milan, Rome, and Padua to assess the policy’s impact on land use optimization, spatial equity, and public resource allocation.

（3）Comparative Research Method

A comparative approach is applied to analyze development rights frameworks in the UK, US, and France, juxtaposed with Italy’s equalization model to reveal differences in rights confirmation, market mechanisms, and revenue distribution. In the design practice section, two contrasting development schemes—based on different stakeholders and intensity levels—are compared to demonstrate the adaptability of the policy.

1.4 Definition of Key Concepts

1.4.1 Urban Equalization Policy

Urban equalization policy is a policy tool proposed by Italy in the 1980s, aimed at optimizing land resource allocation and achieving fair distribution of development benefits through the confirmation and market transfer of building rights. This policy distributes the same development rights within the same planning area, ensuring that landowners can still receive appropriate compensation through the transfer of building rights even if development is restricted due to public needs[12].

Compared with traditional land acquisition models, urban equalization policy does not rely on government forced acquisition of land, but rather on market-based building rights transactions, allowing landowners in low-development-intensity or restricted plots to transfer building rights to other developable areas. This not only reduces the government's fiscal burden but also enhances the flexibility of land resources, improving the operability and fairness of urban planning[16]. In addition, this policy emphasizes the government's guiding role, ensuring that urban renewal projects conform to public interests under market mechanisms, and to some extent alleviating the unfair distribution of land value increments[17].

1.4.2 Land Development Rights and Building Rights

Land development rights refer to the development rights owned by landowners under a specific legal and planning framework, including operational space in building density, use adjustment, floor area ratio, etc. This concept originated from the 1947 Town and Country Planning Act in the UK and has formed different operational models in countries such as the US, France, and Japan[3].

Under the framework of Italy's urban equalization policy, land development rights are confirmed and can be traded in the market in the form of building rights. The government assigns certain building development rights to land based on the equalization index (Indice Perequativo, IP), allowing them to be transferred within the framework of planning compliance[18]. This system breaks the rigid control of land use changes through the establishment of a building rights market, allowing land resources to achieve optimal allocation under market regulation, while reducing interest conflicts caused by land planning adjustments[16].

The market-based trading of land development rights is also a core tool for achieving fair distribution of land value increments. In traditional models, land value increments are usually concentrated in the hands of governments or developers, while equalization policy enables landowners with restricted development to fairly share land value increments through the circulation of building rights, improving land use efficiency[17].

1.5 Research Innovations

This study explores how Italy's urban equalization policy optimizes land development and spatial design by constructing a "Policy–Development–Design" framework and applying it to the case of the Royal Tobacco Factory. Compared with existing literature, the research contributes two key innovations:

（1）Focus on Italy's Urban Equalization Policy, Providing a Reference for Urban Regeneration in China

Current domestic studies of land development rights and urban renewal tend to focus on Anglo-American models. In contrast, this research systematically analyzes the evolution, mechanisms, and implementation pathways of Italy's equalization policy, establishing a theoretical framework covering rights confirmation, rights transfer, and benefit sharing. This offers a new academic lens for studying land governance and spatial planning in China.

（2）Constructing the Full Path from Policy to Development and Design, and Visually Validating the Policy's Spatial Impacts

Whereas prior research has primarily examined equalization in land markets, this study further investigates its influence on development models and spatial strategies. It establishes a logical framework from institutional mechanisms to spatial practices and proposes a strategic framework for urban spatial optimization under equalization policy. By applying the framework to the Royal Tobacco Factory's redevelopment, the study clearly illustrates how the policy affects building density, functional mix, public space, and mobility systems, providing visual and spatial evidence of the policy's planning value.

1.6 Research Framework

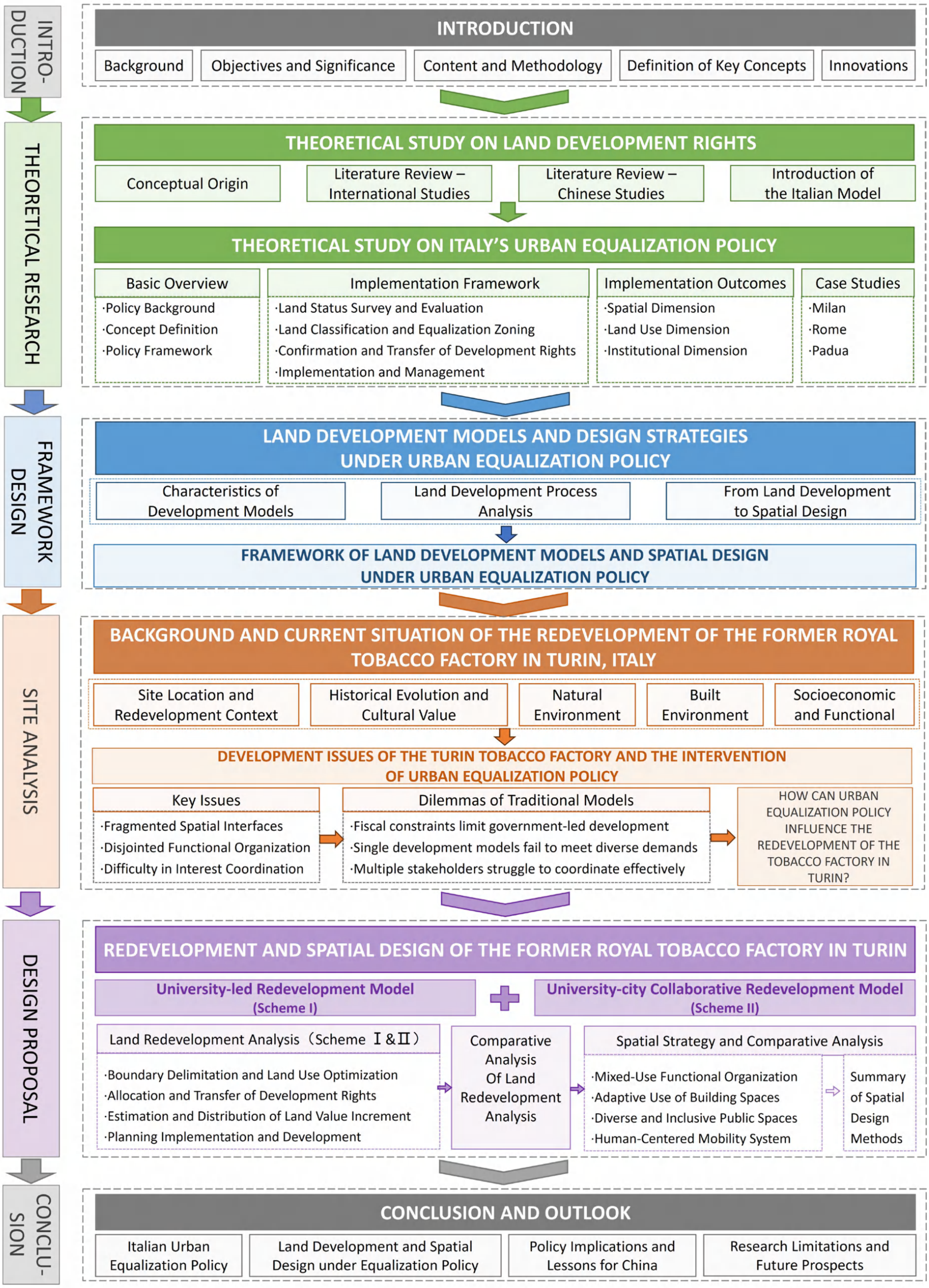

Figure 1-1 Research Framework Diagram
(Source: Drawn by the author)

Chapter 2 Theoretical Study on Land Development Rights

2.1 Origin of Land Development Rights Concept

Land development rights refer to the right to redevelop land based on existing land use, specifically the right to obtain benefits by increasing land use intensity or changing uses[8,19]. The introduction of this concept was aimed at separating land development rights from land ownership to address issues of interest distribution and management in urban planning[1]. After the Industrial Revolution, cities urgently needed to scientifically coordinate the layout relationships of various land uses, and land zoning control became an important means to optimize urban space[1]. However, due to the rigidity of traditional land use controls, issues such as regional development imbalance and limited multi-functional development of urban land emerged in urban spatial development. In particular, during land use changes and land acquisition processes, there was damage to landowners' rights to share value increments, leading to social equity issues[20]. Against this background, the UK first introduced the concept of land development rights in the Town and Country Planning Act, clearly stipulating that land development rights belong to the state, and private individuals who need to change land use must apply to the government and pay corresponding taxes[8]. This system broke through the static land rights framework of the pre-20th century, focusing on development rights generated by land use changes and establishing the basic principle of "public capture of value increases"[1,21]. In contrast, the Transfer of Development Rights (TDR) system in the US represents a "private capture of value increases" model, where land development rights are detached from land entities and can be freely traded in the market, reducing government intervention and fully leveraging the role of market entities[1-2].

2.2 International Research Review on Land Development Rights

2.2.1 United Kingdom

After World War II, the UK faced land demand issues arising from population growth and urban reconstruction, while high land prices in the highly privatized land market posed significant challenges for government land acquisition. To regulate land development order and ensure public interest, the UK government promulgated the 1947 Town and Country Planning Act[8], formally introducing the concept of land development rights and establishing the land development rights system. The law stipulated that all land development rights belong to the state, while private individuals still retain land ownership, but their rights are limited to possessing, using, benefiting from, and disposing of land; if they need to change land use or increase development intensity, they must purchase land development rights from the government[2]. This system partially transferred decision-making power over land use from private individuals to the state, enhancing government control over land resources.

The implementation procedure of UK land development rights typically includes four stages, with the "development permission" system as its core mechanism. First, private landowners must submit land development applications to the urban planning department, ensuring that development plans comply with established urban planning requirements. Subsequently, relevant departments assess the price of development rights for the proposed land, determining the tax payable by the applicant based on changes in land value before and after development. This tax is usually calculated based on the value appreciation part of the land; for example, after 1985, land development tax was levied at 60% to 80% of capital gains, ensuring that value increments return to the state[6]. After the applicant pays the corresponding tax, the urban planning department approves and issues a land development permit, allowing development according to the approved plan, at which point land development rights flow from the state to private individuals[9].

Although the UK's land development rights allocation system has been influenced by the economic positions of different political parties during implementation, with specific policies adjusted several times, overall, the system established the basic framework of "public capture of value increases"[1] and to some extent alleviated social equity issues caused by rising land prices. The establishment of land development rights broke the tradition of land rights remaining only in the static ownership category before the 20th century, making land rights structure more dynamic and regulatory, providing feasible policy tools and reference experiences for countries to alleviate land supply and demand contradictions during urbanization.

2.2.2 United States

In the mid-20th century, the US urbanization process rapidly accelerated under the impetus of high economic growth, with contradictions between urban expansion, population growth, and land supply intensifying. This increased land demand not only led to disorderly urban spatial expansion but also brought a series of problems such as ecological environmental damage, public infrastructure shortages, and housing supply tensions. Drawing on the UK's land development rights system, the US established the Transfer of Development Rights system, detaching land development rights from land entities so they could enter market transactions as independent property rights, transferring between different landowners[10]. This system effectively improved the market-based allocation efficiency of land resources while maintaining land use control, providing policy tools for the government to regulate urban development and land protection.

As a typical private land ownership country, land development rights in the US still belong to landowners but have achieved separation from land ownership. Compared to the UK's land development rights system, the US Transfer of Development Rights system relies more on market mechanisms, with less direct government intervention. The core content of land development rights includes land use, floor area ratio, and development density, with the tradable land development rights mainly being floor area ratio, as it is easy to quantify and price in the market, so development rights trading is often called floor area ratio transfer[10]. The operation process of the Transfer of Development Rights system mainly includes three stages: designation of sending and receiving areas, allocation and confirmation of land development rights, and development rights trading. First, the government needs to designate sending areas (Sending Area) and receiving areas (Receiving Area) for land development rights according to urban planning. Sending areas are usually regions where the government wishes to limit or prohibit development, such as agricultural land, ecological protection areas, and historical-cultural protection districts, aiming to reduce the impact of urban expansion on the ecological environment. Receiving areas are typically located in urban development core areas, where higher density development is allowed due to planning adjustments[9].

After designating the areas, landowners in sending areas can apply to the government, and after assessment and review by relevant government agencies, the tradable quantity of land development rights is calculated according to floor area ratio conversion standards. In the trading stage, the government can directly purchase land development rights to achieve farmland protection and prevent disorderly urban expansion[10]. Additionally, landowners or developers can trade through land development rights trading markets or intermediary institutions such as TDR Banks, achieving the transfer of development rights through market-based methods. The market-based operation of the Transfer of Development Rights system not only improves the freedom of land resources but also largely ensures transaction fairness.

The US Transfer of Development Rights system established a "private capture of value increases" land development rights distribution mechanism[1], adopting market-based trading methods to allow landowners to directly benefit from land value increments. This model has played an important role in protecting the natural environment, optimizing urban spatial structure, and promoting reasonable flow of land resources. However, in practice, the US Transfer of Development Rights system still faces some technical challenges, such as how to determine the scale of sending and receiving areas, how to scientifically evaluate the price of land development rights, and how to ensure liquidity in the development rights market[10]. Nevertheless, the US Transfer of Development Rights system still provides a market-based, sustainable land development rights regulation method for global land management and urban planning, offering important references for related institutional building in other countries.

2.2.3 France

France's land development rights system is centered on Legal Density Ceiling, establishing a model where land development rights are jointly held by the state and landowners. According to the 1975 "Law on Reforming Land Policy" and the 1976 "Urban Planning Code," landowners can freely develop within the legal density limit, but portions exceeding this limit belong to the government; if further development is needed, they must pay an "excess burden fee" to the government[9]. This system uses floor area ratio (FAR) as a quantitative indicator to limit the abuse of private land rights, ensure fair distribution of land value increments, and simultaneously avoid speculation in the real estate market and excessive urban development[22]. Additionally, the government also possesses priority land purchase rights to control ecological protection zones, historical and cultural districts, etc., to maintain urban development sustainability[10].

This system is not only a land planning tool but also serves a fiscal regulatory function. Through fees on excess development, the government incorporates a portion of land value increments into public finance for infrastructure construction, thereby balancing land revenue disparities between different regions to some extent[6]. At the same time, the French government has established a "land intervention zone system," granting the government planning intervention rights in specific areas to ensure land use aligns with public interest. Compared to the UK's land development rights nationalization system and the US's market-based development rights system, France has adopted an approach combining government regulation with market mechanisms, achieving reasonable land resource allocation, both ensuring local fiscal revenue and effectively controlling urban expansion[9].

3.2.4 Comparison of Land Development Rights Systems in Different Countries

In summary, the UK, US, and France exhibit different characteristics in terms of land development rights ownership, management methods, and market operation (see Table 2-1). The UK adopts a "public capture of value increases" model, emphasizing government control, with development rights held by the state and revenue recouped through land value taxes. The

US employs a "private capture of value increases" model, allowing development rights to be traded in the market, improving land use efficiency but providing weaker guarantees for public interest. France adopts an intermediate model, with development rights partially belonging to private individuals, but the government levies fees on excess development to redistribute land value increments. Each system has its advantages and disadvantages, reflecting the balance between government intervention and market regulation.

Table 2-1 Comparison of Land Development Rights Systems in the UK, US, and France
(Source: Compiled by the author)

Comparison Dimension	United Kingdom	United States	France
Development Rights Ownership	State-owned	Private, market tradable	Jointly held by state and private parties
Core Mechanism	Development permission Land value tax	Transfer of Development Rights	Legal density limit + Excess development fee
Government Intervention	Strong (strict planning approval)	Weak (market-led)	Medium (government regulation + market mechanism)
Development Rights Trading	Restricted trading	Allows market trading	Restricts excess development
Relationship with Spatial Planning	Mainly relies on planning permission	Optimizes through market trading	Adjusts urban density through government control
Public Benefit Mechanism	Public capture of value increases	Private capture of value increases	Partial revenue to government

2.3 Current Status of Land Development Rights Research in China

Systems involving land value increment distribution emerged during China's transition from planned economy to market economy, including land use control systems, planning regulation systems, and land acquisition compensation systems. Land development, use conversion, and other activities are controlled by the state, with the government only needing to pay the cost of land when acquiring it. Since land development and use conversion are predominantly government-led, the government only needs to pay the benchmark land price when acquiring land. In the urban-rural dual system, farmers primarily focus on whether they can enter urban factories through land acquisition, with less attention to compensation amounts[23-24]. However, this institutional arrangement seriously damages the property rights of collective landowners while continuously expanding developers' rights, which is unfavorable for rational resource allocation. Therefore, scholars generally recommend drawing on the UK and US land development rights systems to optimize China's land development rights distribution mechanism and enhance fairness[1,7].

2.3.1 Main Issues of Land Development Rights in China

Although Chinese law has not yet clearly defined the concept of land development rights, many related issues have already emerged in practice, including difficulties in rights transfer, limitations on use changes, and uneven distribution of benefits[1].

（1）Difficulties in Land Development Rights Transfer

The market-based transfer of land development rights in China faces numerous obstacles, with core issues being the capitalization assessment of land development rights, the absence of market trading mechanisms, and the government's strong position in land management[25]. Since land development rights are typically fixed to specific land uses and spatial locations, without an effective way to quantify their market value, it is difficult to form a reasonable trading mechanism[25]. Under China's current land management model, the transfer of land development rights relies primarily on government approval rather than market mechanisms, not only resulting in high transaction costs but also limiting the mobility of land development rights, affecting resource optimization allocation[4]. For example, many local governments intervene in land development rights transfers based on administrative needs rather than market supply and demand regulation, potentially leading to issues of non-transparency and unfairness[4].

Additionally, the transfer of collective construction land development rights is particularly difficult, mainly due to unclear legal status, strict use restrictions, and unclear property rights definition[7]. As current laws stipulate that rural collective construction land cannot directly enter market transactions, this type of land's development rights are difficult to achieve optimal allocation through the market[7]. In comparison, countries like the United States use market-based means such as development rights transfers to allow development rights to flow across regions, achieving more rational land resource allocation[26]. For example, the US Transfer of Development Rights banks, through valuation systems and transfer mechanisms, enable development rights to be detached from original land ownership and transferred to areas suitable for development[26]. However, China has not yet established similar intermediary mechanisms, lacking pricing guidance for land development rights transactions and standardized trading platforms, making it difficult for market operations to be effectively carried out[26].

(2) Limitations on Land Development Rights Use Changes

The use change of land development rights in China is subject to strict planning restrictions, making it difficult to flexibly adjust rights and release development potential[1]. Land use changes mainly depend on government planning, with the granting and adjustment of land development rights constrained by rigid planning constraints, causing some land development rights to be underutilized or improperly allocated. In practice, land use adjustments usually require complex approval procedures, and under the influence of "one plan per plot," it is difficult to dynamically adjust land uses in different regions according to actual market demand[1]. For example, in Beijing's old city renovation process, the land use of some areas is strictly limited, making it difficult for development projects to be implemented; even if market demand for certain types of land (such as commercial or residential land) is strong, land resources remain in a state of inefficient use due to unchangeable planning uses[5].

At the same time, China's national spatial planning's main functional area division further exacerbates the difficulty of land development rights use changes[3]. Under the "Three Zones and Three Lines" policy (ecological protection red line, permanent basic farmland, urban development boundary), some areas' land is included in restricted development zones, making it impossible to adjust original land uses even if market demand changes, making it difficult to optimize land resource allocation through market means. This rigid control model leads to "resource mismatches" in land development rights in some areas, where high-value land cannot enter the market, while inefficient land cannot obtain appropriate development rights due to planning restrictions[3].

(3) Uneven Distribution of Land Development Rights Benefits

The distribution of land development rights benefits in China has long favored the government and developers, while original property rights holders such as farmers or collective economic organizations often are in disadvantaged positions, unable to fairly share in the benefits brought by land appreciation[1,4]. This issue is particularly prominent in areas like urban renewal, old city renovation, and rural land transfers. For example, in old city renovation projects, the government and developers typically acquire land from farmers or residents at relatively low compensation prices, but after land use changes, market values increase significantly, allowing developers to obtain huge profits, creating a "low compensation, high profit" phenomenon[5].

Moreover, the land revenue distribution gap between urban and rural areas is significant, especially under agricultural land protection policies, where agricultural land development rights and value-added benefits are severely restricted[3]. Due to the rigid requirements of farmland protection policies, farmers cannot enhance land values through market-based means, while the use changes of state-owned land are relatively flexible, causing the gap in land value-added benefits between the two to continuously widen[3]. This unbalanced benefit distribution mechanism exacerbates the imbalance in urban-rural development and limits the optimization of land resources in rural areas.

2.3.2 Discussion on Ownership of Land Development Rights

Current discussions on land development rights ownership mostly focus on three models: "public capture of value increases," "private capture of value increases," and "shared value increases"[1,2,6,7,27], with scholars generally agreeing that China urgently needs to explore reasonable benefit-sharing mechanisms to optimize land resource allocation and improve social equity.

（1）Discussion on "Public Capture of Value Increases" and "Private Capture of Value Increases" Models

In Western land development rights systems, the UK and US represent typical models of "public capture of value increases" and "private capture of value increases," respectively[1]. The "public capture of value increases" model emphasizes that land value increments are controlled by the state, with the government recouping development rights benefits through taxation to fund infrastructure construction and social welfare expenditures. While this model can support government finance, it can also lead local governments to become overly dependent on land finance, encouraging them to expand urban construction scales and exacerbate land market instability[2]. Additionally, under China's current land acquisition system, a model where land benefits completely accrue to the public often harms farmers' interests, with compensation received by farmers being far lower than the market value of land, leading to the issue of "land transformation without people transformation," where farmers lose land but cannot truly integrate into urban life[2].

In contrast, the "private capture of value increases" model believes that land value increments should mainly belong to landowners, a model that has received relatively mature application in the US's transferable development rights system[1]. This system allows landowners to freely trade their development rights, enabling them to directly benefit from land appreciation while reducing government intervention in the land market and improving market allocation efficiency[7]. However, fully market-based land development rights trading may also lead to social inequity issues; for example, in urban village transformation processes, when land value increments completely accrue to original landowners, some groups rapidly accumulate large amounts of wealth, forming a new "landlord class," while landless farmers and migrant workers are marginalized due to rising housing prices and land resource scarcity[2]. This phenomenon exacerbates the imbalance in social distribution, leading to a decline in housing affordability and intensifying the survival predicament of low-income groups.

（2）Proposal of "Shared Value Increases" Model

Amid the controversy between "public capture of value increases" and "private capture of value increases" models, scholars have gradually reached a consensus that single public or private ownership discussions should be abandoned in favor of exploring reasonable benefit-sharing mechanisms[28]. Particularly in urban village transformation processes, issues such as unfair land benefit distribution, excessive building, farmer employment, and social security have become prominent, emphasizing the need to adopt a benefit-sharing model to promote fair distribution of land value increments. This model advocates establishing a reasonable value increment distribution mechanism among the government, developers, and original land property rights holders, ensuring all parties can benefit from land value-added processes, rather than having benefits captured solely by one party.

In terms of practical research involving land development rights transfers, they can be roughly divided into macro-level land use index transfers and micro-level floor area ratio transfers[29]. Although China has not formed a unified development rights transfer system, there have been numerous related practices locally, such as the urban-rural construction land increase-decrease hook[30-31], Guangzhou's "Three Vouchers" system[32], Chongqing's "Land Ticket" system[33], and shadow indices[34].

2.3.3 Local Government Exploration and Practice

In practice, some local governments have begun to optimize the distribution and management of land development rights through market-based means, exploring the "shared value increases" model to improve land resource allocation efficiency and alleviate issues of uneven benefit distribution.

Zhejiang Province has recently introduced a series of policies, such as "discounted index paid transfer," "substitute protection," and "land vouchers," with the core idea of these policies being to achieve reasonable flow of land development rights between different regions through market-based mechanisms, promoting the sharing of land value increments[4,29,35-36]. Among them, "discounted index paid transfer" allows the transfer of land development rights from specific areas to regions with higher development needs, ensuring original rights holders receive certain compensation through reasonable price mechanisms, while the government plays a regulatory and management role in this process[4]. Additionally, the "land vouchers" system introduces market transaction methods, allowing farmers to transfer their land development rights for compensation, enabling them to participate in land value increment distribution without losing land ownership[29,35-36].

Similar reform attempts have also appeared in cities like Guangzhou and Chongqing. Guangzhou's "Three Vouchers" system (demolition compensation vouchers, reconstruction vouchers, and housing purchase vouchers) provides more diversified compensation methods for farmers whose land is expropriated, ensuring they receive relatively fair returns in the land revenue appreciation process[32]. This model breaks the traditional "one-time compensation" mechanism, allowing farmers to choose compensation in the form of physical property or money, increasing the level of benefit sharing in land development. On the other hand, Chongqing's "Land Ticket" system builds a market-based trading platform, enabling rural collective economic organizations to sell their development rights through "land tickets," directly obtaining economic benefits and reducing social conflicts caused by insufficient compensation in the land acquisition process[33]. This system allows rural land resources to more effectively enter the market while protecting farmers' land rights.

These local explorations indicate that the practice of benefit-sharing models is gradually advancing, with market-based means becoming important tools for optimizing land development rights allocation. Compared to traditional government-led land acquisition models, these market-based reforms not only improve land resource mobility but also strengthen the voice of original property rights holders (such as farmers or collective economic organizations) in land benefit distribution to some extent. In the future, how to promote these pilot experiences on a larger scale and form nationwide standardized systems will become an important direction for China's land development rights system reform.

2.4 International Experience of Land Development Rights and Introduction of the Italian Model

In recent years, research on land development rights has mainly focused on institutional frameworks, market operation models, and equity. European and American countries have formed different pathways in rights confirmation and transfer mechanisms, reflecting their respective land management models and policy orientations. The UK adopts a "public capture of value increases" model, ensuring that land appreciation benefits are used for infrastructure construction and social welfare through land value taxes and government-led development rights control mechanisms[1-2]. The US has developed a market-based Transfer of Development Rights system, allowing landowners to trade development rights in the market to optimize spatial resource allocation and reduce direct government intervention in the land market[15]. France uses a legal density limit system, where the government sets upper limits for land development rights and regulates market benefits through an "excess burden fee" mechanism to achieve fair distribution of value increments[9].

Compared to these countries, China's land development rights system is still in the exploratory stage. Due to the influence of the urban-rural dual structure on the land management system, the marketization degree of land development rights is relatively low, mainly relying on local government-led land supply and use adjustments. In recent years, various regions have promoted the optimization of land resources through land development rights transfer mechanisms (such as urban-rural construction land increase-decrease hook, "Three Vouchers" policy, "Land Ticket" system, etc.) and attempted to introduce some market mechanisms, but still lack a systematic legal framework and trading system[32-33,35-36]. On the issue of balancing marketization and government control, different regions' explorations still face obstacles in land rights confirmation, benefit distribution, and transaction mechanisms, with the effective use of land development rights still limited by the administratively-led planning system.

From a global perspective, land development rights systems fundamentally aim to achieve reasonable land resource allocation through rights control while balancing market mechanisms with government regulation. The UK model ensures public capture of value increments but limits market flexibility[2]; the US's market-based system improves efficiency while facing fairness challenges[7]; France's hybrid approach effectively coordinates planning and fiscal regulation, though questions remain about balancing intervention with market forces[9]. This evolution demonstrates that neither purely government-led approaches nor complete market mechanisms can optimally balance equity with efficiency; developing more adaptive regulatory frameworks that combine both strengths remains the focus of contemporary policy research.

Against this background, Italy combined European and American experiences with its national conditions to propose "urban equalization" policy as a new model for land development rights regulation. This policy has gradually been established in Italy's local planning system since the 1980s, emphasizing the optimization of development intensity between different plots, achieving more equitable and efficient land resource management through building rights transfers, land substitution, and public interest sharing[37-38], and establishing a market trading system that allows building rights to flow between different plots, thereby improving land resource utilization efficiency and optimizing urban spatial layout[16].

Chapter 3 Theoretical Study on Italy's Urban Equalization Policy

3.1 Basic Overview

3.1.1 Policy Introduction

The formation of Italy's urban equalization policy stems from multiple factors including historical development, planning concept evolution, and social transformation, and has been gradually perfected in the process of public and private interest negotiation. After Italy's unification in the 19th century, the government began to intervene in land management, but the 1865 Italian Civil Code's protection of private property significantly limited the government's intervention capacity[11]. With the advancement of the Industrial Revolution from the late 19th to early 20th century, the urbanization process accelerated, with large populations flocking to cities, urban-rural disparities widening, and cities facing challenges such as housing shortages and traffic congestion. Against this background, the land management model dominated by private landowners revealed numerous shortcomings, prompting the state to strengthen public intervention[14].

After World War II, disorderly urban expansion exacerbated the development gap between central and peripheral areas. To address this issue, the Italian government introduced modern urban planning concepts of functional zoning to strictly control land use and development scope, guide urban development direction, and establish the principle of public interest priority. The 1967 Law No. 765 proposed using urban planning "standards" (Standard) to curb disorderly urban expansion, and the 1968 Decree No. 1444 further clarified planning zoning principles, stipulating standards for land use and building density, making zoning planning a core management tool for urban development[11].

However, as social and economic changes occurred in the latter half of the 20th century, traditional zoning planning systems gradually revealed limitations, particularly in issues of spatial, use, and interest distribution equity[11]. First, resource-concentrated areas developed much faster than resource-scarce areas, causing urban internal and inter-regional imbalances to intensify. Second, rigid use controls limited the possibility of complex land development, making it difficult to adapt to modern cities' diverse and sustainable development needs, hindering urban renewal and regeneration[12,14]. Additionally, low-price compensation by the government during land acquisition processes led to social discontent, with uneven interest distribution increasing the difficulty of planning implementation[13]. Under the zoning planning system, the government typically acquired public facility land at relatively low prices, while private development land owners could obtain huge benefits through development operations, enjoying marginal benefits brought by surrounding urban facilities. This mechanism not only created inequality among landowners but also made it difficult for the government to directly profit from public investment, with the social benefits of public facilities often flowing into some private developers' hands, further exacerbating the uneven distribution of public resources[13].

Facing these issues, the Italian government drew on land management experiences from the US and France in the 1980s and proposed urban equalization policy, which began implementation in the 1990s. This policy aimed to promote fair and reasonable resource allocation through more flexible land management mechanisms, making urban planning adaptable to market demand while enhancing social equity. In 2008, the Italian National Parliament first introduced the equalization mechanism in the "Finance Law" (No. 244/07) to promote public housing construction; the 2011 Decree No. 70 then formally standardized the building rights transfer mechanism, filling the regulatory gap for equalization tools[11]. This policy adjustment reflected Italy's transition in urban governance from strict control to more flexible planning methods, striving to establish a more reasonable balance between public and private interests, providing institutional guarantees for sustainable urban development.

3.1.2 Concept Definition

Urban equalization is an urban planning technique aimed at achieving a balance between public and private interests through fair distribution of land value increments, gratuitous acquisition of public construction land, and improving the implementation efficiency of urban planning[15]. Its core lies in separating land construction and development rights (i.e., building rights in the Italian context) from land ownership, enabling them to be traded and transferred in the market, thus promoting the evolution of traditional static zoning planning toward dynamic equalization and compensation mechanisms[12].

The key mechanism of urban equalization policy is that all land in the same planning area will be assigned the same development index, regardless of whether its future use is for private development or infrastructure and public service construction. Landowners can obtain building area proportional to their land area based on the index, which can be actually built in designated areas. This means that even if some plots are requisitioned by the government due to urban infrastructure construction needs, their original property owners can still enjoy the same development rights as other plots and can achieve equalization of building rights across the entire planning area[39].

The implementation of this system avoids land value differences caused by different planning uses, making interest distribution among landowners more equitable, while allowing the government to ensure the acquisition of public land needed for development and construction without high land acquisition expenditures[13]. Compared to traditional land acquisition models, urban equalization policy pays more attention to market regulation, forming a model combining government guidance with market rules, following the principle of benefit sharing[17], effectively balancing private development interests with public interests[40]. Additionally, the implementation of urban equalization policy not only improves land use efficiency but also reduces the government's fiscal burden in land acquisition, making urban planning more independent of external interest pressures, thereby improving planning implementation feasibility[40]. Its core feature is to achieve balanced allocation of land development rights, enabling municipal authorities to freely obtain a certain proportion of public area resources, providing a more equitable and reasonable land allocation model for sustainable urban development[15].

3.1.3 Policy Framework

In the urban equalization policy system, the central government is responsible for providing the legal framework, regional or provincial governments legislate according to specific needs, and city governments are responsible for implementing specific measures (see Figure 3-1). At the national level, the "Building Code" (DPR 6 giugno 2001 n. 380) and the "Decree-Law for Promoting Economic Growth" (Decreto Legge 70/2011) form the legal framework, providing unified guiding principles for local and government authorities[41]. These laws not only stipulate the basic rules for urban construction but also lay the legal foundation for implementing urban equalization policy through adjustments to land development rights, ensuring planning policies have operability and legal binding force.

As urban planning in Italy belongs to the "joint legislation" domain of the state and regions, regional or provincial governments have the right to formulate specific regulations based on local needs and implementation scope to ensure balanced allocation of regional resources[42]. On this basis, different regions can formulate equalization policies with local characteristics according to their socioeconomic development conditions, adjusting building indices, public land acquisition mechanisms, and development rights trading methods to adapt to different regions' urban development needs. For example, in regions where urban spatial expansion is rapid, regional governments might strengthen restrictions on land use, encouraging land redevelopment and renewal, while in relatively resource-scarce regions, they might guide reasonable resource allocation through equalization policy to promote balanced regional development.

Figure 3-1 Italian Urban Equalization Policy Legal System
(Source: Drawn by the author)

Local governments play a key role in this process, responsible for implementing equalization policy in local planning regulations, including structural and operational levels[42]. At the structural level, local planning sets the overall objectives of urban equalization policy, stipulating implementation standards and methods, such as how to calculate land development rights and how to transfer building rights, while ensuring urban planning can consider both social equity and economic sustainability. At the operational level, planning stipulates detailed rules for implementing urban equalization policy, ensuring the effective implementation of specific projects[16]. For example, in specific land development projects, local governments might adopt a "building rights transfer" approach to ensure the acquisition of public infrastructure land does not cause excessive economic losses to private landowners. Additionally, equalization policy also involves specific planning tools, such as the Municipal Operational Plan (Piano Operativo Comunale) and the Municipal Implementation Plan (Piano Attuativo Comunale), with the former mainly responsible for formulating medium and long-term strategies for urban development, and the latter responsible for specific development project execution, ensuring equalization policy can play a role in practice.

Overall, Italy's urban equalization policy is a multi-level collaborative operational system, with the state providing the legal framework, regional and provincial governments formulating regional regulations, and local governments implementing specific plans, achieving a complete closed loop from legal norms to urban planning practice. This institutional design ensures both the flexibility of planning policies and the coordination between different levels of government, providing strong guarantees for the sustainable development of Italian cities.

3.2 Implementation Framework

The specific implementation process of urban equalization policy varies by region but can generally be divided into four stages: land status survey and evaluation, land classification and equalization zone designation, confirmation and use of building rights, and implementation and management of equalization plans[45], with land classification and the use of building rights directly reflecting the essence of equalization principles.

3.2.1 Land Status Survey and Evaluation

In the implementation of urban equalization policy, land status survey and evaluation is the first step, providing scientific basis for subsequent selection and implementation of equalization models. The core task of this stage is to comprehensively evaluate the intrinsic and extrinsic characteristics of land to ensure rational allocation of land resources and maintain equity in the equalization process[11]. Land's intrinsic characteristics mainly include geographic location, topography, soil quality, and infrastructure conditions, while extrinsic characteristics involve legal provisions for land use, market supply and demand conditions, and the development status of surrounding land. These factors collectively determine the land's economic value and future development potential.

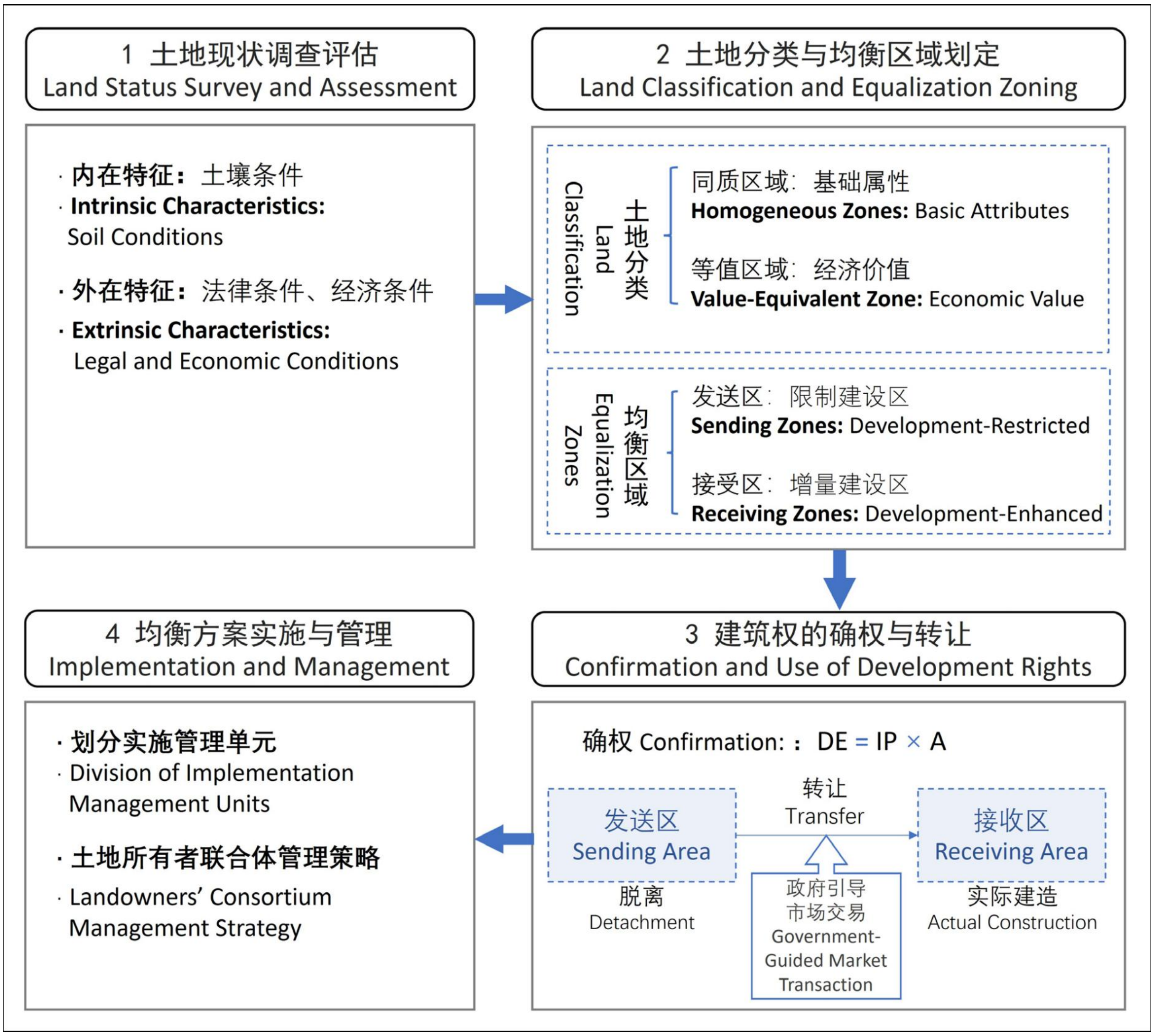

Figure 3-2 Urban Equalization Policy Implementation Process
(Source: Drawn by the author)

In the evaluation process, land characteristics must be determined based on the objective land status before planning formulation, rather than being influenced by subsequent planning uses, to avoid unfairness caused by planning adjustments. Additionally, institutional and economic productive factors of land also need to be considered to ensure equitable and reasonable resource allocation of equalization policy under the framework of real estate market economics. Accurate land evaluation not only helps reasonably define the distribution method of building rights but also provides a basis for setting equalization standards in different regions and ensures the scientific nature of land value compensation mechanisms. Therefore, land status survey and evaluation is not only a technical analysis process but also an institutional guarantee for the fairness and feasibility of equalization policy, laying a solid foundation for subsequent policy implementation.

3.2.2 Land Classification and Equalization Zoning

In the implementation of urban equalization policy, land classification and equalization zone designation is a key link, providing a spatial framework for the specific execution of equalization policy. The core task of this stage is to identify and classify urban land areas with similar characteristics and determine the scope requiring implementation of urban equalization.

First, land classification usually includes homogeneous zones (Zone Territoriali Omogenee, ZTO) and value-equivalent zones (Zone di Isovalore, ZI). Homogeneous zones are districts divided based on factors such as land use, development potential, environmental, and social impacts, mainly focusing on land use and planning characteristics, typically expressed using parameters such as buildable area or building volume[37-38]. This classification method is widely used in urban master planning, ensuring that land with different uses is reasonably allocated within the corresponding spatial range. In comparison, value-equivalent zones are formed based on homogeneous zones combined with refined analysis of the real estate market, mainly used to assess land market value and ensure fair distribution of development rights[43]. Value-equivalent zones are based on the suitability of real estate transformation and related risk assessment, delineating areas with consistent market attractiveness levels, measured by real estate value. This classification method can more accurately reflect the relative value of different plots in the market, providing a basis for fair trading of building rights.

After completing land classification, it is necessary to determine the areas implementing urban equalization based on planning objectives. The scope of equalization zones can be urban partial areas requiring transformation, or can extend to the entire city scope, to adapt to urban development needs at different levels[44]. After delineation of equalization zones, it is further necessary to determine the generation and usage sites of building rights, namely sending and receiving areas[18]. Sending areas are typically regions restricted from development due to ecological, cultural heritage protection, or infrastructure construction needs, while receiving areas are increment construction areas, where building rights actually take effect. Through this mechanism, building rights can reasonably flow between different regions, enabling landowners in development-restricted land to receive reasonable compensation through transferring building rights, while high-density development areas can obtain more usable building indices.

3.2.3 Confirmation and Transfer of Building Rights

In the implementation of urban equalization policy, the confirmation and use of building rights is a core link, directly related to the distribution of landowners' rights and the operability of urban planning. The main task of this stage is to determine the equalization index IP based on land value-equivalent zones, which is an indicator measuring land development intensity[44]. The equalization index is similar to an area's average floor area ratio, representing the total building area or volume assigned to each square meter of land by municipal planning documents based on equalization principles. Building rights are the product of the equalization index and land area (Formula 3-1), determining the total building area or development volume available to landowners[40]. In other words, the distribution of equalization indices directly determines the size of building rights, thereby affecting the value of an area[16].

$$DE = \mathrm{IP} \times A \qquad (3\text{-}1)$$

Where:

DE—Building rights, m^2 (or m^3)

IP—Equalization index, m^2/m^2 (or m^3/m^3)

A—Total land area of the plot, m^2.

For urban renewal and reconstruction areas, determining building rights also involves assessing the value of existing buildings to ensure value balance before and after transformation. The basic principle is that the sum of land value and its depreciated building value before transformation should equal the total value of building rights. If the unit value of existing buildings is higher than the unit value of building rights, owners will receive building rights higher than the original building area under equalization policy; conversely, building rights will decrease[43]. This mechanism ensures equity in building rights distribution across different regions while also ensuring interest balance in the urban renewal process.

Building rights transfer refers to building rights detaching from their originally attached land (sending area) and moving to other areas of different value (receiving area). Essentially, it is a process of flowing from sending to receiving areas. In this process, building rights, as a property right independent of land ownership, can be freely traded on the building rights market. The operation mechanism of building rights transfer includes three stages: "takeoff," "flight," and "landing," where the stage of building rights detaching from original land ownership in the sending area and entering market trading is called the "flight" stage, the core process of building rights transfer[18]. If sending and receiving areas are in different value-equivalent zones, or involve conversion between different building uses, conversion coefficients need to be applied to building rights calculation to ensure fair treatment of different categories of land in terms of development potential and restriction conditions. This operational mechanism is similar to the US Transfer of Development Rights system, separating land development rights from specific plots and entering market trading as property rights interests, thereby achieving more flexible and efficient land resource allocation.

Urban equalization can be classified into restricted equalization (Perequazione Ristretta) and extended equalization (Perequazione Allargata) based on the spatial range involved in building rights flow, with restricted equalization suitable for small-scale urban renewal implemented in the short term, while extended equalization focuses on longer-term, broader regional development planning.

Taking restricted equalization as an example, after building rights are determined, the equalization zone is typically divided into consolidated development areas and public service areas (Figure 3-3). Consolidated development areas are mainly used for private development, such as housing, commercial facilities, parking lots, and private roads, while public service areas are exclusively used for building public service facilities. According to equalization policy regulations, once building rights are allocated, they can only be used in consolidated development areas, not in public service areas[35]. At the same time, land in consolidated development areas must meet certain minimum construction standards before building rights can be actually exercised. This mechanism encourages landowners in consolidated development areas to proactively acquire building rights from public service area landowners to complete building development. After the building rights of public service areas are transferred and used, their attached land is usually transferred to the government free of charge or at a low price to ensure the smooth progress of public facility construction. In this process, the government, consolidated development area owners, and public service area owners are all driven by interests to negotiate. Consolidated development area owners can obtain more building development indices, the government can acquire public facility land, and public service area owners gain economic benefits through building rights transfer. This mechanism ensures the fairness and feasibility of equalization policy, achieving a win-win situation among the government, private developers, and public service area owners.

Figure 3-3 Restricted Equalization Building Rights Use Diagram
(Source: Drawn by the author)

3.2.4 Implementation and Management of Equalization Plans

In the implementation and management stage of equalization plans, to ensure efficient policy execution, equalization zones are further divided into equalization units based on property relationships. The core objective of this stage is to optimize property rights structure, simplify negotiation procedures, and improve the implementation efficiency of equalization policy through reasonable division of management units[53].

Equalization units are the basic management units of equalization policy, typically managed by consortia composed of landowners. The minimum standard for establishing a consortium is that the total land value held exceeds two-thirds of the unit's total land value; once established, its members have the right to uniformly manage and lead land adjustment and redevelopment[53]. Since consortia possess land acquisition rights, the government only needs to obtain the consortium's consent to implement projects when promoting equalization policy, without having to negotiate with each landowner individually, greatly improving management efficiency.

3.3 Implementation Outcomes: Three-Dimensional Equalization

3.3.1 Spatial Dimension

Zoning planning as a core urban development management tool has to some extent limited the circulation of spatial resources. However, with urbanization advancement, regional development imbalance issues have gradually emerged. For example, in Milan, the city center developed rapidly due to high concentration of economic, cultural, transportation, and other resources, while peripheral areas could not meet residents' demands for employment, public services, and transportation due to insufficient planning and resource investment. Similar imbalance phenomena also appeared at the national level, where economic centers like Milan and Rome received continuous development due to policy and resource tilt, while surrounding small and medium-sized cities fell into growth stagnation[40].

To address this issue, Italy's urban equalization policy introduced a spatial transfer mechanism for building rights, alleviating development imbalance phenomena by allocating building quantity between different regions. This mechanism allows building rights in restricted construction areas (such as ecological protection areas, historical-cultural protection areas, etc.) to be transferred to increment construction areas (such as urban renewal areas or expansion areas), thereby optimizing spatial allocation of land resources and improving utilization efficiency of construction land.

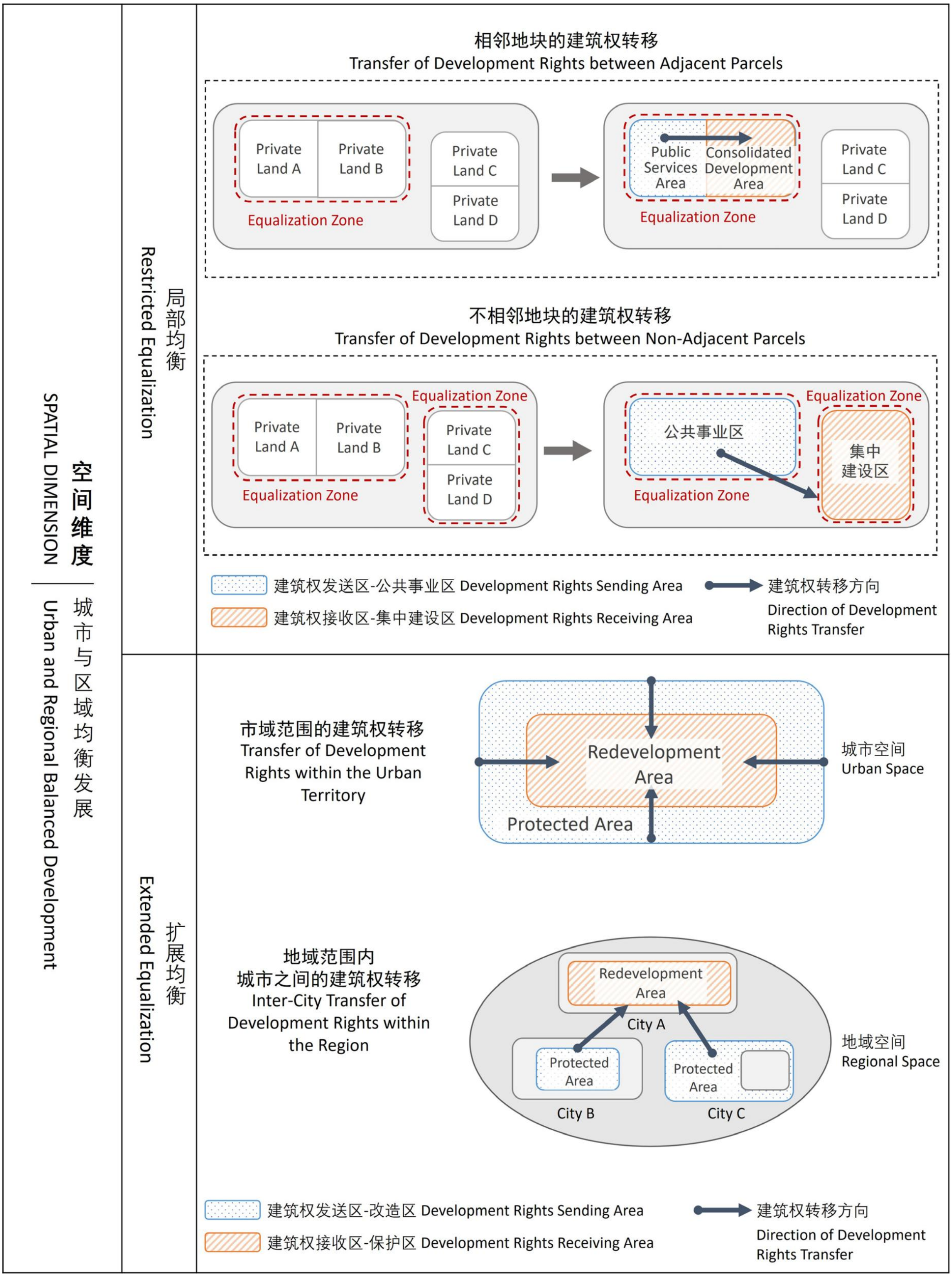

Figure 3-4 Spatial Dimension Equalization Analysis
(Source: Drawn by the author)

In specific implementation, spatial transfer of building rights can be divided into restricted equalization and extended equalization[16]. Restricted equalization primarily targets small-scale urban renewal areas, redistributing building rights within the same district through equalization zoning to address conflicts between public facility shortages and private development rights[45]. Building rights in this model typically transfer from public service areas to consolidated development areas, ensuring rational layout within limited space and improving land development utilization efficiency.

In contrast, extended equalization applies to larger-scale land resource optimization, including coordinated development within an entire city or multiple cities forming a regional scope. This model is implemented under regional planning guidance, only distinguishing between transformation areas and protection areas, stipulating that building rights in protection areas can only be realized in transformation areas[45]. The extended equalization mechanism emphasizes balance between environmental protection and economic development; for example, while restricting development in ecologically sensitive areas, it transfers building rights to urban renewal areas to promote urban revitalization. Building rights flow can occur both within a single city and across cities to promote balanced regional development.

The spatial transfer mechanism of building rights enhances urban planning flexibility, allowing local governments to adjust resource allocation according to development needs, both ensuring sustainability in restricted areas and providing necessary development space for construction areas. Ultimately, this mechanism helps achieve more balanced resource allocation on a larger scale, promoting coordinated regional development and improving overall urban planning efficiency.

3.3.2 Land Use Dimension

Traditional land use planning based on strict zoning by land use has to some extent limited multi-functional development of buildings[13]. For example, Rome's urban zoning planning has long formed serious restrictions on modern multi-functional development due to emphasis on historical protection. This rigid planning makes the city lag in responding to population growth and modern commercial needs, especially in peripheral areas where insufficient public facilities and employment opportunities exacerbate development imbalances between central and surrounding areas[46]. Addressing this issue, urban equalization policy optimizes land resource allocation by breaking through traditional planning's use restrictions, increasing land use flexibility to better adapt to modern urban development needs.

The core mechanisms for use changes include homogeneous zone division, building rights confirmation, and land use conversion coefficient setting, which together form the basis for flexible adjustment of land uses. In the process of homogeneous zone division and building rights confirmation, urban equalization policy avoids traditional planning's rigid zoning model, instead dividing homogeneous regions according to land's current status and legal conditions, allocating the same equalization index within these regions, no longer strictly distinguishing between residential, public service, commercial, or green space uses. This approach provides greater space for subsequent flexible use of building rights, making land uses no longer fixed but adjustable within a reasonable range according to needs[13].

Under traditional planning models, different land uses are strictly divided with clear boundaries, limiting development flexibility (as shown in Figure 3-5, traditional land zoning is divided into four areas by use). Urban equalization policy, by dividing homogeneous areas, designating equalization coefficients, and allocating building rights, allows different types of development rights to freely transfer within homogeneous areas (as shown in Figure 3-5, urban equalization zoning divides into two areas based on land characteristics, each allocated an equalization index).

Additionally, land use conversion coefficients (Coefficienti di Conversione, C) are important tools in urban equalization policy for realizing land use adjustments. The coefficient values depend on housing prices in different regions or market values of buildings with different uses, ensuring economic equivalence during use conversion[41]. This mechanism allows value conversion between lands of different uses; for example, when adjusting a plot from its original use—residential and public service land under traditional zoning—to commercial land, the original uniformly allocated building rights DE1 must be converted to DE3 according to the corresponding conversion coefficient C1, i.e., the commercial building area usable in that equalization zone.

Through the use change mechanism, urban equalization policy not only meets the need for "integrated building functions" in the land use dimension, allowing different land uses to coexist in the same space[13], but also ensures complex land utilization through nature conversion coefficients, making development more flexible and efficient. This policy not only improves land resource utilization efficiency but also enhances urban planning adaptability, enabling cities to more adequately address future development challenges.

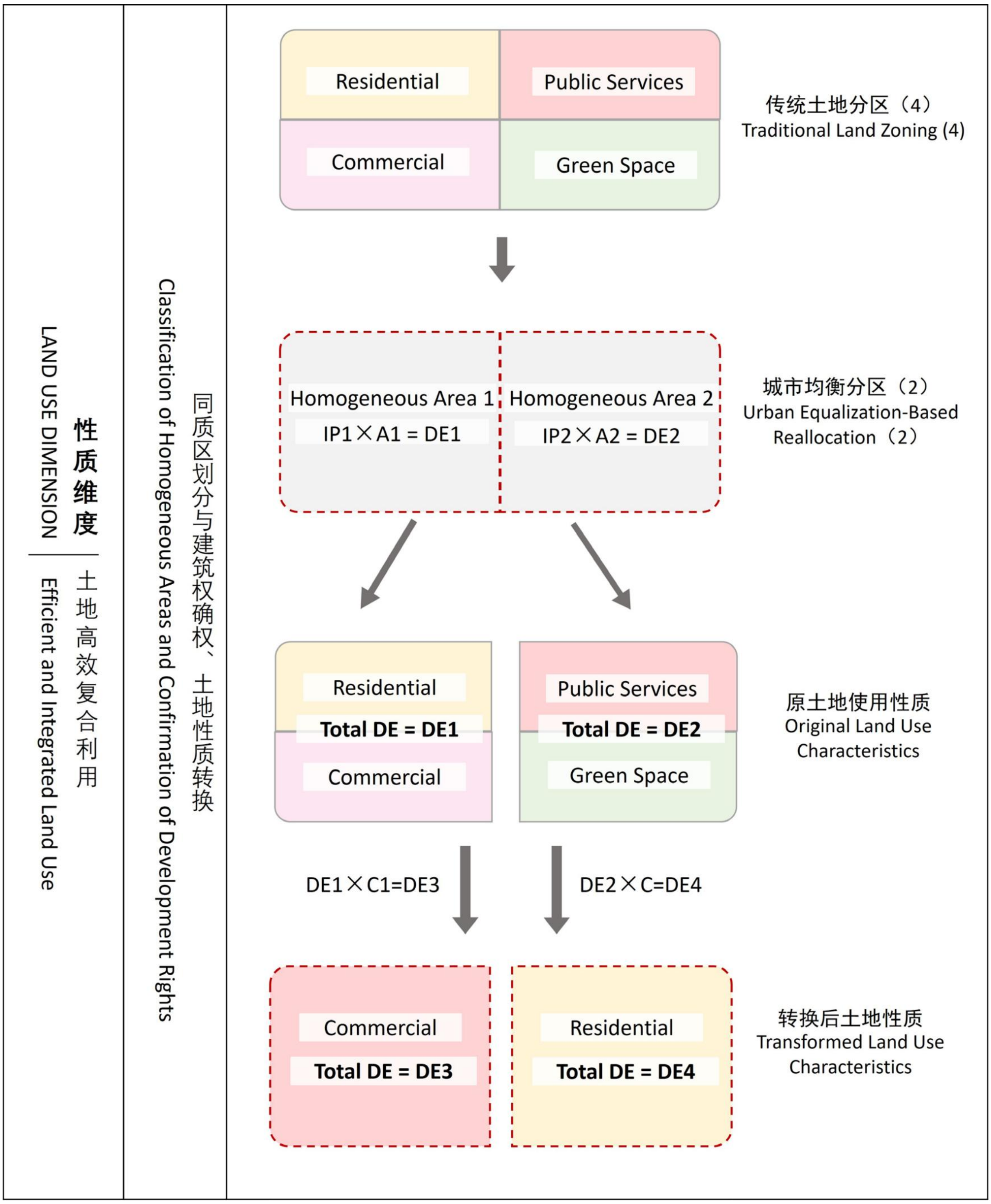

Figure 3-5 Land Use Dimension Equalization Analysis
(Source: Drawn by the author)

3.3.3 Institutional Dimension

Urban equalization policy follows the principle of benefit sharing[17], aiming to coordinate the interests of landowners, government, and developers through a multi-stakeholder fair sharing model, making land resource allocation more rational. Specific implementation strategies include fair distribution and transfer of building rights, and combining government control with market operation, to improve land utilization efficiency and achieve balance of socioeconomic interests.

Traditional land acquisition models often ignore original landowners' rights to obtain land appreciation benefits, leading to unbalanced distribution of land value increments. For example, landowner A, whose land is acquired by the government, can usually only receive low-price compensation without enjoying appreciation benefits brought by land development, while landowner B of adjacent plots gains external benefits from public facility construction. Under urban equalization policy, landowner A can recover losses from land acquisition by selling building rights to plot B through the building rights transfer mechanism. Meanwhile, landowner B can realize larger development space by purchasing additional building rights while enjoying benefits from public facilities. This mechanism distributes land value increments more fairly among owners, alleviating interest conflicts caused by land acquisition and ensuring equalization policy's fairness.

Urban equalization policy not only optimizes interest distribution among landowners but also reduces government development costs. In traditional models, governments often need to pay high compensation and infrastructure construction costs to obtain public construction land. However, this approach makes it difficult for governments to capture capital gains from public facility construction, increasing fiscal burden. Under the equalization policy framework, governments reduce land acquisition costs by delineating equalization zones and guiding building rights flow, allowing public facility construction land to be acquired free or at low cost[39]. Additionally, land value increments from urbanization can flow back to the government through taxation mechanisms, further reducing fiscal pressure in infrastructure investment.

Implementation of equalization policy also enhances market enthusiasm, promoting active participation by developers. In traditional land acquisition processes, developers mainly profit from government-authorized public facility construction, whereas in equalization policy, building rights as tradable resources provide developers with new development opportunities. Developers can develop projects in consolidated development areas by purchasing building rights, thus obtaining more market benefits. Simultaneously, the circulation of the building rights market enhances developers' flexibility, allowing them to freely choose development locations within areas covered by equalization policy, improving project feasibility and return rates.

In the building rights transfer process, government authority guidance combines with market mechanisms to jointly ensure the fairness and transparency of building rights transactions. The Italian government establishes municipal registers through legislation, recording building rights circulation and making relevant information public, ensuring market transaction transparency[41]. Additionally, while supervising the building rights market, the government can dynamically regulate the real estate market to ensure reasonable allocation and transfer of building rights, avoiding the impact of market speculation.

Overall, urban equalization policy achieves interest sharing among multiple subjects through fair distribution of building rights, reducing government development costs, activating market entities' enthusiasm, and establishing sound regulatory systems. This mechanism not only improves land utilization efficiency but also effectively alleviates social conflicts arising from uneven distribution of land value increments, making urban development more coordinated and sustainable.

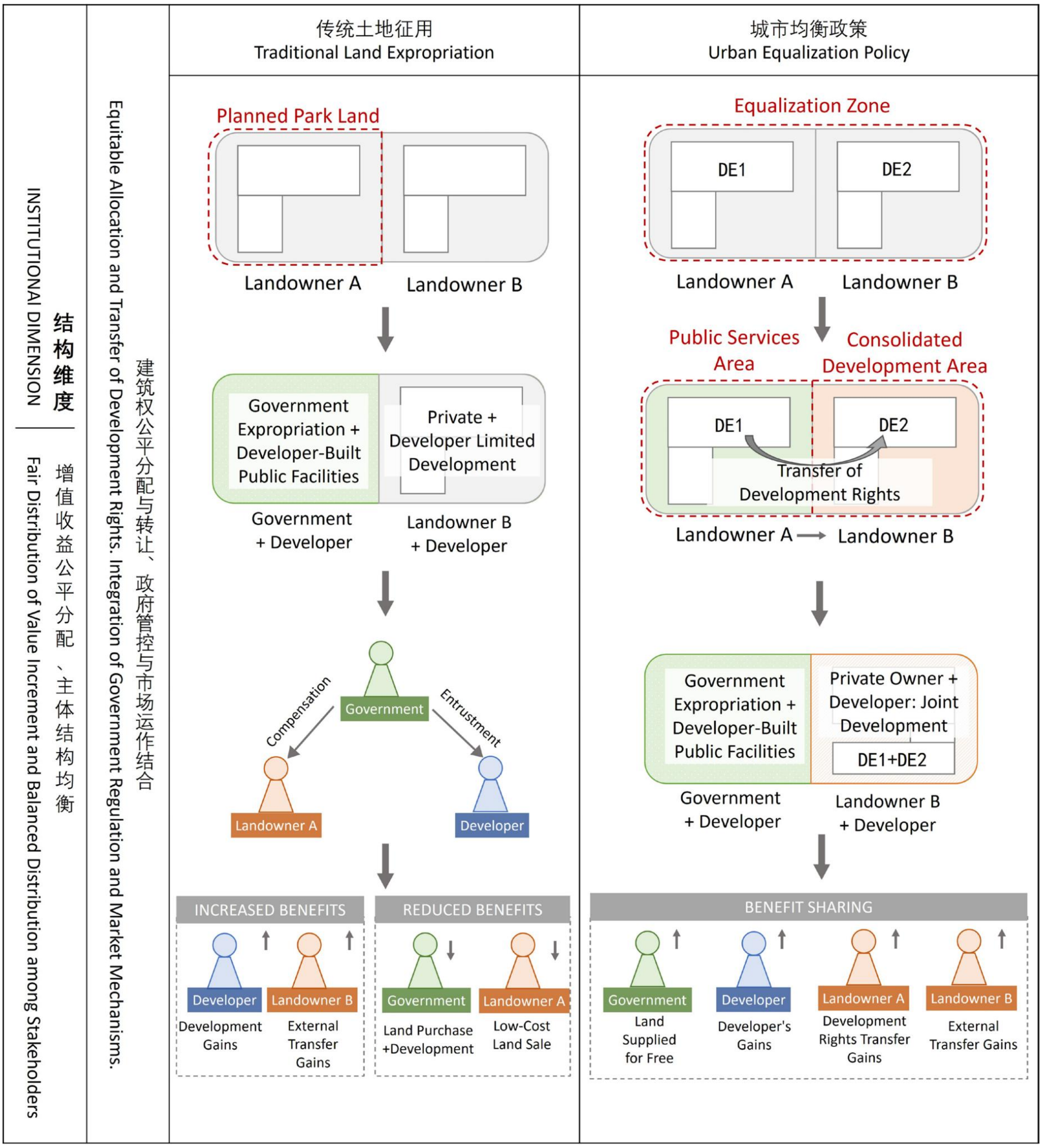

Figure 3-6 Institutional Dimension Equalization Analysis
(Source: Drawn by the author)

3.4 Case Studies

3.4.1 Milan's 2030 Urban Spatial Plan

（1）Milan 2030 PGT Documents

As the capital of Lombardy Region and the provincial capital of Milan Province, Milan is the core engine of metropolitan development in northern Italy. In recent years, with population growth, economic recovery, and social structure changes, Milan faces numerous challenges in spatial and social development, including urban spatial expansion, social polarization, and climate environmental changes[47]. To address these issues, the Milan municipal government formulated the "2030 Milan Urban Spatial Plan" (Piano di Governo del Territorio, PGT), proposing five major planning objectives: transportation interconnection, social equality, environmental protection, neighborhood friendliness, and urban renewal. Its spatial focus is on stitching together the fragmented central and suburban areas through public space optimization, while strengthening connections between the city and natural ecological environment without increasing land development.

In the specific legal documents of the "2030 Milan Urban Spatial Plan," including the "Rules Regulations"[48] (Piano delle Regole, PdR) and "Services Plan"[49] (Piano dei Servizi, PdS), the implementation principles of urban equalization policy are further clarified. These documents stipulate that the implementation scope of urban equalization policy includes urban reconstruction areas, environmental regeneration areas, public space areas, transfer nodes, historical core areas, and pedestrian spaces, uniformly using 0.35 (m^2/m^2) as the basic equalization construction index[48]. This index ensures that different regions maintain fairness in land use during development, while providing standardized basis for reasonable flow of building rights.

Additionally, the implementation of urban equalization policy in Milan also involves equalization management of different functional lands, especially in key areas such as public service facilities, ecological green spaces, and transportation infrastructure. For example, in ecological woodland areas where building rights transfer out, landowners need to take responsibility for maintaining plants in the woodland and conduct appropriate afforestation to ensure implementation of ecological compensation measures[49]. Meanwhile, the Milan municipal government has also made detailed regulations on the transfer and registration of building rights. For example, building rights can be freely transferred within the city area, but must be done through signing public or private contracts, and recorded in the municipal building rights transfer register to ensure the legality and transparency of transactions[47].

（2）Environmental Protection in PGT

Urban equalization policy plays a key role in environmental protection and urban renewal, especially with support from the building rights transfer mechanism, ensuring balanced distribution of construction volume across the entire city, avoiding ecological damage caused by excessive development. In the environmental protection strategy of Milan's 2030 Urban Spatial Plan (PGT), the government plans to protect 1.7 million square meters of land from urbanization impact, optimizing land use structure and reducing land consumption by four percent through reducing residential development and restricting agricultural land construction[47].

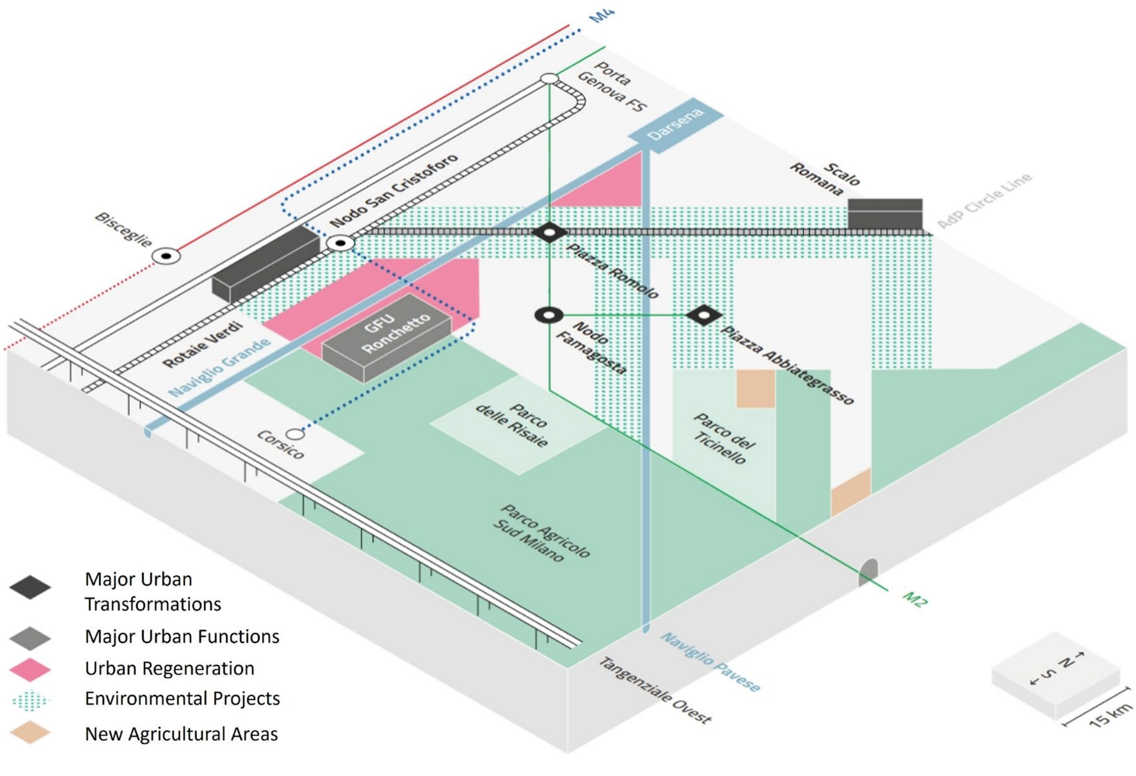

Figure 3-7 Milan Southwest Region Canal Axis Area Agricultural Ecological Transformation Diagram
(Source: Redrawn by the author based on reference [47]

To further enhance ecological protection, PGT especially emphasizes the protection and regeneration of agricultural landscapes on the city outskirts, encouraging agriculture development in peripheral areas to maintain ecological balance. For example, near the Naviglio Grande Canal and Pavia Canal axis in southwest Milan (Figure 3-7), agricultural production and environmental landscape transformation are set as the main development goals. Agricultural landscape protection areas such as South Milan Agricultural Park are included in the planning scope. In these areas, PGT adopts building rights reduction planning, i.e., through building rights transfer, limiting new development to prevent agricultural land from being eroded by urbanization, while encouraging ecological transformation and environmental renewal.

Additionally, PGT supports releasing ecological and agricultural areas to advance metropolitan park construction. This strategy not only improves urban green coverage but also establishes a more dynamic land flow mechanism between residential and ecological lands through equalization policy. Through these measures, PGT ensures balance between environmental protection and urban expansion while laying foundations for future green development.

（3）Urban Renewal in PGT

In terms of urban renewal, Milan's 2030 Urban Spatial Plan (PGT) promotes renewal of buildings within the city and mends fragmented spaces through the building rights transfer mechanism, making the urban structure more coherent and sustainable[47]. For example, in the Knowledge Innovation Center in northwest Milan (Figure 3-8), planning hopes to enhance the vitality of the connection area from Milan to Malpensa International Airport through a series of transformation projects. Renewal of this area mainly includes building innovation centers relying on universities, functional transformation of abandoned industrial areas, and upgrading of infrastructure. By stimulating cooperation between public and private sectors, the government guides external building rights to renewal areas for increment construction, achieving balance in space, structure, and function in three dimensions, and establishing more effective spatial connections at the metropolitan scale, promoting regional strategic transformation.

Urban renewal and regeneration is one of the core concepts of Milan's 2030 plan, aiming to reshape urban public spaces and heritage, and rebalance quality of life in urban peripheries. In this process, urban equalization policy and building rights transfer strategies become important tools for promoting renewal. PGT allows building rights to flow between different plots, promoting renewal and transformation of already-built building clusters within the city, while controlling land development in urban peripheral areas to alleviate urbanization erosion of surrounding ecological environments.

Additionally, PGT aims to repair spatial fractures between these regions and the central urban area through urban equalization tools for unintegrated areas at the urban edge, promoting connections between the metropolitan area and surrounding cities, thereby forming a sustainable model of reuse and recycling for urban renewal. This model not only helps optimize urban spatial structure but also enhances Milan's competitiveness as an international metropolis, maintaining its leading position in the global urban system.

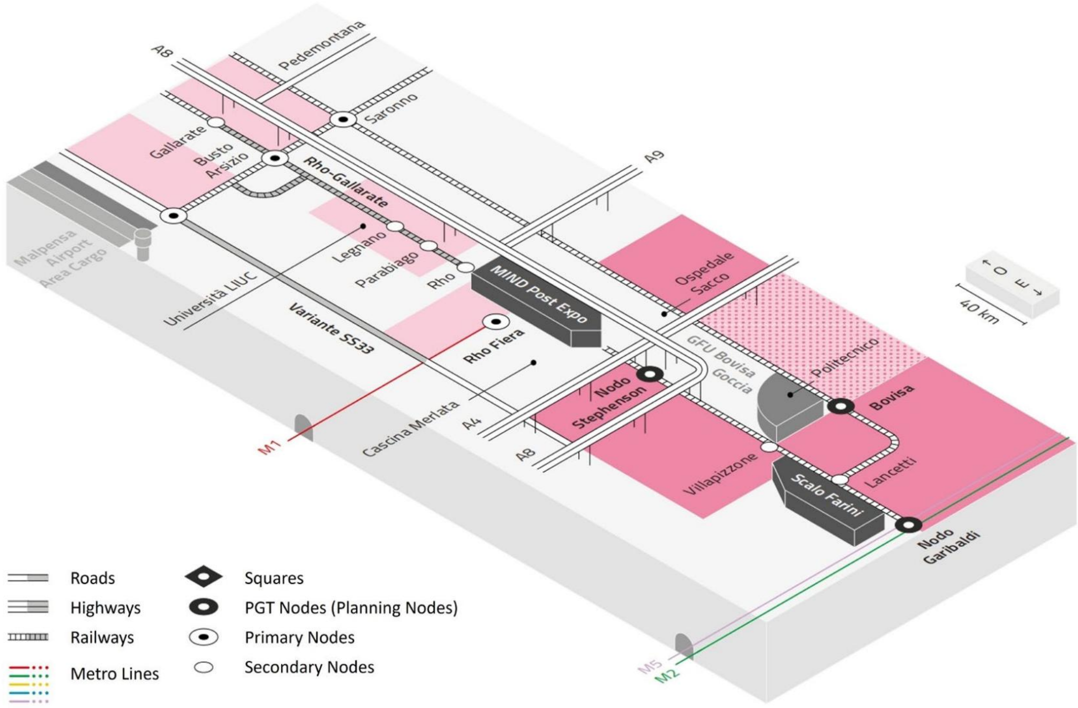

Figure 3-8 Milan Northwest Knowledge Innovation Center Renewal Transformation Diagram
(Source: Redrawn by the author based on reference [47]

3.4.2 The Ecological Redevelopment of the "Acilia–Madonnetta" Suburban Center in Rome

(1) Background of Redevelopment

As Italy's capital and a historic cultural metropolis, Rome entered the 21st century facing dual challenges: the fragmentation of urban functions and increasing ecological vulnerability. A strategic balance between urban development and climate adaptation became urgent. To address these issues, the municipal government issued a revised General Urban Plan in 2008, which proposed a polycentric urban structure to replace the traditional monocentric layout. It designated 18 urban and metropolitan centers, aiming to regenerate peripheral areas and restructure urban resources through the introduction of social housing, green mobility, and public service infrastructure [50–52]. Among them, Acilia–Madonnetta emerged as a key node due to its ecological potential and spatial integration value. Located southwest of the city beyond the ring road, the area covers 136.1 hectares and lies at the interface between ecological conservation zones and urban expansion fronts.

The area had long lacked effective regulation, resulting in a highly fragmented urban form. The territory was dominated by non-productive agricultural land and underutilized parcels, with widespread informal construction, scattered settlements, and privately initiated subdivisions, producing a fractured spatial structure, weak infrastructure, and insufficient public services. Despite rich surrounding ecological resources, the internal area lacked a green infrastructure system and ecological networks, compromising hydrological and biological functions. Furthermore, the absence of an integrated transport system and poor accessibility exacerbated marginalization. Redevelopment of Acilia–Madonnetta therefore required both spatial restructuring and comprehensive strategies integrating institutional adjustment and ecological restoration [50].

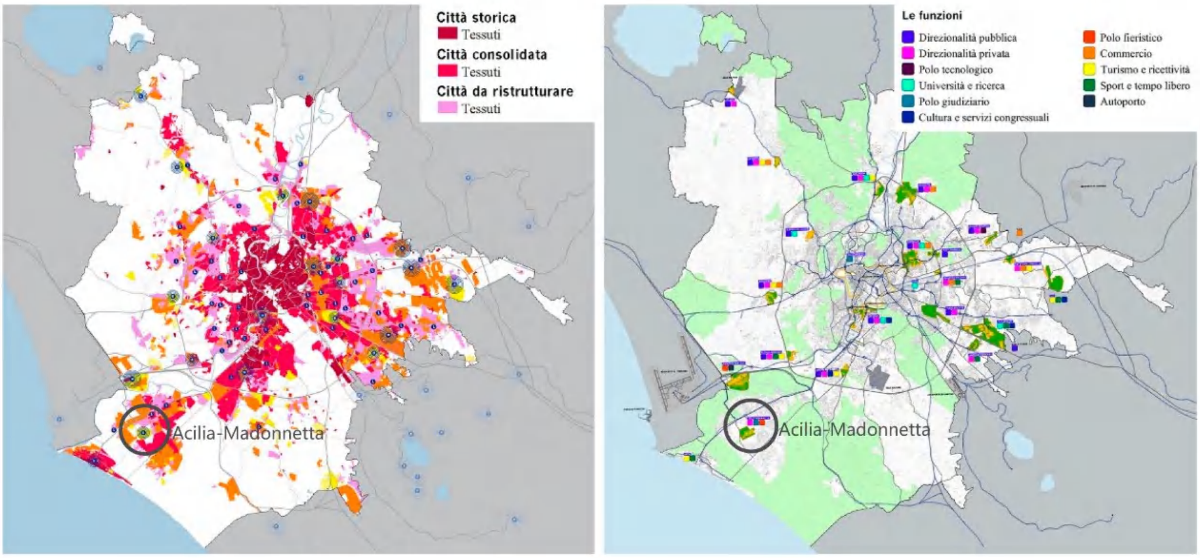

Figure 3-9 Functional Distribution of Rome's Polycentric Urban Plan
(Source: Redrawn by the author based on Reference [50])

（2）Operation of the Equalization–Offset Model

In the redevelopment of Acilia–Madonnetta, the urban equalization policy functioned not only as a legal mechanism for granting development rights over former agricultural land but also shaped the entire process of planning, index allocation, land use regulation, and ecological resource distribution. Introduced in the 2008 General Urban Plan, the equalization–offset model served as a key institutional innovation aimed at simultaneously achieving spatial development and environmental protection. Under this mechanism, private developers were required to transfer a proportion of their land to the municipality at no cost for public uses, thereby balancing private gains with public interests [50,53].

According to planning appendix data [54] (see Table 3-1), Acilia–Madonnetta's total land area is 1,361,662 m², with a planned total building area of 351,582 m². Of this, 194,174 m² was reserved by the municipal government for public and social purposes, while 157,408 m² was allocated to private developers. Over 55% of the total floor area was not derived from inherent land ownership but obtained via institutional regulations and the transfer of building rights.

Table 3-1 Total Building Area Statistics
(Source: Reference [50])

LSA (m²)	Private GFA (m²)	Public GFA (m²)	Total GFA (m²)	Transfer of Areas %
1,361,662	157,408	194,174	351,582	55.2%

The total public building area of 194,174.0 m² was generated through building rights transfer mechanisms [55], categorized into five sources based on the equalization–offset model: specific planning compensation, urban renewal projects, social housing programs, ecological area transfers, and compensatory allocations. Except for the first, all building rights were generated internally or distributed by policy.

Table 3-2 Sources of Public Building Rights
(Source: Reference[50])

Institutional Sources by Allocation Purpose	GFA m²	%
Compensations ("Certain Plan")	59,487.5	30.6
Urban renewal	24,854.0	12.8%
Social housing	60,000.0	30.9%
Transfer of built volumes from the ecological network	41,832.5	21.5%
Compensatory assignment	8000.0	4.1%
Total	94,174.0	100.0%

The first category involved transferring development rights from four external plots designated for heritage or ecological conservation to the center for public infrastructure.

Table 3-3 Specific Planning Compensation Transfers
(Source: Reference [50])

Name	LSA (m²)	GFA Departure (m²)	Exchange Ratio	GFA Arrival (m²)
G3—Castel Fusano	39,149	2750.0	1.0	2750.0
D—Castel Fusano	49,420	18,750.0	1.0	18,750.0
G3—Ponte Fusano	223,733	6738.5	1.0	6737.5
E1—Malafede (residue)	149,848	31,250.0	1.0	31,250.0
Total	462,150	59,487.5	1.0	59,487.5

Figure 3-10 Illustration of Development Rights Transfer through Specific Planning Compensation (Source: Reference [50]))

（3）Design Proposal

The proposal is centered on ecological sustainability and environmental regeneration, integrating environmental, social, and economic dimensions through the introduction of green infrastructure, hydrological regulation systems, and multifunctional urban spaces. The master plan divides the site into four functional zones based on existing road networks and introduces four bio-lakes and water channels to form continuous blue-green corridors. Large-scale ecological green spaces are positioned in the northwest and southeast for buffering and stormwater retention, while the central zone accommodates the primary development volume with mixed-use functions.

The total planned construction area is 351,582 m², with 40% (approximately 140,633 m²) designated for residential use, including 60,000 m² of social housing for approximately 3,750 residents. The remaining 210,949 m² serves non-residential purposes [50]. The mixed-use program includes a university campus, Music City, a media and cultural center, a craft district, courthouse, commercial spaces, and tourist facilities, reflecting a public-private development synergy.

Figure 3-11 Overall Functional Structure Diagram
(Source: Reference [50])

Table 3-4 Functional Building Area Statistics
(Source: Reference [50])

	Public GFA (㎡)	**Private GFA m2 (㎡)**	**Total GFA (㎡)**	**%**
Residential	44,532	36,100	80,633	22.9%
Social housing	60,000	0	60,000	17.1%
University campus	52,849	0	52,849	15.0%
City of music	0	32,000	32,000	9.1%
Media library and cultural center	36,793	0	36,793	10.5%
Citadel of craftsmanship	0	30,558	30,558	8.7%
Justice palace	0	31,250	31,250	8.9%
Commerce	0	20,000	20,000	5.7%
Tourist accommodation		7500	7500	2.1%
Total	194,174	157,408	351,582	100.0%

The transportation system aims to improve accessibility and ecological adaptability. A cross-shaped primary road structure divides the site into four zones, with central park-like boulevards combining traffic, landscape, and environmental functions. Road sections integrate pedestrian paths, bike lanes, tram tracks, green buffers, and slow-traffic systems to build a comprehensive multimodal and sustainable mobility network. Features include ecological trams, pedestrian and cycling paths, EV charging stations, diverse parking options, and shared mobility services, supporting education, housing, employment, and community services.

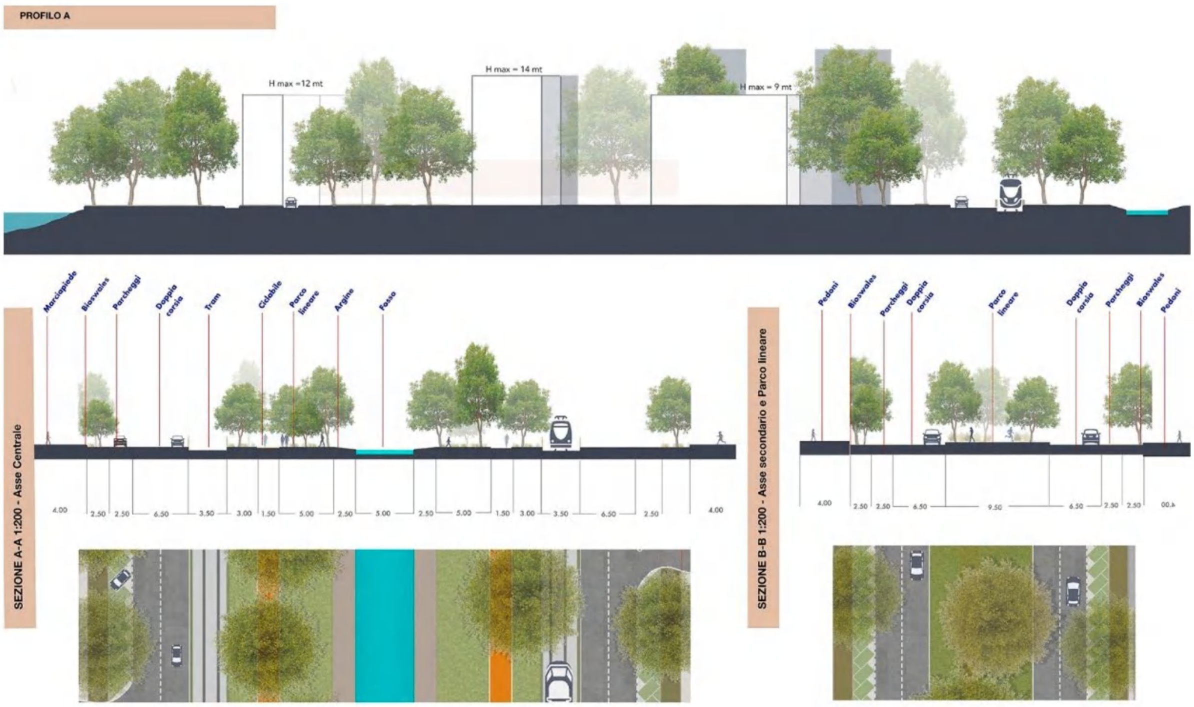

Figure 3-12 Road Section and Park-Style Street Design Diagram
(Source: Reference [50])

The water system incorporates a multifunctional rainwater management and ecological regulation network to enhance urban climate resilience [56–59]. Components include permeable surfaces, vegetated swales, bio-lakes, and rain plazas, forming a green urban hydrological chain of "collection–filtration–purification–reuse." Bio-swales, planted with rich vegetation, slow surface runoff and enhance rainwater infiltration and retention. They are co-designed with pedestrian and green corridors, integrating ecological and public space functions.

Figure 3-13 Surface Infiltration and Rainwater Retention System Diagram
(Source: Reference [50])

At the system's endpoint are four bio-lakes with swimming capacity, using phytoremediation techniques to ensure water quality [50,60]. These lakes serve recreational and ecological education purposes while moderating microclimates and supporting biodiversity. Adjacent areas include health trails, ecological gardens, and activity plazas, forming integrated "water-green-human" ecological public spaces.。

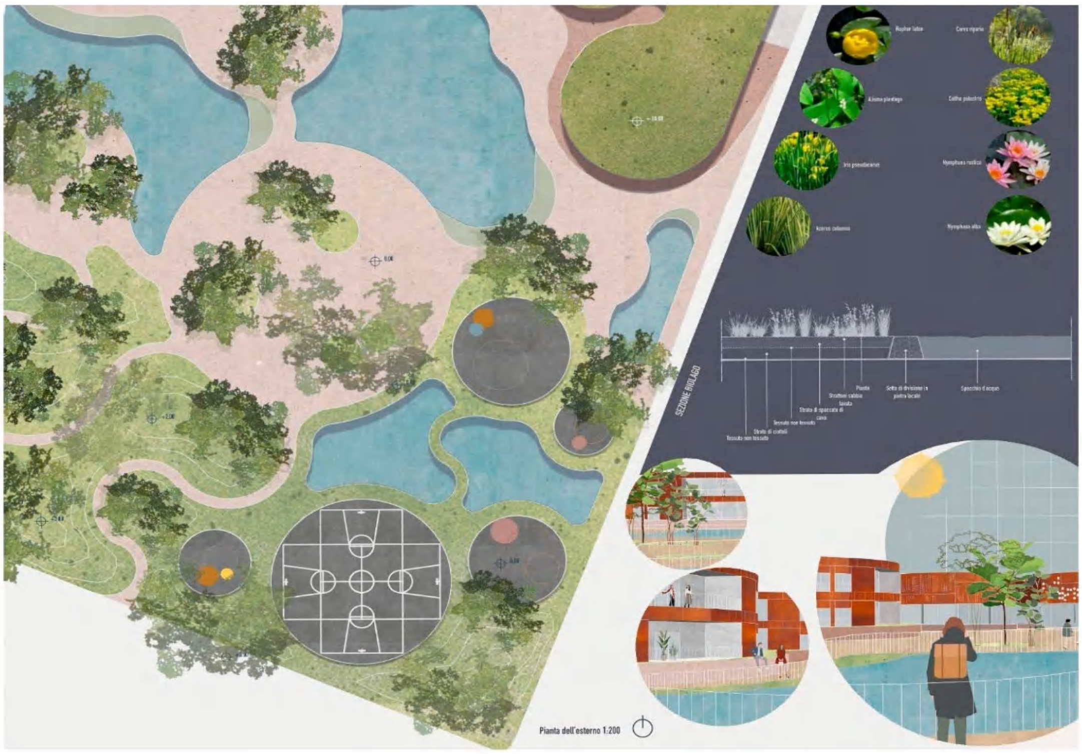

Figure 3-14 Bio-Lake Landscape and Ecological Purification System Diagram
(Source: Reference [50])

The project also develops a multidimensional green infrastructure system through coordinated planning of ecological parks, reforested areas, green streets, and open space systems, enhancing the city's environmental functions and climate resilience [50] . A 10.7-hectare high-natural-value forest is planned at the central node, planted with native tree and shrub species for ecological buffering and carbon sequestration. A key feature is short-rotation forestry (SRF), combining biomass production with landscape compensation, supplying material for cogeneration systems. Fast-growing energy forests are also planted on the urban–rural edge as a renewable energy source and carbon-neutral strategy. The green system integrates with stormwater networks, bio-lakes, and mobility corridors to strengthen connectivity, alleviate urban heat islands, and improve microclimate conditions.

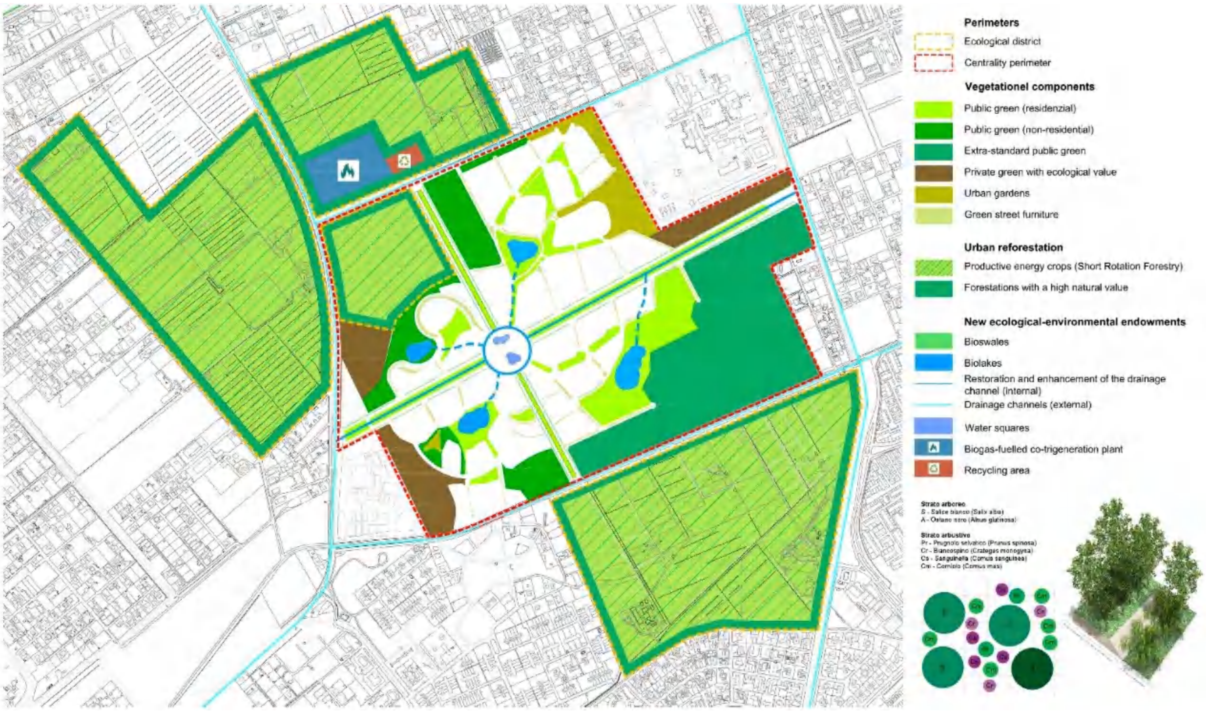

Figure 3-15 Green System and Reforestation Strategy Diagram
(Source: Reference [67])

（4）Ecological and Social Benefits

Ecologically, the project achieved substantial restoration and environmental upgrades through the equalization mechanism and green infrastructure. By the end of the project, 117.2 hectares of public-use land—86% of the total area—were acquired through free transfers [50], serving climate regulation, rainwater purification, biodiversity restoration, and carbon sink functions.

Table 3-5 Public Land Acquired through Transfers
(Source: [50])

Destinations	**Surface(㎡)**	**%**
Green and public services	336,361	28.7%
Canal, bioswales, water squares, and bio lakes	100,000	8.5%
Ground level and multistory parking	71,020	6.1%
Private green with ecological value	37,601	3.2%
Urban gardens	60,000	5.1%
Short Rotation Forestry—SRF	249,616	21.3%
Interchange and roads	129,046	11.0%
Purposes of public or general interest	188,007	16.0%
Total	1,171,652	100.0%

Socially, the equalization policy facilitated not only the granting of development rights but also a public-interest urban restructuring model. In exchange for development rights, private landowners transferred portions of land to the city at no cost, which was then used for green infrastructure and public services. The project generated €112 million in municipal revenue through basic and additional development fees, supporting infrastructure and public service investment, and enhancing the financial sustainability of the equalization model [50].

（5）Summary

Originally composed of low-density, non-productive agricultural land, most of which was privately owned but lacked autonomous development rights, Acilia–Madonnetta gained conditional development rights through its designation as a central node in the 2008 General Urban Plan. Developers were granted building indices on the condition that a portion of land would be transferred to the city for green infrastructure and public spaces. Through this institutional framework, the city achieved spatial rebalancing and more efficient land use. Rome's equalization–offset model institutionalized the link between development rights, ecological conservation, and public benefit, creating a governance system that aligns private development with public responsibility, with notable outcomes in ecological restoration, infrastructure provision, and social inclusion.

3.4.3 Application of Urban Equalization Policy in Padua's Implementation Plan

Padua City (Città di Padova), as an important city in the Veneto Region, has systematically introduced urban equalization mechanisms into its "Intervention Plan (Piano degli Interventi, PI)" and "Inter-Municipal Master Plan (Piano di Assetto del Territorio Intercomunale, P.A.T.I.)"[61] under the framework of "Regional Law No. 11/2004", and in 2021 formulated the "Guidelines for Application of Urban Equalization in the Intervention Plan (Linee guida per l'applicazione della perequazione urbanistica nel Piano degli Interventi)"[43] as a supporting explanatory report, providing detailed explanations on aspects such as building rights delineation, transfer mechanisms, value conversion coefficients, and distribution of development rights across different plots.

（1）Market Value and Conversion Coefficient Determination

The basic principle of the building rights transfer system is that the total economic value of building rights in their generation area (sending area) equals the total economic value of building rights in their use area (receiving area). The unit price of building rights is based on market price, determined by government regulatory departments' assessments, used in practice in the form of "value-equivalent area" maps. To ensure equal value transfer of building rights, certain conversion coefficients need to be set.

Padua City, through surveys of the real estate market, delineates and calculates the average land value of each value-equivalent area (Formula 3-2), forming a "real estate value map." The formula for calculating real estate value is as follows:

$$V_{zona} = \frac{\sum_{i=1}^{n} P_i \cdot A_i}{\sum_{i=1}^{n} A_i} \tag{3-2}$$

Where:

V_{zona}—Average land value of a value-equivalent area, €/m²;

P_i—Market price of a certain plot in the area, €;

A_i—Area of the corresponding plot, m².

Through this calculation method, the government can set reasonable market prices for each area, providing scientific basis for building rights trading.

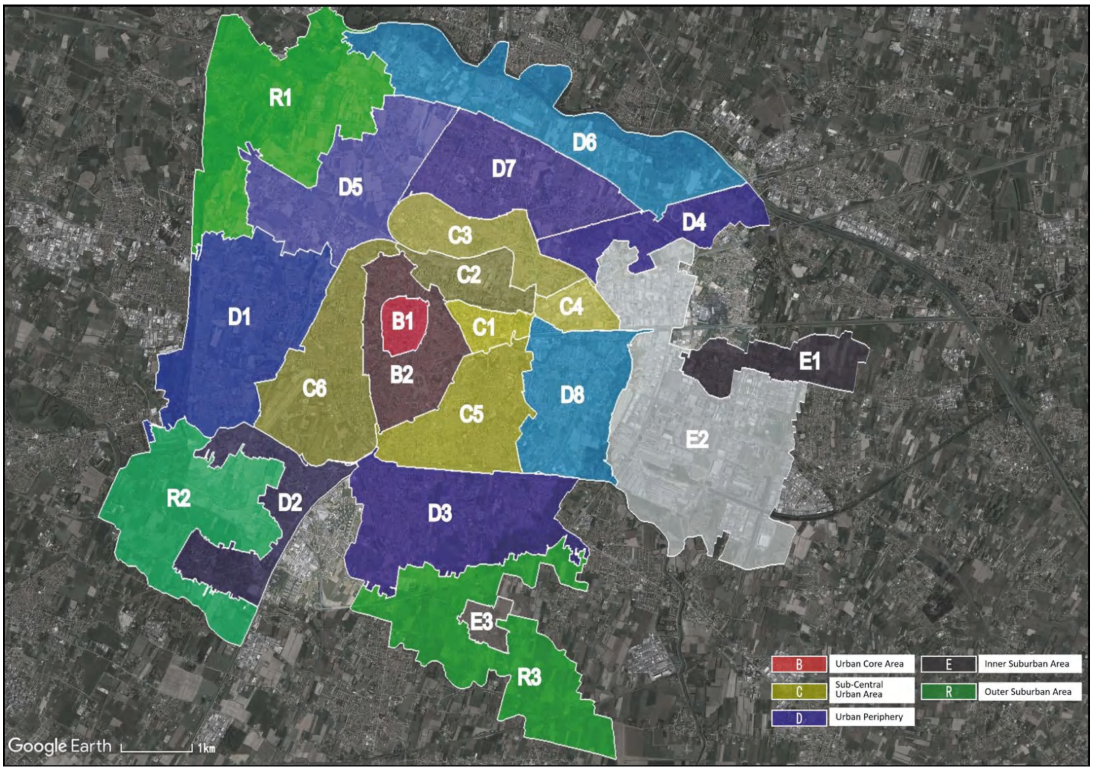

Figure 3-16 Value-Equivalent Zone Illustration in Padua City's Real Estate Value Map
(Source: Author's translation from reference [43])

The "real estate value map" includes value-equivalent zone illustrations and indicator statistical tables. Padua City has divided five categories and twenty-six value-equivalent zones. The value-equivalent zones in Figure 3-16 are areas where reference unit values for new buildings can be considered the same in terms of environment, urban planning, legal aspects, etc.[51]. The urban planning department of Padua City government updates this map annually based on current changes in real estate values, including verifying regional boundaries and updating reference unit quotes, ensuring that urban equalization policy uses the latest "real estate value map" to formulate detailed implementation plans.

Due to differences in land values across different regions, when building rights flow between different regions, they need to be adjusted according to conversion coefficients to ensure that the value of building rights in the sending area equals that in the receiving area. The calculation method for conversion coefficients is as follows:

$$C_{trasferimento} = \frac{V_{dest}}{V_{orig}} \quad (3\text{-}3)$$

Where:

$C_{transferimento}$—Conversion coefficient for building rights transfer;

V_{dest}—Unit land value of the receiving area, €/m²;

V_{orig}—Unit land value of the sending area, €/m².

Padua City government creates a double-input matrix by calculating individual conversion coefficients to define conversion coefficients of building rights between different value-equivalent areas. Some value-equivalent area conversion coefficients are shown in Table 3-6:

Table 3-6 Padua City's Residential Use Building Rights Transfer Conversion Coefficient Matrix (B, C Zones) (Source: Author's extraction from reference [51])

Value €/m²	Receiving	B1	B2	C1	C2	C3	C4	C5	C6a	C6b
Sending		4,050	3,700	2,700	2,250	1,650	1,650	2,450	2,600	2,200
B1	4,050	1.00								
B2	3,700		1.00							
C1	2,700			1.00						
C2	2,250	1.80	1.64	1.20	1.00	0.73	0.73	1.09	1.16	0.98
C3	1,650	2.45	2.24	1.64	1.36	1.00	1.00	1.48	1.58	1.33
C4	1,650	2.45	2.24	1.64	1.36	1.00	1.00	1.48	1.58	1.33
C5	2,450	1.65	1.51	1.10	0.92	0.67	0.67	1.00	1.06	0.90
C6a	2,600	1.56	1.42	1.04	0.87	0.63	0.63	0.94	1.00	0.85
C6b	2,200	1.84	1.68	1.23	1.02	0.75	0.75	1.11	1.18	1.00

（2）Building Rights Transfer Calculation

When calculating building rights transfers, building rights as property rights are quantified as building rights credits (Crediti Edilizi, CE), representing building volume or area belonging to a certain subject in the urban building transformation process[62]. When sending areas and corresponding receiving areas are determined, receiving area building credits can be obtained by multiplying sending area initial building credits by conversion coefficients. The calculation formula is as follows:

$$V_{atterraggio} = V_{decollo} \times C_{trasferimento} \quad (3\text{-}4)$$

Where:

$C_{transferimento}$—Conversion coefficient for building rights transfer;

$V_{atterraggio}$—Building rights credits in the receiving area, m² (or m³);

$V_{decollo}$—Building rights credits in the sending area, m² (or m³).

If land use conversion is involved, additional reference to the conversion coefficient matrix for use conversion is needed for superimposed calculation, such as conversion coefficients for residential to correspond to community shops, service retail, tourist reception, medium-sized sales, manufacturing production, etc., which are 1.00, 1.20, 1.10, 1.30, and 2.30 respectively (Table 3-7). These coefficients may be adjusted according to actual situations and are updated annually.

Table 3-7 Padua City's Building Use Conversion Coefficient Table
(Source: Author's translation from reference [51])

	Community Stores	Service Retail	Tourist Reception	Medium-Sized Sales	Manufacturing
Residence	1.00	1.20	1.10	1.30	2.30

For example, transferring 2500 cubic meters of residential building rights from C6a zone for use as service retail function buildings in C2 zone, the building rights credits after transfer are calculated as:

$$2500 \times 1.16 \times 1.20 = 3480(m^3)$$

That is, 2500m³ of residential building rights would be converted to 3480m³ of commercial building rights after transfer.

（3）Fiscal Regulation in Policy Implementation

The transfer of building rights not only needs to comply with market rules but also involves government public revenue calculation to ensure balance between urban development and fiscal balance. Developers pay land value increment taxes or infrastructure construction funds through building rights transactions:

$$P_{pubblico} = \sum_{i=1}^{n} \left(V_{trasferimento} \cdot A_i \cdot T_{pubblico}\right) \quad (3\text{-}5)$$

Where:

$P_{pubblico}$—Fiscal revenue the government obtains from building rights transactions, €;

$T_{pubblico}$—Tax rate set by the government (generally 10%~20%).

Example calculation:

Building rights transaction price: 1500€/m²

Transaction area: 5000m²

Tax rate: 15%

$$P_{pubblico} = 1500 \times 5000 \times 0.15 = 1{,}125{,}000€$$

This means the government obtains public revenue of 1.125 million euros from this project, which can be used for infrastructure construction or providing social housing.

Padua City's land development rights equalization policy, through market value assessment, conversion coefficient setting, and building rights credit calculation, achieves reasonable circulation of building rights between different regions, both guaranteeing market fairness and improving land resource utilization efficiency. This calculation system not only supports the practice of urban equalization policy but also provides important references for other cities' applications in land development rights management.

3.4.4 Summary of Practical Case Studies

This chapter presents three case studies that illustrate the application of urban equalization policies at different governance levels. The Milan PGT reflects the policy’s role in guiding development direction and ecological structuring at the strategic planning stage; the Acilia–Madonnetta project in Rome demonstrates its concrete implementation in urban regeneration and functional layout; and the case of Padua outlines how technical standards—such as the allocation of development rights, land use conversion, and value assessment—are operationalized through detailed regulatory instruments. Despite their varied emphases, these multi-tiered examples collectively highlight the policy’s adaptability and practical relevance across different phases of urban development.

Although the three cases differ in scale and approach, they all involve the interconnected dynamics of policy, development, and spatial design. From master planning to actual implementation and spatial configuration, the development rights mechanism has played a vital role in adjusting development intensity, organizing land use, and enabling public resource allocation. At the planning level, the policy sets development parameters and land use regulations to provide directional guidance. At the development level, the confirmation, exchange, and transformation of building rights facilitate rational distribution of development capacity. At the spatial level, policy implementation indirectly influences design outcomes such as functional mix and public space allocation, albeit to varying extents.

At the same time, these cases reveal a notable challenge: the difficulty of translating macro-level policy mechanisms into concrete design strategies. Compared to policy formulation and technical implementation, the spatial design phase lacks a clear and systematic response framework. Different cities demonstrate varied approaches in aligning institutional objectives with design practice, and some projects show weak correspondence between design outcomes and policy goals. This issue stems both from the nature of the policy itself and from the absence of mature transmission tools and coordination mechanisms at present.

In light of this, the following chapter will focus on how urban equalization policy functions in the actual process of land redevelopment. It will explore how institutional mechanisms shape development processes, identify their potential impacts on spatial strategies, and propose a clear analytical framework to deepen the understanding of the intrinsic linkages and practical pathways among policy, development, and design—a key intersection in contemporary research on urban design and institutional systems.

3.5 Summary of the Core Mechanisms of Urban Equalization Policy

Italy's urban equalization policy has evolved from a traditional static zoning system into a more dynamic equalization and compensation mechanism, effectively separating development rights from land ownership [12]. Within this framework, development rights are recognized as tradable property rights, which can circulate freely in the market. This arrangement enhances land use efficiency while ensuring a fairer distribution of development benefits across society. The core of the equalization policy lies in integrating government regulatory authority with market principles under a benefit-sharing framework [17], thereby creating a coordinated model wherein landowners, public authorities, and developers participate equitably in shaping urban space.

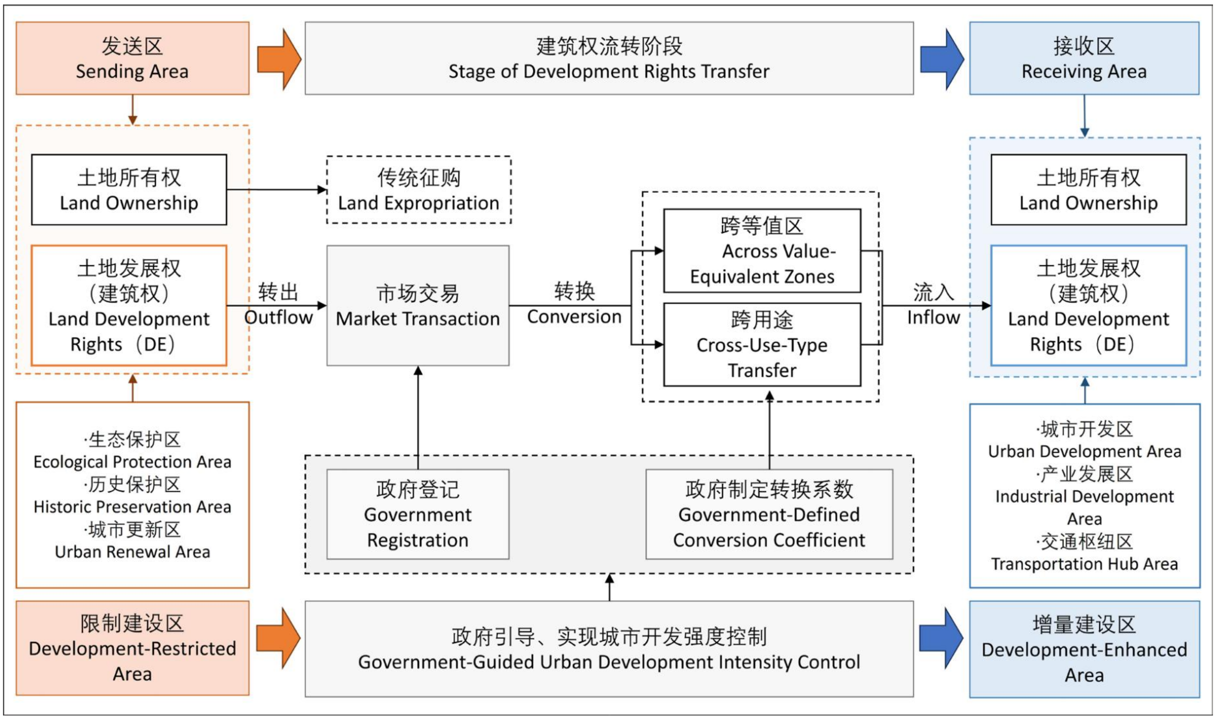

Figure 3-17 Summary of Italian Urban Equalization Policy Core Mechanisms
(Source: Drawn by the author)

In its implementation, the policy employs both governmental and market-based instruments, each playing a distinct role across different stages. The establishment of a development rights market provides a transparent platform to address land value disparities caused by conventional zoning. At the same time, it enables municipal authorities to capture part of the value generated through planning changes and redistribute it to support public services and infrastructure [16].

In the early stages of policy implementation, the government defines the geographic areas where development rights are generated and allocated. Local equalization primarily applies to urban renewal zones, while expanded equalization addresses broader regional or citywide coordination. Development indices are determined through land classification and indicator distribution to balance the economic value of development entitlements across zones. The real estate market is also dynamically adjusted to ensure the fair distribution and transfer of development rights.

In terms of rights transfer and intermediary management, Italy's approach differs from the U.S. model of Transfer of Development Rights (TDR), which relies on designated agencies or market exchanges. Italian law mandates the creation of a municipal registry that records the circulation of building rights and discloses this information to the public to maintain market transparency [18]. The government sets transaction prices based on market benchmarks and adjusts them periodically in line with market conditions, ensuring both fairness and timeliness in trading. This mechanism enhances market acceptance of building rights and improves policy flexibility, while also providing developers and landowners with a more stable investment environment.

3.6 Chapter Summary

This chapter has systematically reviewed the theoretical foundations, operational mechanisms, and spatial effects of Italy's urban equalization policy. Originating as a critique of static zoning systems, the policy introduces development rights as tradable property assets. By situating this instrument between government regulation and market forces, a dynamic equilibrium is established—separating development rights from ownership while improving land efficiency and ensuring equitable benefit distribution.

In terms of its implementation framework, the policy encompasses land status assessment, zoning for equalization, confirmation and transfer of development rights, and ongoing project management. Together, these components form a transparent and adaptive system for configuring development rights. Regarding its effects, the policy demonstrates significant influence across spatial, functional, and structural dimensions—optimizing development boundaries and intensity, encouraging mixed land use, and facilitating multi-stakeholder coordination.

The case study section examined three governance levels: strategic planning (Milan PGT), urban design (Rome’s Acilia–Madonnetta), and regulatory enforcement (Padua). These cases collectively illustrate a complete practical system—from planning and spatial design to institutional mechanisms—validating the flexibility and viability of the equalization policy under diverse scales and objectives.

In summary, the urban equalization policy constructs a land governance framework that balances fairness, flexibility, and sustainability through the institutionalization of development rights. It offers both regulatory support and spatial tools for addressing the complexities of urban regeneration. The following chapter builds on this foundation to propose an integrated “policy–development–design” framework, aiming to further explore how institutional logic can be translated into design practice.

Chapter 4 Land Development Models and Design Strategies under Urban Equalization Policy

4.1 Research Approach of This Chapter

Building upon the theoretical foundations and multi-level case studies of urban equalization policy discussed in the previous chapter, it becomes evident that the transmission pathway from institutional mechanisms to land development and spatial design remains incomplete. Particularly at the district scale, the spatial response to institutional logic still appears fragmented and indirect, lacking a clear transmission path and systematic operational logic. As an institutional intermediary mechanism, the core function of urban equalization policy lies in guiding the optimization of land resource allocation and transformation of development modes through the confirmation, transfer, and conversion of building rights. However, its influence on spatial design strategies has yet to be comprehensively articulated.

To address this issue, this chapter focuses on the specific operational mechanisms of urban equalization policy in the context of land redevelopment, systematically analyzing the transmission from institutional logic to spatial strategies. On one hand, it reviews the regulatory logic of spatial, functional, and structural equalization under the policy and identifies three typical characteristics observed in land redevelopment processes: spatial openness, mixed-use development, and benefit-sharing. On the other hand, it dissects key stages of the redevelopment process—including development boundary delineation and land use optimization, building rights allocation and circulation, benefit estimation and distribution, and development organization and regulation—to examine how institutional mechanisms operate in practice.

Based on this analysis and the evolving spatial demands driven by changes in development models, the chapter further distills the primary response logic at the spatial design level. Four adaptive spatial design strategies are proposed to meet the transmission needs of institutional mechanisms at the spatial scale: (1) composite functional land use organization, (2) adaptive utilization of architectural space, (3) diversified and inclusive public spaces, and (4) human-centered mobility systems. These strategies aim to provide a logical foundation and practical support for establishing an integrated framework that links “policy–land development–spatial design.”

4.2 Characteristics of Land Development Models under Urban Equalization Policy

Land redevelopment models based on urban equalization policy mainly exhibit three major characteristics: spatial openness, mixed development, and benefit sharing. These characteristics result from the influence of urban equalization policy in spatial, land use, and institutional dimensions, not only changing the logic of traditional land development models but also affecting the organization of land use and urban space.

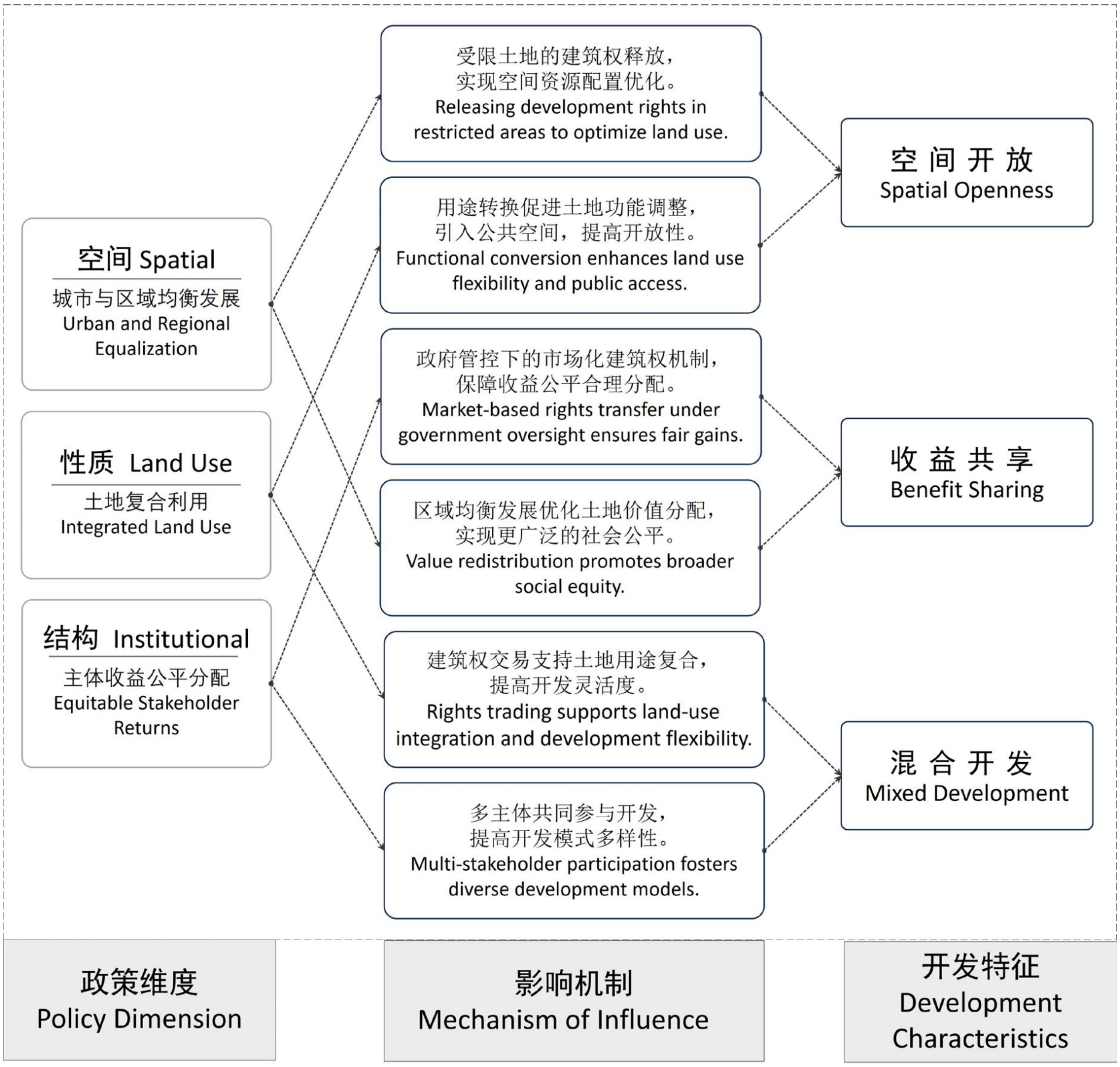

Figure 4-1 Characteristics of Land Development Models under Urban Equalization Policy
(Source: Drawn by the author)

4.2.1 Spatial Openness

Spatial openness is one of the important characteristics of land redevelopment under equalization policy, manifested in the optimization of spatial resources brought by building rights flow and the reconfiguration of public spaces triggered by land use adjustments. Under traditional development models, due to strict land use control, development in many areas is restricted, leading to imbalanced allocation of urban spatial resources, with some core areas overdeveloped while some land remains in a state of inefficient use. Equalization policy, through building rights flow mechanisms, allows land with restricted development to transfer building rights to other areas through market transactions, thereby releasing previously restricted spatial resources and improving overall urban land utilization.

At the same time, equalization policy promotes dynamic adjustment of land uses, allowing renewal areas to more flexibly introduce new functions and public spaces. Traditional land use conversion often relies on government approval, with complex adjustment processes and long time cycles, leading to delays in land use adjustments. Equalization policy, through market-based flow of building rights, allows land uses to more flexibly adapt to market demand. For example, in urban renewal areas, some previously closed industrial land can be transformed into public service land under the guidance of equalization policy, introducing green spaces, pedestrian areas, and other open functions, thereby enhancing urban accessibility and livability.

Spatial openness is not only physical openness but also an opening of land use rights. Under equalization policy, land development rights are no longer strictly locked to a certain area but are allowed to be dynamically allocated according to overall urban development needs. This flexibility provides more possibilities for urban spatial structure optimization, transforming land development from single spatial planning control to a more market-oriented, open model.

4.2.2 Benefit Sharing

Benefit sharing is a key characteristic distinguishing equalization policy-based land development models from traditional models, emphasizing reasonable distribution of land value increments based on market-based trading of building rights to ensure fairness among different entities. In traditional land development, benefits are mainly captured by the government and large developers, with landowners often receiving only limited compensation, leading to monopolization of development rights and market imbalance. Equalization policy, by establishing benefit-sharing mechanisms, ensures fair distribution of land value increments among government, developers, and landowners, improving market mobility and fairness of land resources.

Market-based trading of building rights is one of the core mechanisms for achieving benefit sharing. Under equalization policy, landowners are no longer passive compensation recipients but can directly participate in benefit distribution through building rights trading. For example, landowners originally restricted by land use can obtain corresponding economic returns through selling building rights, while receiving parties can acquire additional development capacity by purchasing building rights, achieving mutual benefits. This benefit-sharing mechanism not only improves land market fairness but also enhances land development sustainability.

Additionally, the benefit-sharing mechanism is not only reflected at the market transaction level but also involves broader urban public benefit distribution. Under the guidance of equalization policy, part of land value increments can flow back to public finance through policy adjustments, used for infrastructure construction, public space transformation, and other fields, promoting overall urban welfare improvement. For example, some income from building rights transactions will be used to fund urban renewal projects, such as building new parks, improving public transportation facilities, etc., thereby achieving broader social benefit sharing.

4.2.3 Mixed Development

Mixed development is the third important characteristic of equalization policy-influenced land development. Urban equalization policy primarily promotes multi-functional complex utilization of urban land through equalization zoning, building rights conversion coefficients, and multi-entity development mechanisms, enhancing flexibility and adaptability of urban development models. In traditional development models, land use division is strict, functions are singular, different types of land development are relatively independent, leading to spatial fragmentation and inefficient land use. Equalization policy, by establishing urban equalization zoning combined with market transaction mechanisms, makes land use adjustments more elastic, providing institutional support for multi-functional mixed development.

Setting building rights conversion coefficients is an important regulatory means for land use conversion under equalization policy. This mechanism allows building rights between different types of land to be converted according to market demand, making it possible to adjust different functional lands. For example, building rights for commercial land can be used for residential development according to certain conversion ratios, breaking the rigid division of original land uses, making relationships between different land types more dynamic. Through this mechanism, equalization policy effectively improves the degree of complex land utilization, promoting organic integration of urban functions.

Additionally, mixed development is reflected not only in the complexity of land uses but also in the diversification of development entities. In traditional development models, land development is mainly led by the government or large developers, with landowners and community residents often in passive positions during development. Under equalization policy, land development models are more diverse, with different types of development entities (such as government, developers, landowners, investors) able to participate in land development through various cooperation models. This multi-entity collaborative development model not only promotes diversification of development funding sources but also enhances the flexibility of development projects, enabling land development to better adapt to urban development needs.

4.3 Land Development Process Analysis

In the guidance of equalization policy, the land development process differs from the traditional "government acquisition—planning—development" single linear model, evolving into a "government guidance—market transaction—mixed development" multi-entity collaborative model, making development more flexible and sustainable. This process includes four core stages: boundary delimitation and land use optimization, building rights allocation and flow, land value increment calculation and distribution, planning implementation and development. Unlike the implementation framework of equalization policy (Section 3.2), this section focuses on operations at the specific development plot level, i.e., how to optimize development scope, adjust land uses, calculate benefit distribution, and promote development implementation under the established equalization policy framework, combined with building rights flow mechanisms.

4.3.1 Boundary Delimitation and Land Use Optimization

Under equalization policy, development boundary delimitation is not just a fixed planning line but can be optimized by combining building rights flow, use adjustments, and other means, making development scope and urban functional layout more compatible. Development scope adjustment and land use optimization is a process of repeated negotiation, potentially requiring reassessment of development boundaries and land structures as building rights are traded and uses adjusted.

（1）Plot Boundary Determination

In traditional development models, plot redline delimitation is usually determined by planning approval, with little space for subsequent adjustments once development redlines are determined, potentially leading to mismatches between development boundaries and actual needs. However, under equalization policy, boundaries can be optimized by combining building rights flow mechanisms, making spatial utilization more flexible and efficient.

Market trading of building rights provides possibilities for adjusting development redlines, allowing developers to optimize spatial layout by purchasing building rights from surrounding inefficient land or underutilized public spaces, incorporating them into project scope. At the same time, these plot scope adjustments not only help improve land utilization efficiency but also promote spatial optimization. For example, in early project stages, a development plot might be limited by original planning and unable to incorporate a nearby green space, leading to fragmented public spaces or insufficient functional integration. But under the equalization policy framework, developers can incorporate that green space into overall design through building rights trading, without increasing overall development intensity, forming a closer connection with surrounding development land, improving overall spatial coordination and functional complexity.

（2）Land Structure Optimization

Land structure optimization under equalization policy depends not only on planning design but also on market demand, building rights flow, and use conversion, among other factors. In the process of building rights trading, land uses might be adjusted, so development redline delimitation and land structure optimization are often interactive, dynamically adjusting processes, rather than linearly completed single steps.

The flow of building rights affects not only the flexibility of land uses but may also profoundly impact development density and spatial organization. For example, a plot originally planned for pure residential land might see partial building rights converted for commercial development as trading progresses, adjusting from single use to mixed use to better adapt to market demand. Similarly, developers might choose to purchase more building rights during market trading to increase development intensity and optimize land value, thereby impacting overall project layout. In some areas, plots originally planned for low-density residential might transform into high-density comprehensive development projects due to building rights inflow, a change requiring synchronous adjustment in land optimization to ensure development models match surrounding environments and infrastructure carrying capacity. Therefore, developers, government planning departments, and landowners typically need multiple rounds of negotiation to balance development density, functional complexity, benefit distribution, and other factors, ultimately forming land use plans conforming to equalization policy objectives.

4.3.2 Building Rights Allocation and Transfer

Under equalization policy, building rights allocation and flow is an important mechanism for land development, not only determining plot development intensity but also affecting land use adjustment methods and directly impacting benefit distribution. Compared to fixed development indices dominated by government in traditional models, equalization policy introduces market-based building rights trading mechanisms, allowing building rights to flow between different plots to achieve more reasonable spatial utilization and benefit distribution. The building rights allocation process typically divides into two stages: initial building rights allocation and building rights flow. The former determines the basic development rights of different plots under the policy framework, while the latter adjusts through market mechanisms, making building rights' spatial distribution more aligned with urban development needs.

（1）Initial Building Rights Allocation

Initial allocation of building rights is typically based on the equalization index IP, which is used to measure basic development intensity of different plots and is set by the government under higher-level planning frameworks. The IP index is usually determined at urban master planning or district comprehensive planning stages and refined at implementation planning or detailed planning stages. Its objective is to ensure initial allocation of building rights conforms with overall urban development's spatial layout and infrastructure carrying capacity, while providing scientific basis for subsequent building rights flow. At the development stage, initial allocation of building rights mainly focuses on the following core tasks:

① Determining basic development intensity of different plots, i.e., assigning different IP indices to various regions to reflect land market value and development potential. For example, city center commercial districts typically have higher IP indices, while ecologically sensitive areas or low-density residential areas have lower IP indices to limit overdevelopment.

② Clarifying basic restrictions on land uses, i.e., delineating initial building rights for different plots to ensure distribution of various land uses under the equalization policy framework meets urban development needs.

③ Forming basic transaction frameworks for building rights, i.e., determining which plots' building rights can be transferred, which plots have development restrictions, and providing policy basis for subsequent market transactions.

（2）Building Rights Transfer

At the development stage, core operations of building rights flow mainly revolve around building rights trading, use adjustment, conversion coefficient calculation, and development intensity adjustment, ensuring land development meets market demand while maintaining balance and rationality in spatial utilization. Building rights market trading is the most critical link in the development process, with developers or landowners able to adjust project development intensity by purchasing or selling building rights. For example, in high-density commercial districts, developers might purchase building rights to increase building floor area ratio, adding saleable or leasable building area. In low-density control areas, some landowners might choose to sell building rights to reduce development burden while obtaining economic benefits. In this process, the government typically regulates trading methods and ensures building rights flow between different regions or different uses conforms to policy objectives by setting building rights conversion coefficients.

At the development stage, calculation of building rights conversion coefficients is crucial. Under equalization policy, conversion coefficients mainly include cross-homogeneous zone conversion coefficients and different use conversion coefficients. The former adjusts building rights values between regions of different development intensities; for example, when transferring building rights from low-density residential areas to high-density commercial areas, conversion coefficients might be set at 0.8:1 to reflect differences in market value and development potential. While building rights flow between different uses, such as residential land to commercial land, might require conversion at a 1.2:1 ratio to balance market values of different functions. At the development stage, conversion coefficient calculations not only affect transaction costs but also determine whether developers are willing to adjust project scale through market transactions. Therefore, the government typically introduces regulatory mechanisms in market transactions, such as setting additional conditions for specific use conversions; for example, requiring a certain proportion of public facilities to be built when commercial building rights flow into residential areas, to maintain balance of urban functions.

Development intensity adjustment typically accompanies building rights flow. After trading building rights, developers need to apply to the government to adjust building design plans to match newly added building rights. This might involve replanning building height, floor area ratio, open space proportion, etc., and adjusting supporting infrastructure construction based on new development intensity. For example, if a commercial plot increases development density due to building rights trading, the government might require it to add public parking spaces, green spaces, or transportation facilities to alleviate urban pressure brought by high-intensity development. Additionally, in some cases, the government might set upper limits for building rights flow to prevent excessive market speculation in building rights affecting overall urban planning objectives.

Under equalization policy, the entire process of building rights flow requires multiple rounds of negotiation among government, developers, and landowners, with dynamic adjustments based on market supply and demand changes. The government in this process mainly supervises transaction fairness, sets conversion rules, and guides land use adjustments, while developers optimize land development strategies based on market demand. Ultimately, building rights flow not only provides flexible planning adjustment space for developers but also helps improve land utilization efficiency, promoting more balanced and sustainable urban development.

4.3.3 Land Value Increment Calculation and Distribution

Under equalization policy, land development benefits no longer rely solely on land appreciation itself but are generated through building rights trading, with changes in calculation and distribution methods of benefits. Compared to traditional models where government-led land transfers determine benefit distribution methods, equalization policy introduces market-based trading mechanisms for building rights, making benefit calculation depend not only on land transaction prices but also on market values of building rights, price premiums from use conversions, and government regulatory measures, among other factors. This section discusses value increment calculation and distribution only for land value increments brought by building rights trading, not involving other land value increment sources such as government planning adjustments or infrastructure construction causing land price increases. Final benefit distribution involves landowners, developers, government, and other entities, with equalization policy controlling the building rights market to ensure reasonable sharing of economic benefits from land development among various parties.

（1）Land Value Increment Calculation

Regarding land value increments brought by urban equalization policy, one method is the equalization contribution calculation based on land value increments, which calculates value increments produced by planning changes or development rights allocation based on differences in land values before and after development[63]. The specific calculation formula is as follows:

$$V_p = （V_{lmu} - V_{am}） \times IP \tag{4-1}$$

Where：

V_p—Equalization contribution value, i.e., part of land value increments, €;

V_{lmu}—Future developable land value, referring to market value of land after planning adjustment, €;

V_{am}—Agricultural value, i.e., original use value of land before planning adjustment, €;

IP—Equalization index, m²/m².

Market values of building rights trading are determined by supply and demand, with governments setting conversion coefficients and benchmark prices to ensure transaction prices reflect actual market conditions and maintain reasonable price relationships between building rights in different regions and different uses. For calculating building rights value increments in a specific plot, the basic formula is:

$$V_{gain} = (V_{trans} - V_{base}) \times CE \quad (4\text{-}2)$$

Where:

V_{gain}—Building rights value increment for a plot, €;

V_{trans}—Building rights transaction price, €/m²;

V_{base}—Initial cost of building rights, €/m²;

CE—Traded building rights area, also building rights credit, m².

Calculation of benefits from building rights trading is closely related to land use adjustments. Conversion of different use building rights may bring additional price premiums; for example, when residential building rights convert to commercial building rights, commercial building rights typically have higher market values, potentially generating additional benefits. Governments usually set conversion coefficients ensuring fair and reasonable calculation of value increments when building rights uses are adjusted. For example, in some regions, when residential building rights convert to commercial building rights, conversion might be calculated at a 1.2:1 ratio to balance market values under different uses. During value increment calculations, this premium portion is also incorporated to ensure benefit reasonability.

（2）Value Increment Distribution Mechanism

Land value increments from building rights trading need reasonable distribution among landowners, developers, and the government. As market supervisor, the government ensures fairness of building rights trading and sets reasonable distribution mechanisms to balance interests of market entities while ensuring part of land value increments flow back to public finance, promoting urban infrastructure and public service construction.

① Landowner Benefits

In traditional development models, landowner benefits typically limit to government acquisition compensation or land sale appreciation, while under equalization policy, landowners can directly obtain value increment benefits through building rights market trading.

If building rights for a plot increase in value due to market demand, landowners can sell their building rights without changing land ownership, thereby obtaining market-based transaction benefits. Additionally, landowners can adjust market values of building rights according to use conversion coefficients during the building rights use conversion process, making land asset utilization more flexible.

② Developer Benefits

Developer benefits mainly come from optimization of development intensity through building rights trading, i.e., expanding building scale and increasing project economic value by purchasing additional building rights through market transactions. During use conversion, developers can also maximize land commercial value by adjusting building rights uses. However, benefits from building rights trading are affected by conversion coefficients, with governments possibly requiring developers to pay additional premiums or undertake certain social responsibilities during specific use adjustments, such as providing public facilities or basic supporting facilities.

③ Government Benefits

Government benefits mainly come from taxation on building rights trading, use conversion premiums, and fiscal reflux of some value increments. Governments can ensure regularity of market transactions through taxation on building rights trading while collecting conversion premiums during high-premium use conversions to regulate market liquidity. Additionally, governments may require part of building rights trading benefits to be used for urban infrastructure construction or social housing projects through policy means, safeguarding urban public interests and preventing excessive concentration of land value increments in private capital.

4.3.4 Planning Implementation and Development

（1）Phased Development Model

Under equalization policy framework, land development is no longer a one-time planning and overall advancement process but combines market demand, building rights flow, and infrastructure improvement for phased implementation. The core of phased development model is "infrastructure first, incremental development intensity, and gradual improvement of spatial functions" to maximize land utilization efficiency while avoiding spatial imbalance or resource waste due to overdevelopment.

In the initial phase, governments and development entities need to prioritize infrastructure construction, including roads, public spaces, municipal service facilities, etc., to lay the spatial structure foundation for future development. Meanwhile, initial allocation of building rights mainly focuses on low-intensity development, allowing land to gradually release higher development capacity under market demand guidance. For example, in a new development area, low-density mixed functional development might be introduced initially; as building rights flow and markets mature, development intensity can be increased through transactions, adding commercial, residential, and other high-density functions, ensuring dynamic optimization of spatial utilization.

Additionally, phased development models can reduce development risks, allowing development entities to adjust investments according to market conditions rather than one-time large-scale construction, avoiding resource mismatches. At the same time, this model also provides time windows for policy adjustments and public facility optimization, ensuring development sustainability.

（2）Planning Supervision and Adjustment Mechanisms

Under equalization policy, planning implementation emphasizes combination of planning rigidity and adaptive adjustments. Planning rigidity mainly reflects in core indicators such as total building rights control, public service facility proportions, and upper limits of development intensity; planning adaptability reflects in use adjustments, development model optimization, and building rights flow.

To ensure orderly advancement of planning implementation, the following planning supervision and dynamic adjustment mechanisms need to be established:

① Building rights flow supervision mechanisms: Building rights market transactions need policy regulation to avoid market imbalances caused by speculative transactions. For example, tax rates or transaction upper limits for different use conversions can be set to guide building rights flow conforming to urban development objectives.

② Use conversion evaluation mechanisms: During use adjustments, comprehensive consideration of market demand, urban functional coordination, and environmental impact is needed to ensure converted functions conform to long-term urban development planning. For example, when commercial land building rights convert to residential land, their impact on surrounding service facilities and infrastructure needs assessment, with corresponding compensation or supporting measures adopted.

③ Dynamic optimization of development intensity: During development, building density or development scale can be adjusted according to changes in market demand and land value to improve land utilization efficiency. For example, in some areas, building rights purchase mechanisms can be established, allowing development entities to obtain higher development rights through additional fee payments under compliance with planning requirements.

4.5 Logical Conversion from Land Development to Spatial Design

4.4.1 From Land Development Characteristics to Spatial Demands

Under the guidance of urban equalization policy, land development models have transformed from traditional singular, closed development models to more open, multi-entity collaborative approaches. This change not only affects land utilization methods and economic benefit structures but also places new demands on urban space organization. Spatial design is no longer an ancillary decision to land development but a result of development models, needing to adapt to changes in development characteristics, forming flexible, complex, shared spatial systems.

（1）Spatial Demands under Spatial Openness

Under equalization policy framework, development boundaries are no longer fixed but can be dynamically optimized combining building rights flow, use adjustments, and other methods. For example, building rights from restricted land can be released, allowing more flexible allocation of spatial resources, enabling development boundaries to adapt to market demand. Meanwhile, land use conversions allow development areas to more broadly introduce public spaces, improving urban accessibility and openness.

Spatial design under spatial openness needs to adapt to more elastic development boundaries, ensuring newly opened or updated plots can integrate into existing urban structures without forming fragmented spatial patterns. Additionally, due to flexibility in use adjustments, design plots need advance assessment of land function elasticity, reserving adaptive spaces for future functional layout adjustments. Permeability of public spaces is also an important demand under spatial openness, ensuring interaction between development plots and surrounding areas, improving walkability and overall urban space vitality.

（2）Spatial Demands under Benefit Sharing

Under equalization policy, land value increments are no longer monopolized by government or developers but are reasonably distributed among landowners, developers, and government through building rights trading. Some benefits will be used for construction and maintenance of urban public resources, allowing public spaces and infrastructure to receive better support during urban renewal processes, and promoting green infrastructure construction and ecological environment improvement. Additionally, the multi-entity benefit-sharing model requires development boundaries to no longer be closed but to form interfaces interacting with urban spaces, allowing boundary spaces to exert greater economic and social value.

Against this backdrop, spatial design needs to adapt to optimization of public resource allocation, ensuring value increments can effectively flow back to urban systems and strengthen their impact through spatial strategies. At the same time, boundary spaces of development areas need activation, avoiding spatial fragmentation due to benefit distribution issues between different development entities. Additionally, since the benefit-sharing mechanism encourages intensive utilization of public resources, development areas need to consider spatial needs of multiple entities, with more focus on shared spaces such as public service centers and complex functional community facilities, achieving high-efficiency utilization of land resources.

（3）Spatial Demands under Mixed Development

Mixed development models emphasize functional complexity, multi-entity cooperation, and higher development flexibility. Adjustment of building rights conversion coefficients increases the degree of land use complexity, allowing development areas to flexibly adapt to market demand while enhancing overall spatial complexity. Additionally, mixed development models place higher demands on transportation system adaptability, especially in high-density development areas, requiring establishment of efficient pedestrian networks and public transportation systems to support travel demand brought by land function complexity.

Against this backdrop, spatial design needs to enhance functional flexibility of buildings, ensuring smooth functional adjustments across different development stages, with specific design methods including introducing flexible transformable building spaces and embedded modular buildings. To adapt to flow changes brought by complex functions, development areas need to strengthen connections with public transportation systems, reducing dependence on private vehicles, improving overall accessibility. At the same time, high-density mixed development areas need good pedestrian environments, and traffic needs to consider multi-population friendliness due to intervention by multiple entities, so optimization of pedestrian systems is also a demand that needs special consideration.

4.4.2 Four Spatial Design Strategies

Under the guidance of the equalization policy, the institutional transformation of land development models imposes new demands on urban spatial organization. In response to the multifaceted challenges arising from spatial openness, benefit-sharing, and mixed-use development, this study draws inspiration from contemporary urban design theories and trends to propose four spatial strategies: composite functional land-use organization, adaptive architectural space utilization, diversified and inclusive public spaces, and a human-centered mobility system. These strategies aim to construct a more resilient, efficient, and public-oriented spatial structure. They are widely applicable and represent an organic linkage between policy orientation and spatial practice.

(1) Composite Functional Land-Use Organization

This strategy emphasizes horizontal and vertical functional integration to improve land-use efficiency and foster cross-sectoral synergy. By combining diverse program types and usage scenarios, it overcomes the rigid boundaries of traditional mono-functional zoning, contributing to a continuous, dynamic, and efficient urban system.

This concept aligns closely with the principles of New Urbanism, which advocate for compact development and multifunctional neighborhood systems as alternatives to isolated land-use zoning, thereby enhancing urban vibrancy and social interaction [64]. It also resonates with the idea of multifunctionality in resilient urbanism, which stresses the importance of diverse urban systems in enhancing adaptive capacity [65].

(2) Adaptive Architectural Space Utilization

This strategy focuses on ensuring that buildings and their spatial structures are multifunctional, climate-adaptive, and scenarized, offering dynamic responsiveness and long-term flexibility. Specific approaches include modular construction, flexible interfaces, and open-plan layouts.

It is inspired by Life Cycle Design Theory and Sustainable Architecture, both of which emphasize resource efficiency and functional flexibility across the entire life span of a building [66]. Additionally, the Design for Disassembly concept introduces practical methodologies—such as standardized components and open connection systems—to support architectural adaptability and material circularity [67]. These approaches are also consistent with resilient urbanism's focus on the adaptability and systemic stability of built environments [65].

(3) Diversified and Inclusive Public Spaces

Through an open spatial system and boundary activation mechanisms, this strategy seeks to create vibrant, co-constructed, and shareable urban public environments. It promotes a public space network that is open, accessible, and hierarchically layered, enhancing spatial equity, social interaction potential, and collective belonging.

Its theoretical foundation traces back to Henri Lefebvre's theory of the production of space, which posits that public space is a material expression of social relations, whose vitality depends on cultural embeddedness and collective identity [68]. It also reflects principles from public space theory, particularly the human-scaled, experiential, and behavioral aspects emphasized by Jan Gehl's people-centered design thinking [69]. Furthermore, Jane Jacobs' concept of street vitality highlights how the liveliness of public space depends on small scale, diverse nodes, and dynamic edge interactions [70].

(4) Human-Centered Mobility System

Focusing on walkability, system integration, and equitable access, this strategy aims to establish an efficient, safe, and inclusive green mobility network. It shifts mobility planning from a purely efficiency-driven model to one centered on equity and user experience, prioritizing pedestrian and non-motorized transport, and creating a continuous, multimodal green transport system.

This approach is informed by spatial accessibility planning theory [71], which emphasizes that accessibility is a prerequisite for public service equity and social participation. Jan Gehl's concept of "streets for life" further underlines that high-quality street environments and pedestrian experiences enhance the human orientation and social vitality of urban space [69].

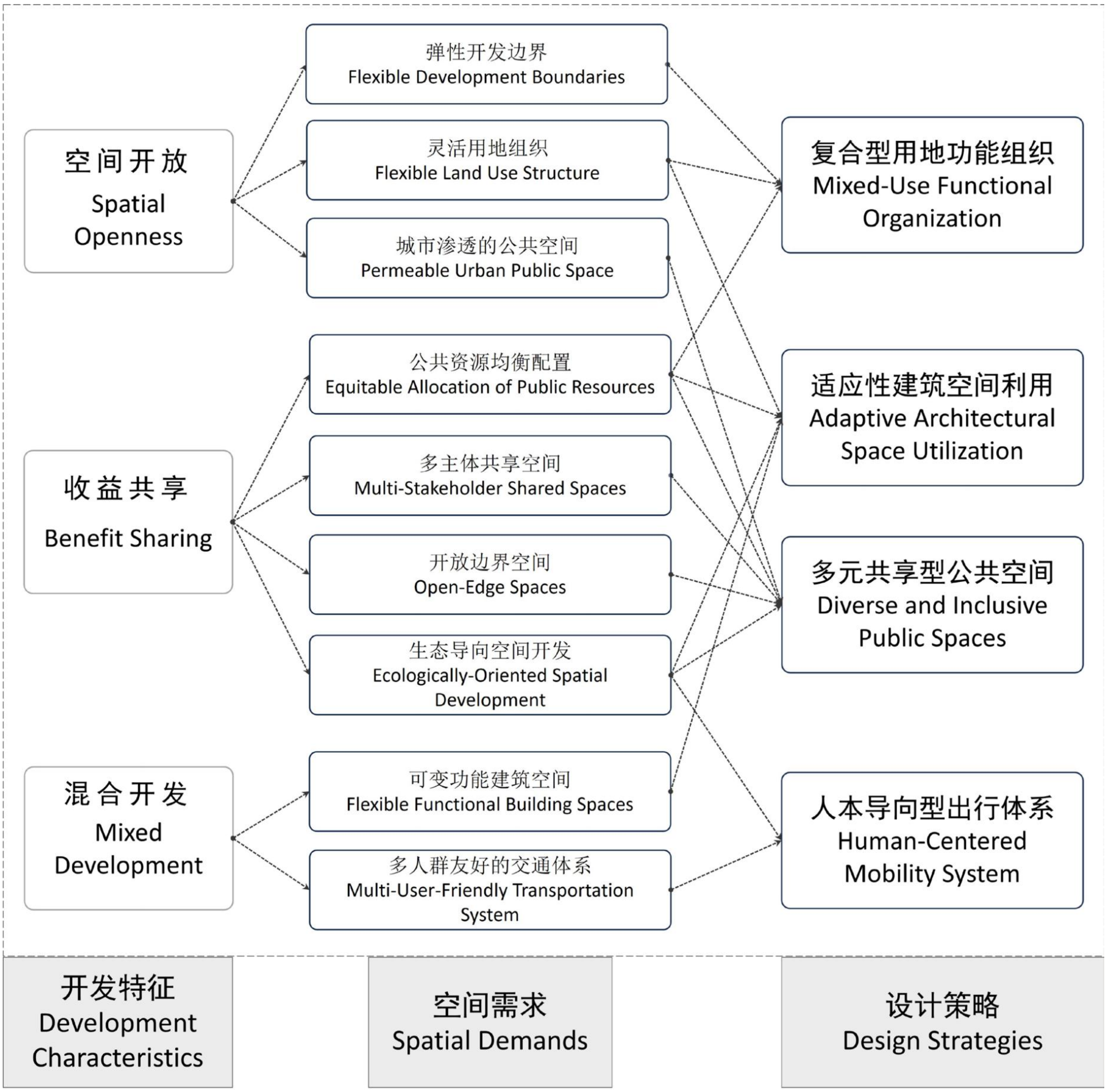

Figure 4-2 From Land Development to Spatial Design: Logic Conversion
(Source: Drawn by the author)

4.4 Framework of Land Development Models and Spatial Design Strategies under Urban Equalization Policy

Based on the above analysis of land development models and spatial design strategies under urban equalization policy, this research constructs a complete strategy framework to systematically reflect the transmission process from equalization policy to land development models and the logical conversion from land development to spatial design. Under this framework, the four spatial design strategies are further refined, with corresponding methodological systems proposed to guide actual planning and design practices.

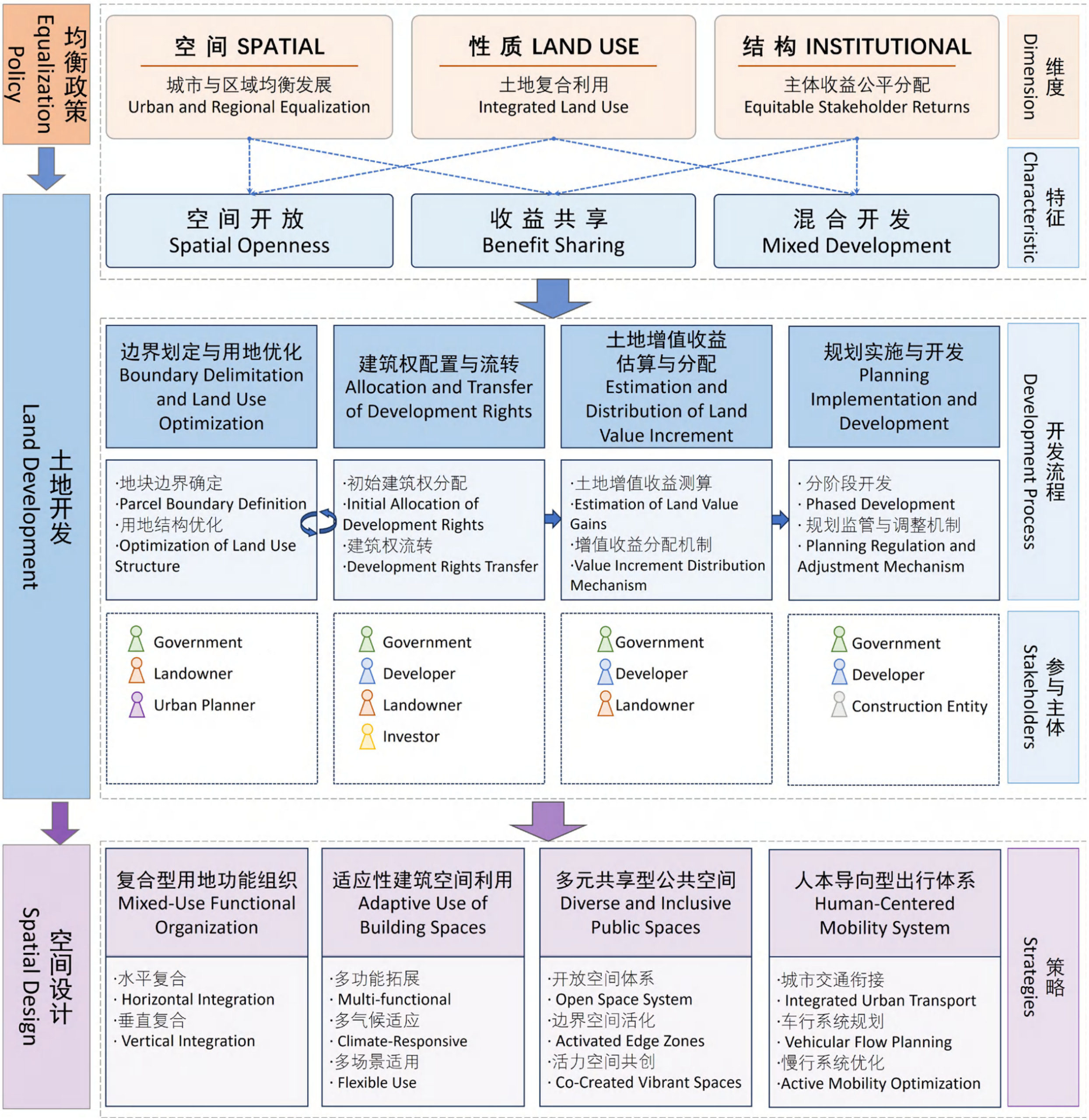

Figure 4-3 Framework of Land Development Models and Spatial Design Strategies under Urban Equalization Policy
(Source: Drawn by the author)

Chapter 5 Background and Current Situation of the Former Royal Tobacco Factory in Turin, Italy

5.1 Site Location and Redevelopment Context

5.1.1 Site Location and Overview

The site is located in the northeastern part of Turin (Torino) in the Piedmont region of Italy, belonging to the sixth administrative district, positioned at the intersection of urban and natural areas. The redevelopment site includes the former Royal Tobacco Factory (Ex Manifattura Tabacchi) and the textile factory (Ex FIMIT) industrial land, adjacent to the Po River and the Stura di Lanzo River, with a total area of approximately 98,592.94 square meters. This location allowed the factory to fully utilize water resources during early industrialization and rely on convenient transportation networks for raw material transport and product distribution.

The area has a long history, originally the site of the Italian royal family's "Viboccone" palace. In the mid-18th century, to meet tobacco demand, the Savoy dynasty established the Royal Tobacco Factory here, gradually forming an industrial settlement centered on tobacco processing, which also spurred the development of surrounding residential areas. By the mid-19th century, the region attracted numerous industrial projects, evolving into an important industrial area in eastern Turin[72].

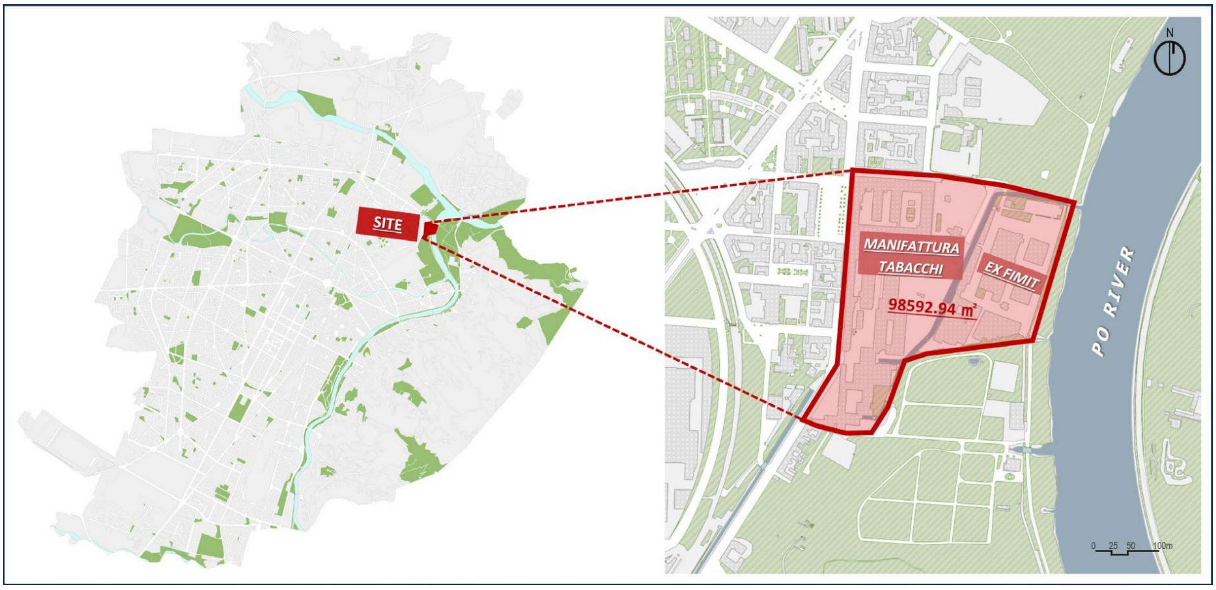

Figure 5-1 Site Location Map
(Source: Drawn by the author)

5.1.2 Transformation Background and Current Progress

The former Royal Tobacco Factory on the western side of the site was built in 1768, ordered by King Carlo Emanuele III, and is one of the earliest industrial buildings for tobacco processing in Italy, completed in 1789. Its structure is primarily brick and stone, with an enclosed layout containing multiple interior courtyards used for tobacco processing and storage[72]. The factory reached its industrial peak from the late 19th century to the mid-20th century, then gradually declined and closed in 1996. The FIMIT plot on the eastern side has an industrial history dating back to the mid-19th century, initially as the "Filatura Vanzina" textile factory, later undergoing multiple functional conversions, eventually becoming a sound insulation material factory until production ceased in the late 20th century. Although its building structure has been modified, it retains the original appearance of a 19th-century industrial building.

In 1999, the textile factory plot was acquired by the Turin municipal government as a reserve site for university expansion, while the main building of the tobacco factory remained under the management of the Italian National Property Agency, creating a mixed land ownership pattern of "national-local government-private" across the site[72]. Since 2012, the area has been included in urban renewal plans, with the government collaborating with the Italian National Property Agency, the University of Turin, and the Turin Polytechnic University through a joint investment model to promote overall development, proposing a comprehensive transformation path oriented toward "university + social functions"[72].

5.1.3 Transformation Objectives and Policy Guidance

This renewal project aims to achieve regional regeneration and social function reshaping through functional mixing, environmental remediation, and historical heritage protection[73]. The main objectives include:

(1) Construction of a higher education and research core area: At least 40% of the above-ground building area will be used for university teaching, exhibitions, sports facilities, and related supporting services;

(2) Construction of social housing and university dormitories: Over 32% of the total building area is planned for collective residential purposes (such as university dormitories, co-living units, etc.), promoting youth congregation and diverse population introduction;

(3) Public services and social integration: A certain proportion of commercial, cultural, leisure, and office spaces will be constructed (totaling no more than 25% of the total building area) to enhance regional vitality;

(4) Green and open space connections: Following the Po River ecological corridor, green open spaces and non-motorized vehicle systems will be planned to strengthen integration with urban parks;

(5) Cultural heritage protection and reuse: Promoting appropriate demolition and reconstruction while respecting the historical value of buildings, prioritizing the preservation of brick facades and courtyard spatial layouts while accommodating modern functional introduction;

This transformation plan has been incorporated into Turin's "University City" development strategy, coordinated with major projects such as the Metro Line 2 extension and Po River Park renewal, aiming to create a new type of urban complex district with educational, ecological, and cultural values.

5.2 Historical Evolution and Cultural Value

5.2.1 Urban Development and Industrialization of Turin

As an important industrial city in northern Italy, Turin's development process is closely related to its industrialization. Since the 19th century, the city has experienced multiple development stages, including early industrial agglomeration, the formation of industrial belts during the expansion period, the multi-center development model in the later period, and deindustrialization and urban functional transformation in the late 20th century[74].

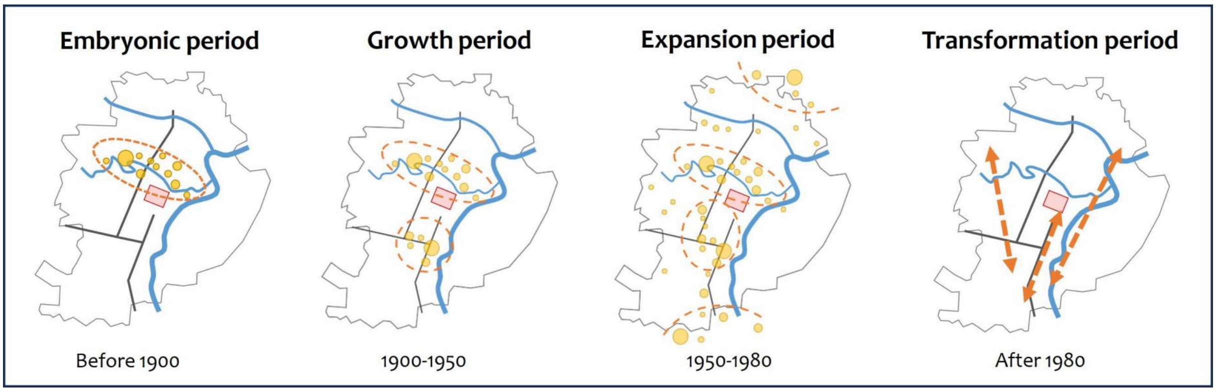

Figure 5-2 Turin's Industrial Development Evolution Diagram
(Source: Redrawn by the author based on reference [74]

（1）Embryonic Period（Before 1900）

Before the 19th century, Turin's industrial development mainly relied on water transportation conditions along rivers, with industries primarily distributed in points. Due to convenient transportation, a number of industrial bases focused on handicrafts and manufacturing, including machinery, textiles, food, and tobacco industries, were concentrated in the city center.

（2）Embryonic Period（1900-1950）

With the expansion of industrial production scale, industrial zones gradually expanded in bands along major transportation axes and rivers. Turin expanded its industrial layout along the Dora Riparia River and Po River, becoming one of Italy's most important industrial cities.

（3）Expansion Period（1950-1980）

This period witnessed further expansion of Turin's industrial zones, with multiple new industrial areas forming on the city's outskirts, transforming the industrial land distribution from a single axis to a multi-center pattern. During this stage, a large influx of industrial population drove rapid urban growth, with industrial areas occupying an increasing proportion of the city.

（4）Transformation Period (1980 to Present)

After the 1980s, global industrial structure adjustments led to the gradual decline of traditional industrial zones in Turin. As industrial facilities closed, many factory areas were abandoned, and the city began transitioning to service industries and the knowledge economy. In recent years, the Turin municipal government has actively promoted urban renewal and industrial heritage reuse policies, gradually transforming old industrial areas into new functions such as cultural, educational, and commercial activities.

5.2.2 Historical Evolution of Turin's Former Royal Tobacco Factory

As an important component of Turin's industrial system, the development of the former Royal Tobacco Factory directly mirrors the city's industrialization process.

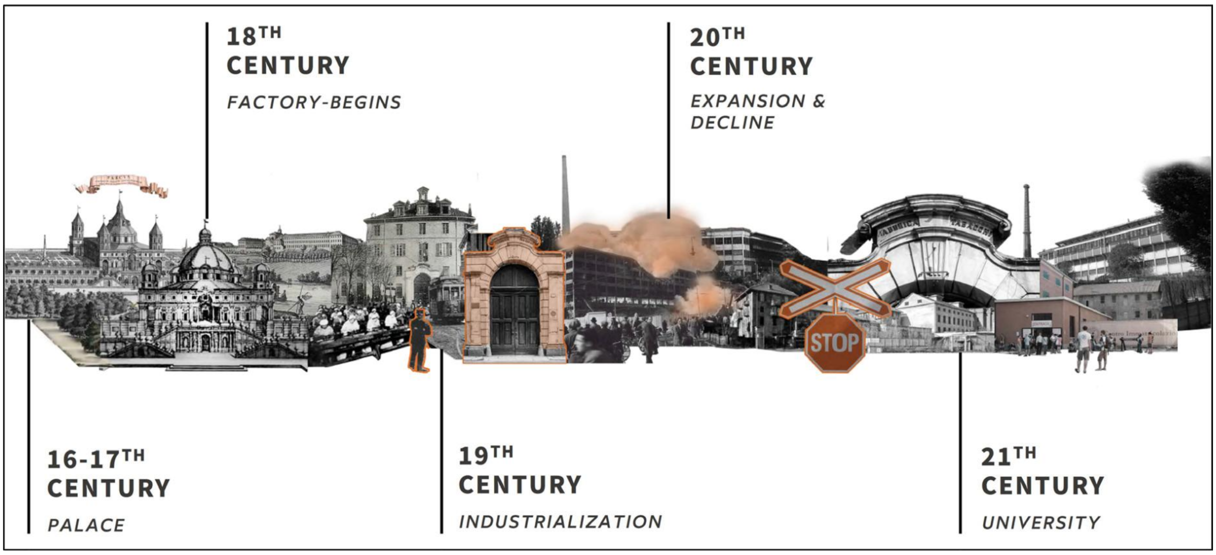

Figure 5-3 Tobacco Factory Historical Evolution
(Source: Drawn by the author)

（1）16th-19th Centuries: From Royal Palace to Industrial Base

Before the tobacco factory was established, the area was a private hunting ground of the Savoy royal family, known as Viboccone Palace, strategically located at the confluence of the Po River and the Dora Riparia River. The palace was besieged multiple times by French troops between 1640 and 1760, and was eventually converted into a tobacco factory in 1768[19]. In 1768, architect Benedetto Ferroggio was commissioned to convert the abandoned palace into a tobacco production factory, completed in 1789. The factory consisted of elongated buildings with multiple courtyards for tobacco leaf processing and storage. During this period, production was still primarily manual.

By the mid-19th century, the tobacco factory had become one of Turin's largest factories, with about 600 employees. By 1875, the factory's workforce had grown to 2,500 people, with cigar makers becoming the primary occupation. Meanwhile, worker residential areas gradually formed around the factory, promoting the development of the surrounding urban area[72].

（2）20th Century: Industrial Prosperity and Decline

In the early 20th century, the Turin tobacco factory experienced rapid expansion. In 1900, the factory underwent a major renovation, not only expanding production facilities but also adding carpentry workshops, cafeterias, bars, kindergartens, and dormitories for female workers, gradually developing into a relatively independent industrial community. However, this prosperity was severely damaged during World War II. During the war, the factory's machinery, equipment, and raw materials were seriously damaged, and production capacity decreased significantly. After the war, although production lines were gradually restored, changes in market demand and the advancement of industry modernization made it difficult for traditional production models to maintain competitiveness.

By the 1960s, the tobacco factory's production scale began to shrink. The factory gradually stopped producing cigars and pipe tobacco, retaining only cigarette production departments to adapt to market adjustments. However, industry transformation pressure continued to increase, making factory operations increasingly difficult. Finally, in 1996, the Italian Tobacco Monopoly Administration (AAMS) decided to close the Turin tobacco factory, and the factory area was subsequently abandoned, becoming an industrial heritage site. This factory, which once drove the city's industrial development, thus entered a period of decline, awaiting new development opportunities.

（3）21st Century: Urban Renewal and Functional Conversion

In 2002, the Turin municipal government adjusted the tobacco factory land from an industrial zone to public service facility land, providing policy support for future redevelopment. In recent years, the government has proposed transforming the site into an education, culture, and innovation industry center, combining resources from the University of Turin and Turin Polytechnic University to make it part of the academic and research network. Additionally, the planning proposal includes introducing public spaces and green infrastructure to enhance the site's accessibility and urban interaction.

The transformation of the tobacco factory is not only the reuse of industrial heritage but also a comprehensive renewal practice involving land integration, functional optimization, and urban economic revitalization. In this process, the cooperation model among government, academic institutions, and private investors, as well as the application of policy tools such as building rights transfers, will largely determine the feasibility and long-term sustainability of the project.

5.3 Natural Environment Analysis

5.3.1 Topography and Hydrology

Turin is located in northwestern Italy, at the junction of the Alps and the Po Valley, with its geographical characteristics profoundly influencing the city's spatial pattern and natural environment. The entire city is mainly distributed between 230m-275m above sea level, with relatively flat terrain, though some areas have local undulations formed by river erosion and sedimentation. Turin's four main rivers—the Po River, Stura di Lanzo River, Sangone River, and Dora Riparia River—intersect and run through the city, providing abundant water resources while also shaping unique waterfront landscapes.

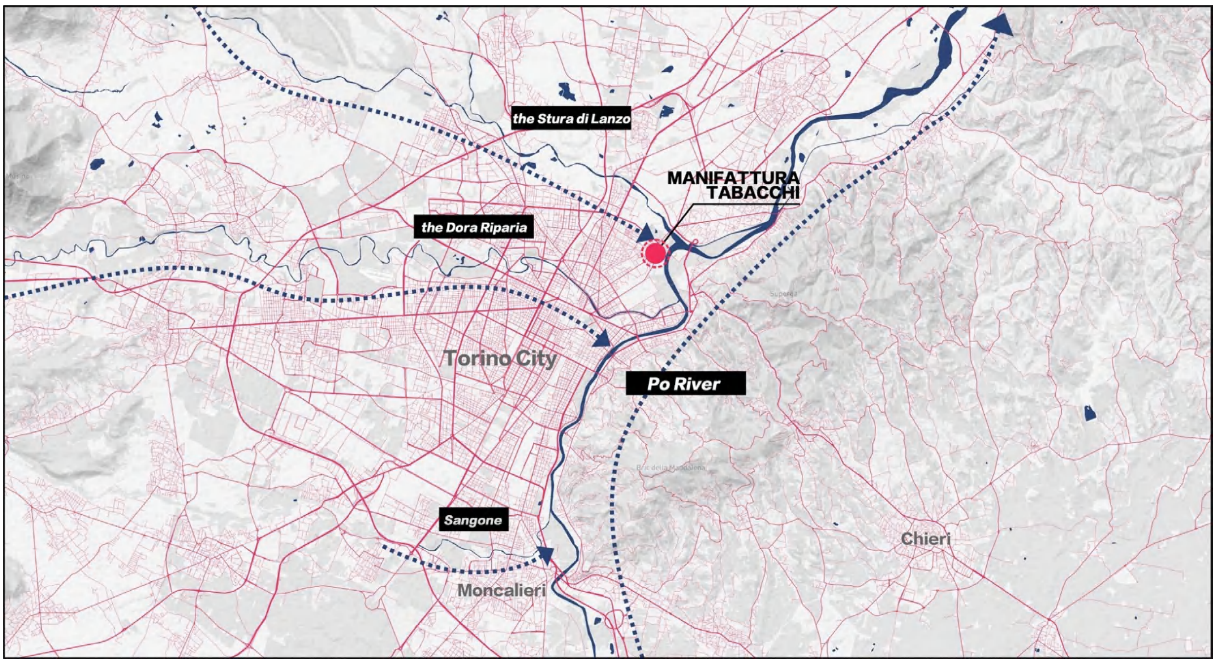

Figure 5-4 Turin's Main Water Systems Diagram
(Source: Drawn by the author)

The project site has a special geographical location, with the Po River to the east and the Stura di Lanzo River to the north, surrounded by a relatively developed river water system. This waterfront location provides the site with excellent landscape resources and ecological value but also brings certain hydrological risks. According to hydrological mapping data from the Turin municipal government, parts of the tobacco factory area may be affected by floods in extreme weather, especially low-lying areas along the river that are more susceptible to impact.

The site overall presents a slight slope from west to east, with an elevation of about 214 meters in the western area near the city's main road, and the lowest point at 209 meters on the eastern side near the Po River, creating an overall height difference of about 5 meters. Within the site, the boundary between the western plateau and eastern riverside zone is relatively clear, forming distinct height zones. Low-lying areas are mainly concentrated in the textile factory plot and some eastern wing factory buildings of the tobacco factory, characterized by flat terrain and slow drainage, susceptible to seasonal flooding of the Po River, posing potential flood risks.

In contrast, the western side has elevated terrain, higher building density, and stronger spatial enclosure, providing a relatively better construction foundation. This high area is suitable for accommodating main public buildings and functional facilities in future development, while the low area needs to achieve both moderate development and ecological buffering through design guidance, with building ground floors kept open and avoiding functions requiring long-term personnel concentration.

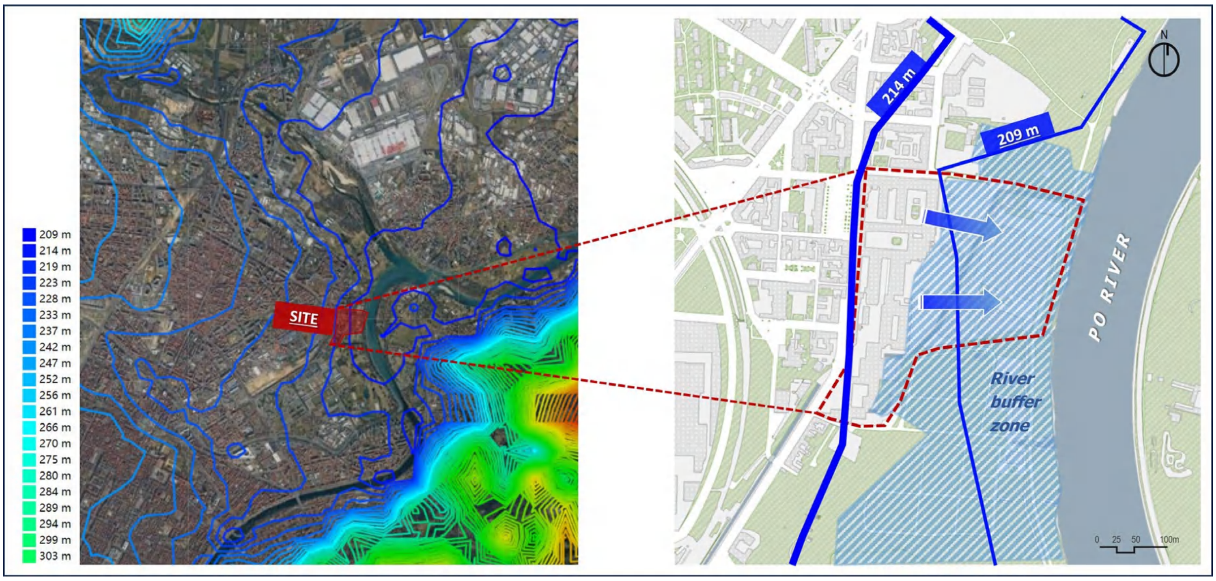

Figure 5-5 Site Elevation and River Buffer Zone Analysis Map
(Source: Piedmont Region Geographic Information Portal [75], Author's drawing)

5.3.2 Green Spaces and Ecosystem

In recent years, the Turin municipal government has placed high importance on constructing urban ecosystems and has proposed a strategic green infrastructure plan[76], aiming to build a more sustainable urban ecological pattern by strengthening ecological connectivity, increasing biodiversity, and improving the urban environment. Currently, there are several important parks and nature reserves around the site, which play a significant ecological buffering role in the urban green system and provide quality public activity spaces for urban residents. However, due to the separation of rivers and existing buildings, there are obvious fragmentation phenomena in green spaces around the site, meaning that different green areas lack effective pedestrian and bicycle connections, leading to poor ecological connectivity. This fragmentation not only weakens the ecological functions of green spaces but also reduces residents' accessibility, resulting in relatively low utilization rates of green spaces.

Figure 5-6 Parks and Nature Reserves Surrounding the Site
(Source: Photos from Google, analysis diagram by author)

Although the project site has rich green resources in its surroundings, showing good natural foundations and ecological potential, there are still obvious structural disconnections between the site and these green spaces in the current spatial structure, with main problems manifested in the following aspects:

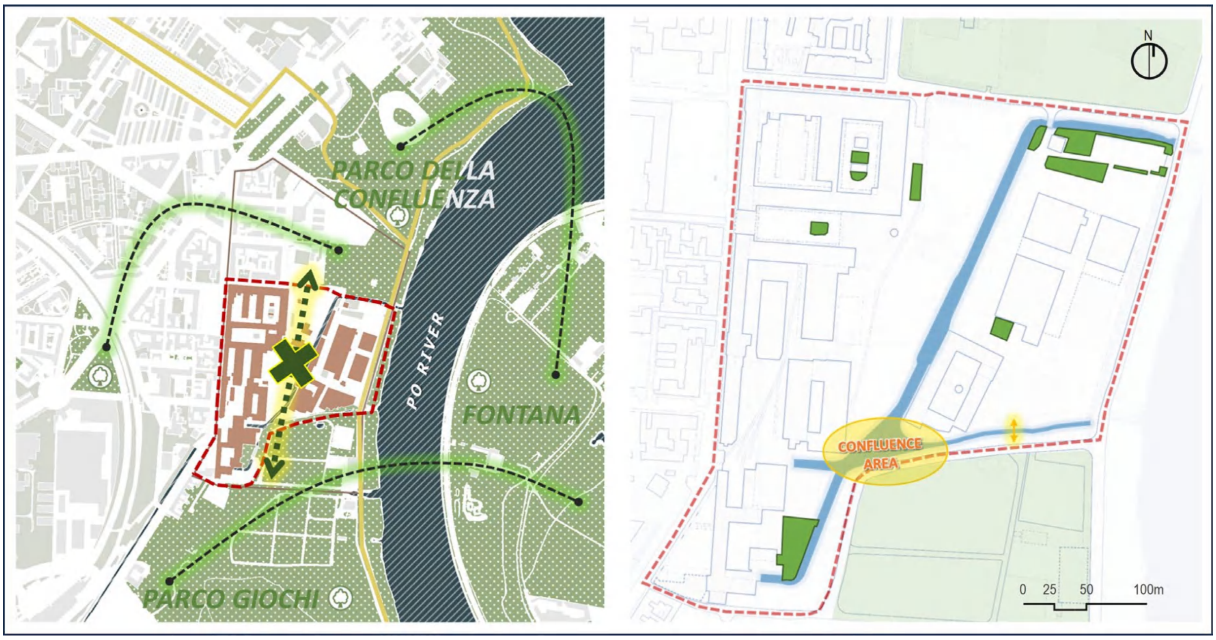

Figure 5-7 Site Current Green Space Problem Analysis Diagram
(Source: Drawn by the author)

(1) North-South Green System Interruption

Despite adjacent parks to the north and south of the site, providing good ecological corridor foundations, current large areas of hard paving and dense buildings within the site block the continuity of north-south green spaces, becoming a break point in the urban green network.

(2) Lack of Green Organization and Spatial Response Inside

Green spaces within the site are scattered, lacking a systematic open space structure, unable to functionally or visually respond to north-south green spaces, with overall enclosed spaces and insufficient publicity.

(3) Ineffective Use of Riverbank Interface

Although directly adjacent to the Po River on the east side, the site lacks riverside greening design and open interfaces, failing to establish ecological buffer or walkway systems, with the riverside space's public and landscape values unrealized.

(4) Untapped Potential of Internal Water Systems

Two internal river water systems exist in the central part of the site, but the current southern river channel has a narrow cross-section, and the "confluence area" where it connects with the northern river channel is blocked by fences and deposits, lacking visual and path accessibility. The entire internal river system lacks landscape and ecological design, failing to exert its potential in spatial organization, microclimate regulation, and green connections.

The current spatial form of the project site has not adapted to its potential role as an "ecological convergence point" and "urban green interface," urgently needing to strengthen integration with the urban green network and enhance ecological continuity and spatial openness through spatial reorganization and green guidance strategies.

5.4 Built Environment Analysis

5.4.1 Land Use and Functions

The land use types in the area where the site is located are diverse. The east and south sides are mainly green spaces and waterfront parks, but connections with the site are weak due to the separation of rivers, roads, and buildings. The west and north sides are dominated by residential and commercial land, with some small community service facilities distributed in parts of the area. Although the site is adjacent to multiple functional areas, it has not formed effective interactive relationships with the surrounding environment due to the fragmentation of land use.

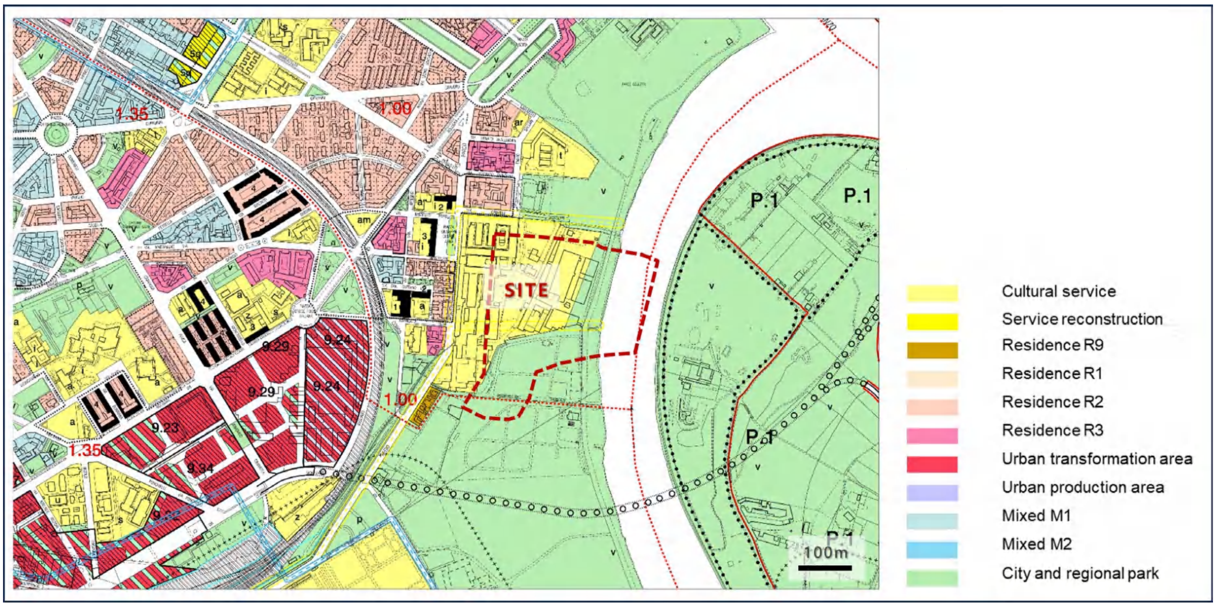

Figure 5-8 Site and Surrounding Land Use Status
(Source: Reference [19])

The planned land use of the site is mainly public service facility land (university education land), with some areas currently temporarily used for warehousing, parking lots, and other secondary functions. Due to long-term vacancy, buildings within the factory area are mostly unused, with overall low spatial utilization rate. The functional layout has issues such as spatial fragmentation and insufficient natural response, mainly manifested in the following aspects:

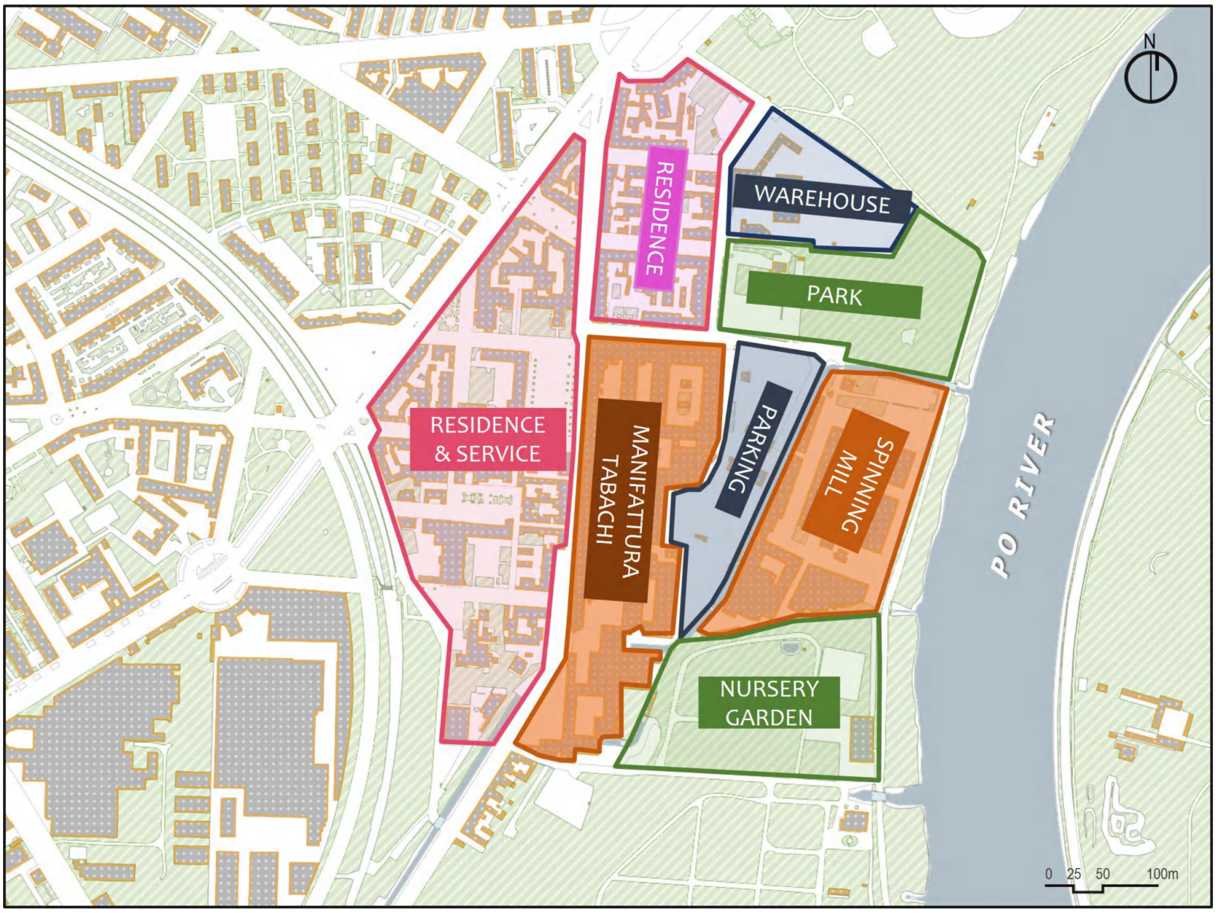

Figure 5-9 Site Functional Zoning Diagram
(Source: Drawn by the author)

(1) Spatial Organization Fails to Respond to Surrounding Natural Elements

The site is adjacent to important natural interfaces to the north, east, and south—respectively urban parks, the Po River waterfront belt, and urban green spaces—but the existing land layout fails to form organic responses to them. The site's south and north sides lack responses to park ecology, while the east side textile factory plot has no ecological transition space with the Po River, this severance breaking the ecological continuity of the region.

(2) Central Parking Plot Causes Spatial Structure Severance

The current parking area is located in the core position between the tobacco factory and textile factory plots, severing the two major plots that should form a unified renewal axis, not only destroying spatial continuity but also affecting functional integration of the entire site. This plot has height differences and is privately owned, which should be considered for maximum utilization through building rights allocation in subsequent renewal construction.

(3) Unclear Spatial Functional Hierarchy, Lacking Mixed and Compound Characteristics

The layout presents a relatively single planar functional zoning, lacking interface transitions and functional integration, generally missing "mixed-use, shared space" strategic orientation, unfavorable for constructing a collaborative and symbiotic urban functional system.

As future university facility land, the site can strengthen functional mixing on the basis of ensuring the main functions, developing in symbiosis with surrounding artificial and natural environmental elements.

The current land layout has issues such as insufficient natural response, spatial fragmentation, and functional singularity, making it difficult to support overall collaborative development. Future renewal should promote reasonable reconfiguration of building rights through optimizing functional structures and integrating core spaces, guiding spatial reconstruction that integrates ecology and functions.

5.4.2 Transportation and Accessibility

Turin's urban transportation network is relatively developed, with main road systems, metro lines, and bus systems forming a relatively complete urban transportation system. The site's western side is adjacent to the city's main road, and the future Metro Line 2 will have a station near the site, greatly enhancing the site's accessibility, making it more conveniently connected to Turin's city center and other important areas.

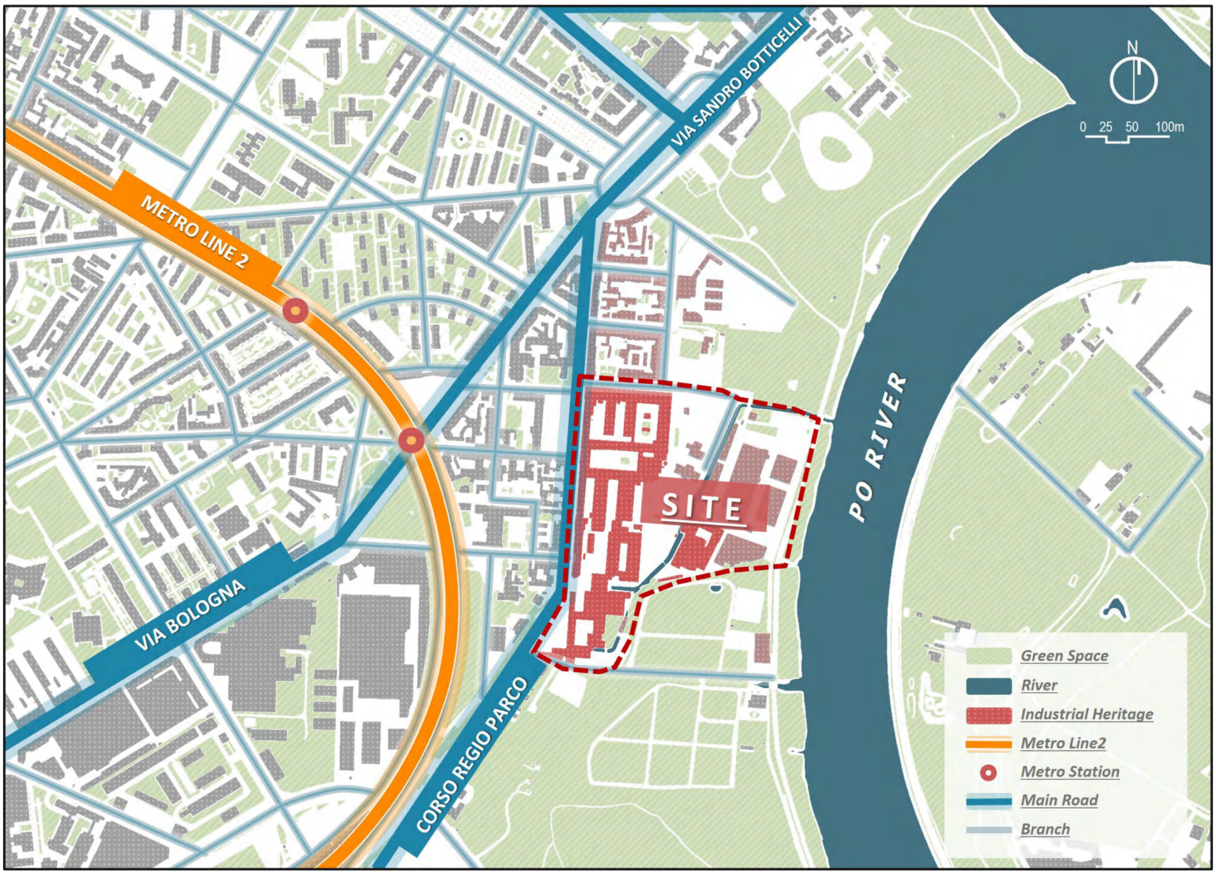

Figure 5-10 Surrounding Transportation Analysis Diagram of the Site
(Source: Drawn by the author)

Although the site's surroundings have certain road infrastructure, the overall transportation system still has multiple problems in terms of accessibility, continuity, and pedestrian friendliness, mainly manifested in the following points:

Figure 5-11 Internal Transportation Organization Analysis Diagram of the Site
(Source: Drawn by the author)

(1) Fragmented Transportation System Structure, Lacking Systematicity

The site's road hierarchy is unclear, with chaotic connections between main roads, secondary roads, branch roads, and internal roads, lacking unified organization. Some areas rely entirely on the factory's original channels, lacking clear public transportation orientation and recognizable access networks, with the overall transportation system presenting fragmented, inefficient states.

(2) Discontinuous Pedestrian System, Poor Walking Experience

Existing roads are dominated by vehicles, lacking dedicated or safe pedestrian spaces, with multiple entrance spaces of small dimensions, severe node fragmentation, making it difficult to form a complete continuous walking network. In particular, the lack of barrier-free connections between core functional areas and surrounding open spaces is unfavorable for public activities and slow mobility system construction.

(3) Lack of Horizontal Transportation Connections Between Internal River Banks

An internal river runs through the site, but lacks bridges or accessible paths between the two sides of the river, causing interruptions in connections between the two factory plots and between factory plots and the southern gardening land, not only constraining spatial integration but also weakening collaborative development of the plots.

(4) Insufficient Accessibility to Po River Waterfront Spaces

Although the site's east side is directly adjacent to the Po River, the current status lacks entrances and open paths oriented toward waterfront spaces. The waterfront interface is closed, without cross-river bridges, walkways, or visual corridors, unable to form effective interaction with ecological resources across the river, with waterfront advantages not transformed into spatial value.

5.4.3 Public Service Facilities

Currently, public facilities within and surrounding the site are relatively limited, especially in terms of culture, commerce, and community services. Although the surrounding area provides certain infrastructure such as schools, small businesses, and parks, they are distributed in a scattered pattern, lacking larger-scale cultural centers, commercial complexes, and public service facilities.

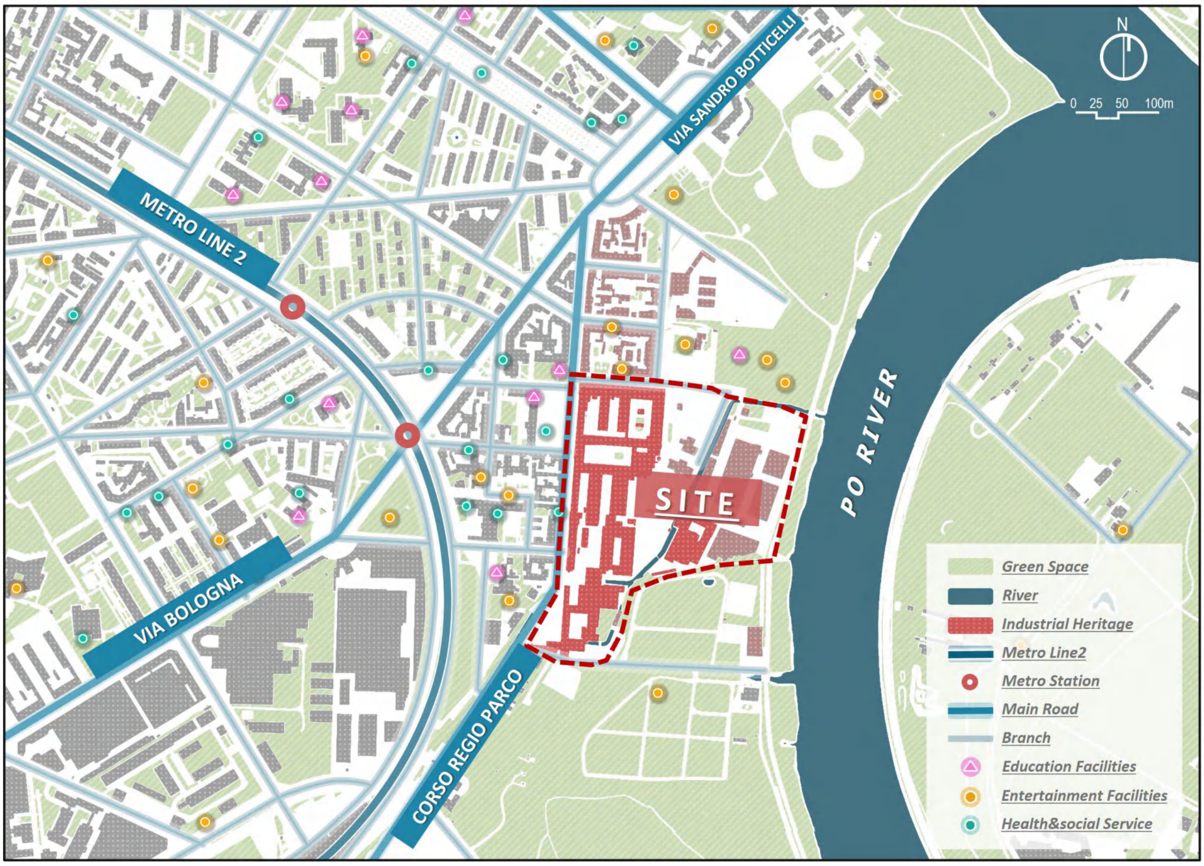

Figure 5-12 Distribution of Public Service Facilities Surrounding the Site
(Source: Drawn by the author)

Future site renewal will rely on universities as important urban cultural facilities, considering supplementing public functions in the surrounding area to better meet citizens' needs. Various public facilities can be introduced, such as libraries, exhibition halls, innovation incubation centers, leisure commercial spaces, etc., to increase the site's functional diversity. At the same time, combining green infrastructure construction to optimize the configuration of public spaces, serving not only the site's interior but also radiating to surrounding communities.

5.4.4 Public Open Spaces

The site is located at the intersection of the urban green system and the Po River waterfront belt, with rich public space resources surrounding it, but the current organization and connectivity of public spaces inside and outside the site have significant deficiencies, specifically manifested in the following aspects:

(1) Good External Public Space System but Ineffective Connection

Outside the site's red line are concentrated multiple types of open spaces, including parks to the north and several street plazas and pocket parks to the west. These spaces have excellent ecological conditions, strong public attributes, and high usage frequency, forming a complete regional-level open space system. However, the site's interior generally lacks accessible paths or visual connections with these spaces, with enclosed boundaries and unclear interface treatments, preventing public spaces from forming a continuous system.

(2) Internal Public Spaces Mainly "Enclosure-Type Semi-Public Spaces"

Current internal public spaces within the site are mainly "courtyard-type" gray spaces enclosed by factory buildings, mostly in a semi-open state, with ambiguous usage functions and insufficient vitality. Some areas, though having open potential, have limited accessibility and low usage frequency due to restricted entrances, lack of landscape creation and management mechanisms, making it difficult to serve as real public activity scenarios.

(3) Waterfront Spaces and Internal River Spaces Lack Activation and Integration

Although the site's east side is directly adjacent to the Po River, with an internal river running through it, providing excellent conditions for water-friendly spaces, neither is systematically utilized currently. The waterfront interface is separated from the site's building spaces, lacking waterside walkways and open nodes; the surroundings of the internal river also fail to form complete landscape belts or spatial guidance, with public value unreleased, water body spaces forming "forgotten resources" in the current status.

Overall, despite the site being adjacent to diverse public green spaces and waterfront resources, with certain open space foundations internally, it is generally enclosed with fragmented interfaces, severely lacking in public attributes and usage efficiency. Future renewal should strengthen linkage with surrounding green systems, activate waterfront and internal river spaces, reconstruct open, continuous, shared public space networks, and enhance overall ecological and social functional values.

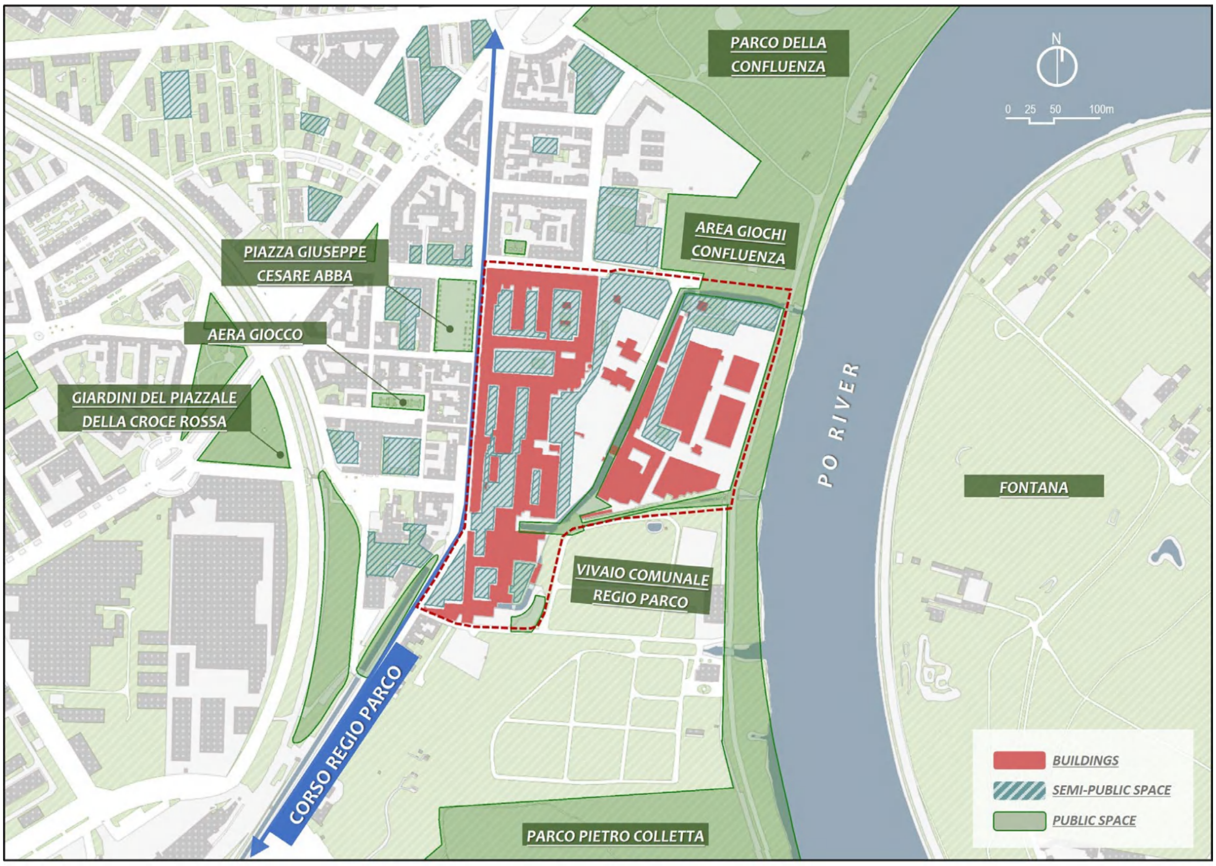

Figure 5-13 Site Current Public Space Analysis
(Source: Drawn by the author)

5.4.5 Building Heritage

Current buildings within the site are mainly divided into listed buildings, transformable buildings, common buildings, and temporary buildings. These categories differ significantly in terms of functions, historical value, and physical condition, directly affecting future renewal strategies and intervention scales.

Listed buildings are mainly concentrated in the tobacco factory plot on the site's west side, with brick and stone as the main structural form, containing multiple enclosed courtyards, possessing certain historical value and integrity. These buildings are listed in Italy's national cultural heritage protection catalog[77], requiring minimal intervention and adaptive reuse.

Transformable buildings are mainly distributed on the east and north sides of the tobacco factory plot, adjacent to protected buildings. These are structurally factory buildings renovated in the 21st century, relatively new, well-preserved, and structurally stable, capable of being updated through partial additions, functional conversions, etc., suitable for bearing some supporting functions or regenerative uses.

Common buildings are mainly concentrated in the central part of the site and the textile factory plot, including original office buildings, textile factory buildings, auxiliary workshops, etc. Their building forms are relatively conventional with lower historical value, and decisions about preservation or replacement in renewal can be made based on structural conditions.

Temporary buildings are scattered in the southeast side and southern edge areas of the site, mostly lightweight structures added later, with unclear purposes or already abandoned, suitable for demolition.

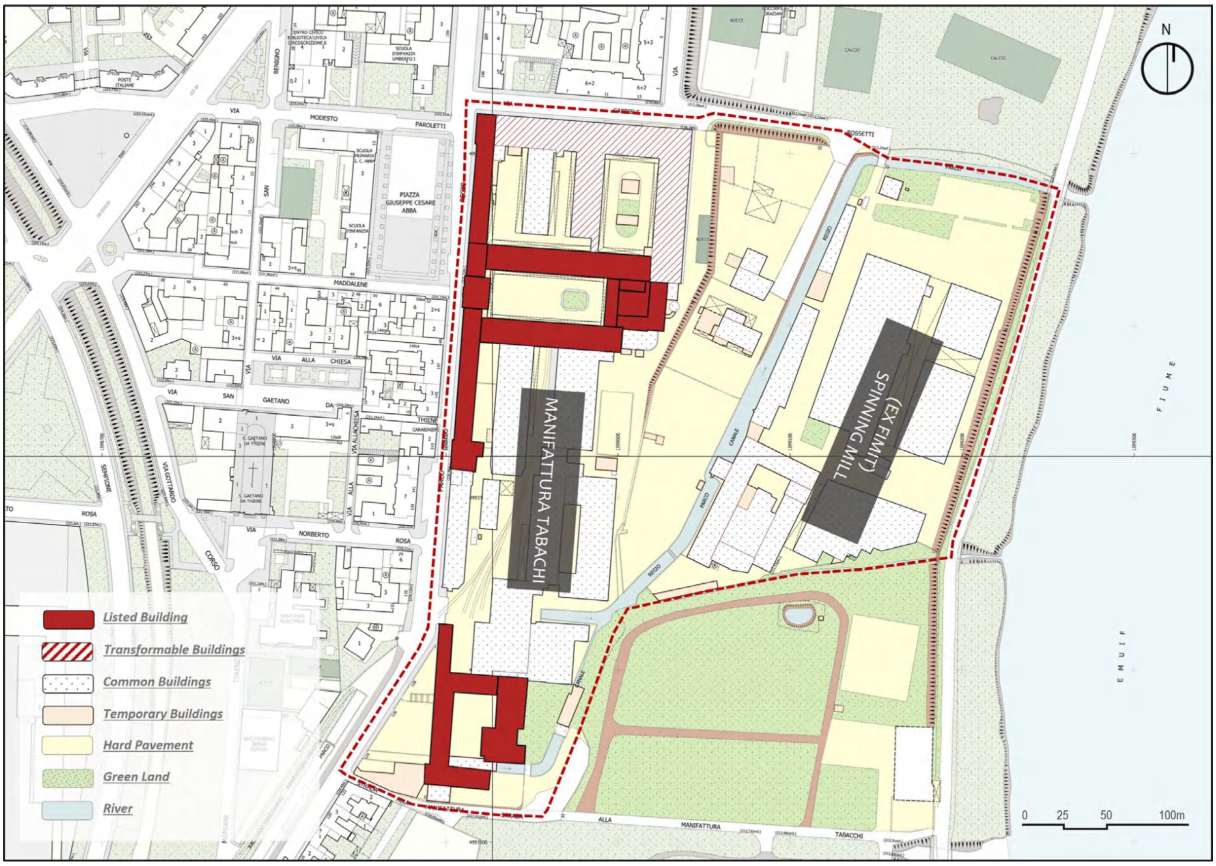

Figure 5-14 Current Building Distribution Map of the Site
(Source: Drawn by the author)

（1）Former Royal Tobacco Factory Building Group

Since 1832, the building morphology of Turin's former Royal Tobacco Factory has evolved from an enclosed layout to a complex expanded structure. Early buildings centered on a central courtyard, with symmetrical distribution around it, emphasizing production processes and spatial control. In the late 19th century, some buildings were modified or demolished, gradually extending the axis, strengthening spatial connections. By the 1970s, multiple auxiliary buildings were added to the site, significantly increasing spatial density, with the original open structure largely filled[78].

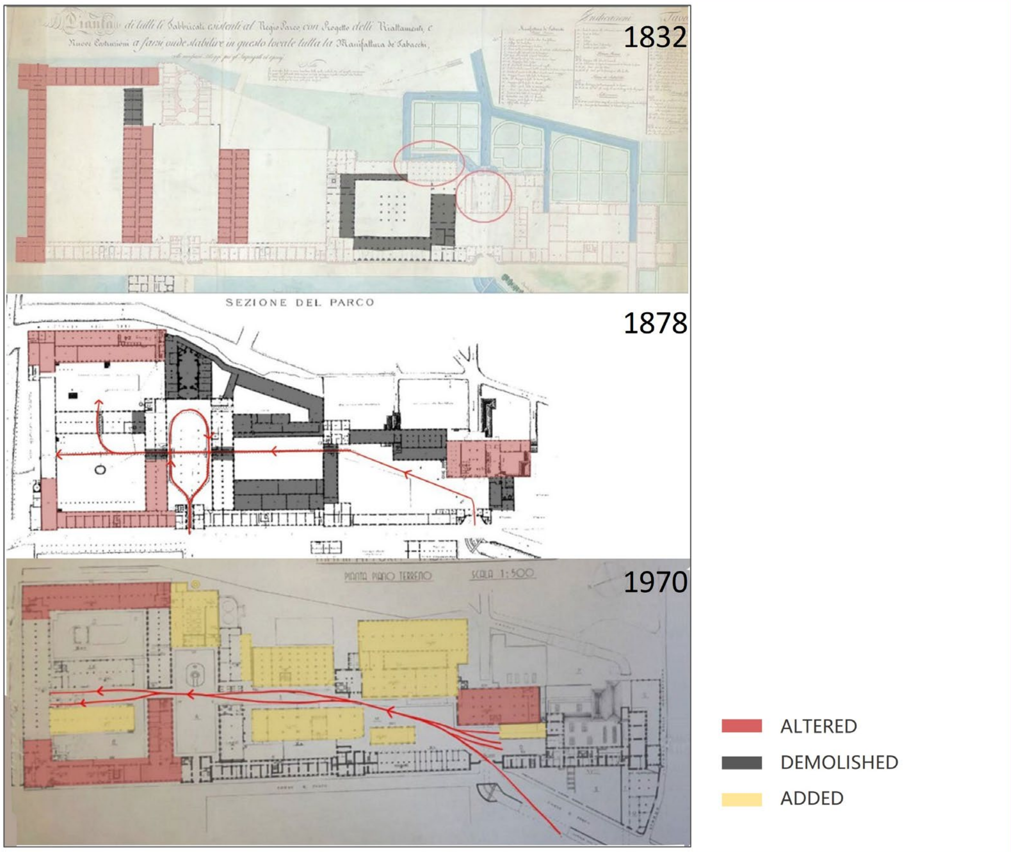

Figure 5-15 Tobacco Factory Building Plan Evolution Diagram
(Source: Redrawn by the author based on reference [78])

Currently, Turin's former Royal Tobacco Factory forms an enclosed, large-scale building group, with spatial characteristics mainly including:

① Enclosed factory area: The tobacco factory's buildings are arranged with strong axiality, with factory buildings and auxiliary facilities enclosing multiple rectangular courtyards, which were used for storage, transportation, and production scheduling, now forming relatively large vacant spaces with reuse potential.

② Large-span factory buildings: Main buildings inside the site are single or double-layer factory buildings, with roofs adopting double-slope or four-slope structures, large spans, heights of about 5 meters, suitable for subsequent transformation into exhibition, commercial, cultural spaces, and other functions.

③ Rich historical remnants: The tobacco factory preserves multiple important industrial remnants, with the most representative including:

a. Chimney: The tobacco factory's chimney is not only an important symbol of industrial remains but also a carrier of site historical memory, which can be preserved through transformation in the future, combined with lighting, art installations, or landscape design, making it a new urban cultural landmark.

b. Original factory building structures: Some buildings still maintain original brick structure gates and sawtooth roofs, showcasing industrial era architectural craftsmanship; these elements can be protected in future transformation and integrated into modern design.

c. Old production equipment: Some early tobacco processing equipment and transportation tracks remain on site, which can serve as parts of industrial museums or exhibition spaces, displaying the historical changes of Turin's industrial development.

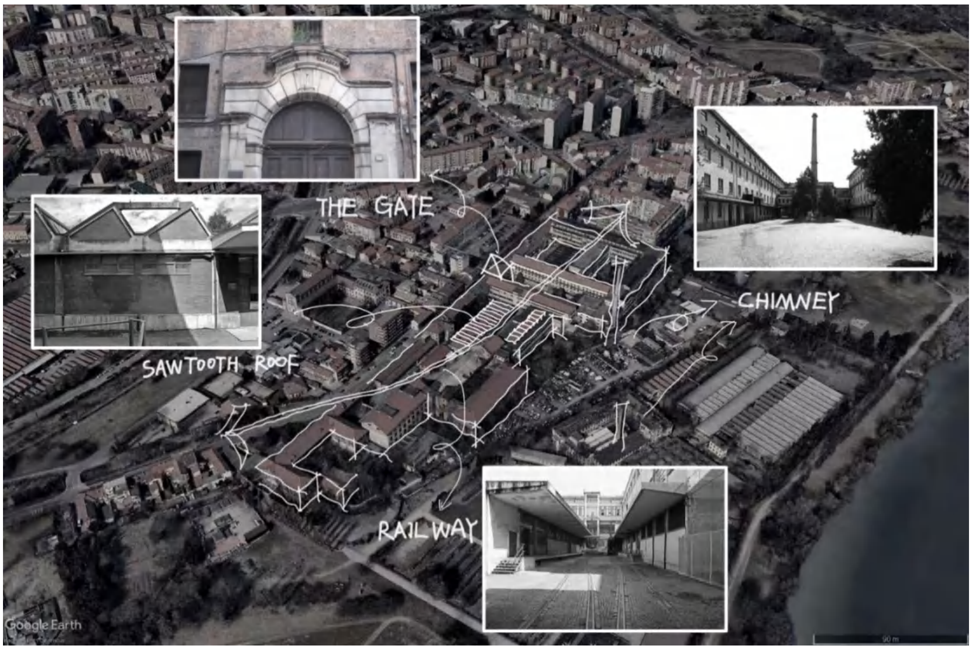

Figure 5-16 Historical Elements of the Tobacco Factory
(Source: Author's photographs, redrawn from Google Earth))

Figure 5-17 Current State of Tobacco Factory Buildings
(Source: Author's photographs)

（2）Textile Factory Buildings

Although the textile factory site in the southeast of the site is not a key protected building in Italy's cultural heritage, it still has certain industrial historical value. After long abandonment, its structural condition shows partial damage and partially repairable characteristics. From image comparisons, in 2011 the building still maintained intact roof structures, while after 2017 the roof largely collapsed, exposing internal structures, with the building's overall protection condition severely deteriorated. The current analysis diagram shows the building can be divided into structures needing preservation, areas awaiting repair, and parts proposed for demolition, with core structures (such as the iconic chimney, some exterior walls, and stairwells) still maintaining relatively good integrity, possessing reuse possibilities. The building's main entrance area is severely damaged, with the roof almost completely collapsed, but still retaining some walls, which can serve as important spatial bases for future transformation. Although the main structure has experienced time erosion, its industrial-style red brick exterior walls are still relatively solid, especially the chimney as the site's landmark element, not only possessing historical value but also potentially becoming a symbol of spatial memory in future transformation. Additionally, some stairwell structures are relatively intact, possibly used for restoration or reuse of vertical transportation.

Figure 5-18 Textile Factory Building Analysis
(Source: Redrawn by the author from Google Earth)

The renovation of buildings within the site should be based on protecting industrial heritage values, combined with adaptive reuse strategies, bringing new life to the tobacco factory and textile factory sites. Key historical elements such as chimneys and original factory building structures should be preserved and activated through new functions such as cultural exhibitions, creative offices, educational research, etc. Some severely damaged buildings without protection value can be demolished to optimize spatial layout and accessibility, introducing pedestrian corridors and public open spaces, enhancing integration between the site and the city. The renewal of waterfront interfaces can be achieved by demolishing walls, adding viewing walkways, fully utilizing the landscape resources of the Po River, making it a complex public space integrating historical protection, cultural innovation, and urban vitality.

5.4.6 Building Morphology and Texture

The building morphology and spatial organization method of the tobacco factory are distinctly different from surrounding traditional urban blocks, with its layout influenced by industrial production modes, forming large-scale, linearly arranged building groups, in sharp contrast to the dense, block-style urban form of the surroundings.

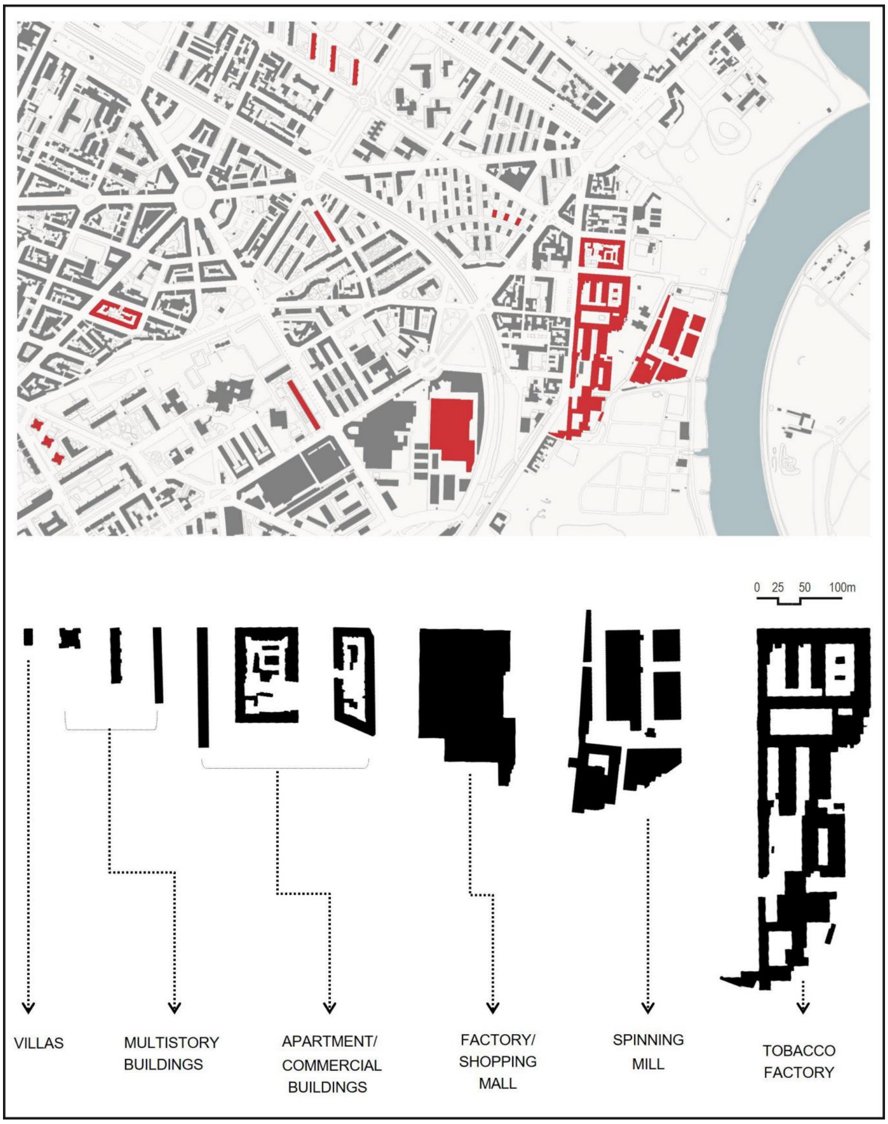

Figure 5-19 Building Texture and Scale Analysis
(Source: Drawn by the author)

From the overall building morphology perspective, the site's building texture has strong linear layout characteristics, with building layouts following industrial production and logistics transportation logic, main buildings arranged along north-south axes, forming multiple band-shaped building groups and factory areas. The spacing between buildings is relatively large, forming multiple enclosed or semi-enclosed internal courtyards, which were used for logistics, goods storage, or production auxiliary spaces during the industrial period. In contrast, surrounding traditional urban textures adopt block layouts, with buildings of relatively higher height, more compact scales, forming continuous urban interfaces. This contrast shows that while the tobacco factory's existing industrial form provides greater building plasticity, it also limits spatial openness to some extent, affecting integration with the urban environment.

From the comparison of building scales, the tobacco factory's building volumes are significantly larger than surrounding blocks, with single buildings occupying larger areas, while surrounding urban buildings are mainly small, tightly arranged street buildings, with smaller building spacing, forming stronger enclosure sense and continuous urban spaces.

In the transformation process of the tobacco factory, how to break the enclosure of the original industrial site and integrate it more closely with surrounding high-density blocks is a key planning issue. By introducing public spaces, pedestrian corridors, and mixed-function buildings, the site can enhance openness and urban interaction while continuing industrial heritage characteristics. Future updates should adopt adaptive reuse strategies, optimizing spaces of existing buildings to meet new functional needs. For example, large-scale factory buildings can be divided, with atriums or internal streets introduced, adjusting building scales to better fit human-scale urban environments while retaining their unique industrial historical characteristics, achieving sustainable spatial renewal.

Figure 5-20 Tobacco Factory Building Scale Analysis
(Source: Drawn by the author)

5.4.7 Main Street Interface

The street interfaces of the tobacco factory site present closed, lacking interaction characteristics under current conditions. Most of the western interface along the main road consists of continuous walls and enclosed factory buildings, with buildings lacking external openings, missing the introduction of functions such as commerce, residential, etc., forming a stark contrast with surrounding open urban interfaces. Compared to traditional blocks with street shops, offices, or residential entrances, the tobacco factory's closed interfaces make street experiences monotonous, lacking vitality, while due to the inward enclosure of building layouts, the site has few entrances, further reducing accessibility, making it difficult to integrate into daily urban activities.

Although the eastern waterfront interface is adjacent to the Po River, possessing extremely high landscape value, due to building and wall obstruction, there is almost no direct connection between the site and waterfront spaces. Compared to other urban waterfront areas typically setting walking paths, public squares, or water-friendly platforms, the tobacco factory's waterfront interface lacks open spaces and visual penetration, failing to form a continuous waterfront experience, preventing the Po River's landscape resources from effectively transforming into site advantages. Additionally, the closed facades of some factory buildings further block interaction between people and water bodies, weakening the site's publicity and attractiveness.

Future renewal should optimize street and waterfront interfaces, on the west side increasing building openings, adjusting walls, introducing commercial and public functions to enhance street vitality and spatial permeability; on the east riverside area, removing some barriers, setting walking paths and public spaces, strengthening connections between the site and the Po River, making it a more open and pleasant urban space.

Figure 5-21 Facade Analysis of the Block Opposite the Tobacco Factory's Western Side
(Source: Redrawn by the author from Google Earth and Google Street View)

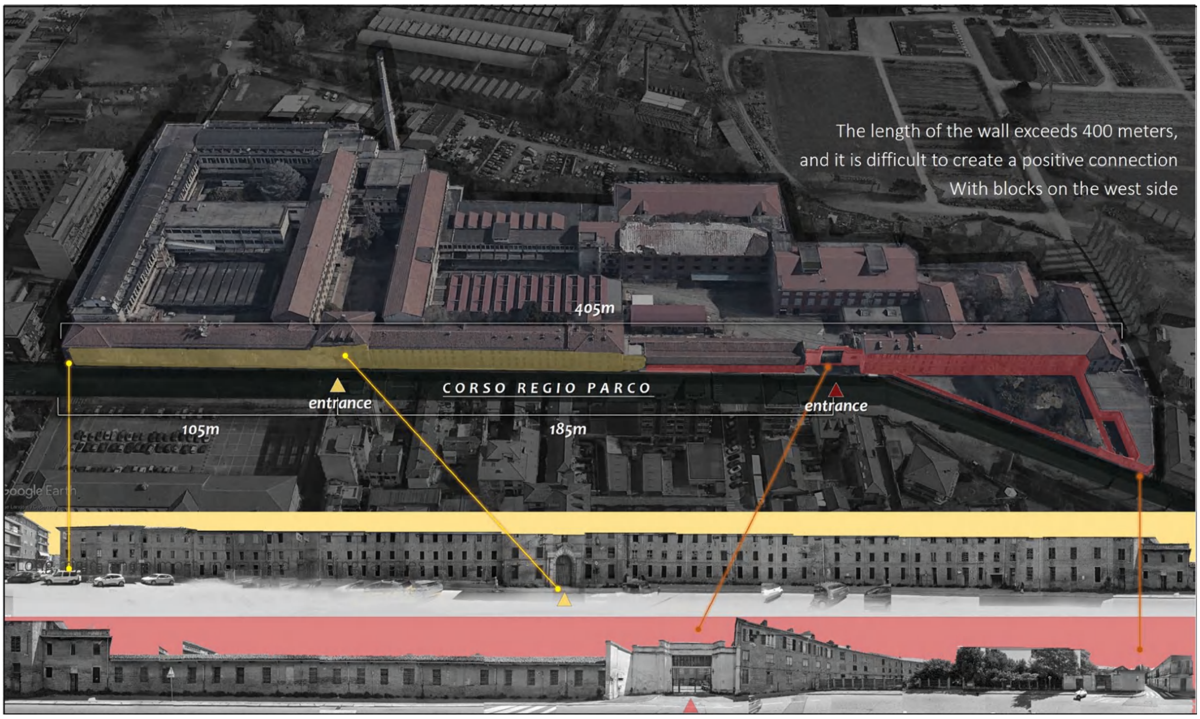

Figure 5-22 Western Facade Analysis of the Tobacco Factory
(Source: Redrawn by the author from Google Earth and Google Street View)

5.5 Socioeconomic and Functional Analysis

5.5.1 Socioeconomic and Functional Analysis

The sixth administrative district of Turin where the tobacco factory is located is a culturally diverse area, gathering large numbers of immigrants, giving the region's population composition significant international characteristics. According to statistical data, the proportion of immigrants in the sixth administrative district is at a relatively high level within Turin, with foreign populations accounting for approximately 20%—30%, significantly higher than other administrative districts. Source countries of immigrants are quite diverse, including other European countries, Africa, South America, and Asia, with particularly concentrated immigrant groups from Eastern Europe, North Africa, and South Asia[79]. This multicultural background not only influences local community structures but also to some extent shapes the region's economic forms and social environment.

Despite relatively high population density, the region's socioeconomic level is relatively low, with residents mainly engaged in low-income occupations, primarily in manufacturing, construction, retail, and service industries. Due to limited economic conditions, the region's infrastructure and public service resources are relatively strained, with relatively low accessibility to education, medical, and cultural facilities. Currently, basic public services in the region can meet residents' daily life needs, but cultural, social, and professional development facilities are relatively lacking, with existing cross-cultural centers unable to meet the growing social integration needs of immigrant communities.

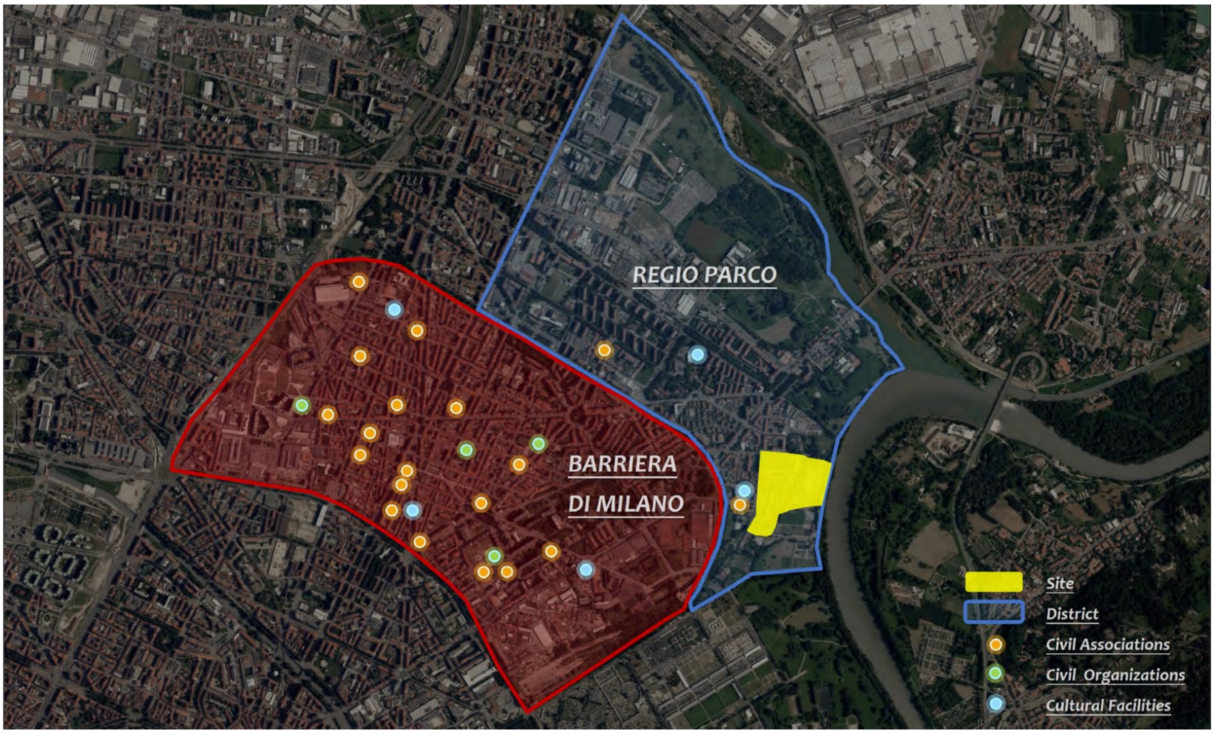

Figure 5-23 Distribution Map of Immigration Culture-Related Facilities in the Surrounding Area
(Source: Drawn by the author)

Given the historical background and location characteristics of the tobacco factory site, its future transformation needs to consider not only building and functional updates but also targeted social integration strategies and public service facilities based on the region's population characteristics. The site's renewal can become an opportunity to promote social integration, introducing education, culture, business, entrepreneurial incubation spaces, and other multi-functional formats to enhance regional economic vitality, while providing community interaction platforms, strengthening integration between immigrant groups and local residents, making it a demonstration area of multicultural coexistence and economically sustainable development.

5.5.2 Stakeholder Analysis

In the process of transforming and reusing the tobacco factory, multiple stakeholders are involved, each with unique focuses and interest demands. How to balance the needs of different entities in the planning process and form a sustainable cooperative model is an important aspect to consider in redevelopment.

The government (Turin municipal government, national government, and related planning agencies) is the main promoter of this site renewal, hoping to promote sustainable urban development through this project, improve the urban image of old industrial areas, while promoting employment and economic growth. The government's main objectives include optimizing land use, improving urban public space quality, promoting cultural and creative industry development, and strengthening urban renewal and social integration. Additionally, the government hopes to achieve reasonable development models through mechanisms such as building rights transfers, reducing fiscal burdens while encouraging private investment.

Universities (University of Turin and Polytechnic University of Turin), as important participants in this site renewal, have deep influence on its future functional layout. Both universities hope to expand their educational facilities, establishing research centers, student apartments, academic exchange centers, etc. in the area, making it a demonstration area combining higher education with innovative industries. University participation can not only enhance the site's cultural atmosphere but also promote concentration of high-quality talent, bringing positive impacts to regional development.

Private property owners occupy important positions in this project. Currently, land ownership of the site is mainly owned by the government, but some plots are still privately held. In the renewal process, building rights transfers, land exchanges, or cooperative development need to be adopted to ensure landowners can participate in the renewal process and obtain reasonable economic returns.

Community residents and immigrant groups are direct beneficiaries and users of the site's future development. Local residents generally hope to improve the community environment, enhance public facility and green space quality, while obtaining more employment opportunities. However, due to residents' limited economic capabilities, they may prefer low-cost housing and commercial spaces, thus site development processes need to consider economic affordability, avoiding the displacement of poor populations due to large-scale high-end commercialization.

Commercial developers and investors are also important stakeholders in this project. They hope to obtain investment returns in the urban renewal process, thus concerned about project commercial feasibility, government policy support, and market demand. Reasonable planning and moderate commercialization can attract investment, enhance regional economic vitality, while avoiding the destruction of historical cultural heritage and social structures through excessive commercialization.

To achieve balance of various interests, renewal needs to construct a multi-party cooperation mechanism of government—university—landowners—community residents—commercial investors, realizing economic and social double sustainable development on the basis of protecting the site's historical and cultural values.

Table 5-1 Stakeholder Analysis
(Source: Compiled by the author)

n.	Stakeholders	Level	Typology	Resource	Goal
1	City Of Turin	regional	political	political/legal	about political consensus,development and economic
2	Regional Administration	regional	political/bureaucratic	political/legal	management of the region
3	Consultants Of Turin	regional	experts	cognitive/economic	increase the participation in decision-making process
4	Environmental Associations	local-international	general interests	political	prevent further degradation and environmental problems
5	Neighbourhood Committees	local	general interests	economic	represent local residents to satisffy their needs
6	The PNRR	international	special interests	economic	provide economic support
7	Campus/Land Owners	regional	general /special interests	cognitive/economic	gain reputations and reshape the site
8	Construction Companies	local	experts	cognitive/economic	gain economic profits from construction activities
9	Designers	local-international	experts	cognitive	formulate well performing project proposals
10	Media	local-international	special interests	economic	create oppotunities about expanding impacts
11	Private Investors	local-international	special interests	economic	maximization of economic profit
12	Tourists	local-international	special interests	economic	visit tourist attractions
13	Local Residents	local	special interests	economic	ameliorate the negative aspects of the area
14	Future Residents And Traders	local-international	special interests	economic	create a full-service neighbourhood and business activities
15	Workers Nearby	local	special interests	economic	gain economic profit by working
16	Teachers And Students	local-international	special interests	economic	gain wages and knowledge

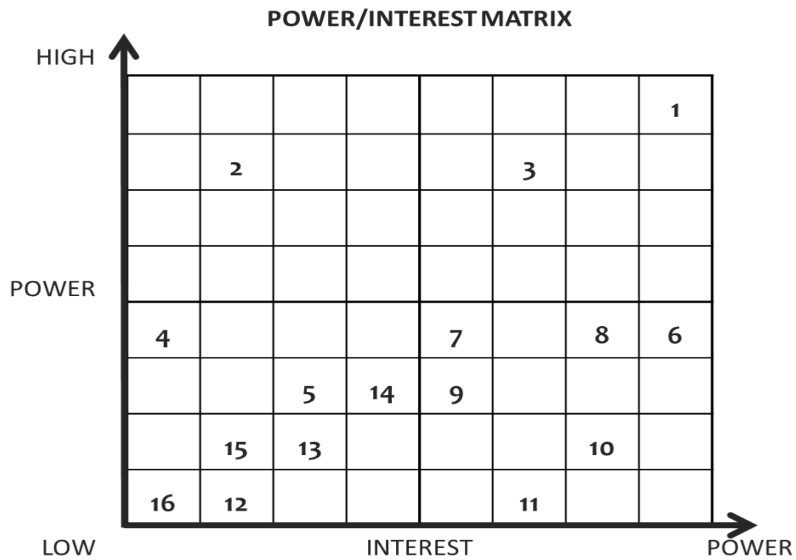

Figure 5-24 Stakeholder Power/Interest Analysis Matrix
(Source: Drawn by the author)

5.5.3 Land Ownership Analysis

The land ownership structure of the tobacco factory site is relatively complex, composed jointly of national, local government, and some private lands[20], and this diversified ownership pattern to some extent influences future development models and spatial integration strategies.

According to the existing land ownership distribution, the site can be categorized as follows:：

Figure 5-25 Land Ownership Division Map
(Source: Drawn by the author)

（1）National-Owned Plots

Including original national monopoly assets and nationally-held plots for lease or development, concentrated in the western area of the site, constituting the main component of the historical tobacco factory core area, currently still managed by the Italian National Property Agency.

（2）University-Use Plots

Including temporarily allocated national assets and 30-year agreement municipal plots provided by the Turin municipal government for use, containing the main portion of the tobacco factory plot and the textile factory plot.

（3）Local Government-Owned Plots

Mainly concentrated in the southeastern Po River riverside green area of the site, held and managed by the Turin municipal government.

（4）Privately-Owned Plots

The parking lot plot in the central part of the site is privately owned. The existence of this plot to some extent increases the difficulty of property rights integration in future development processes but also provides practical space for building rights transfer mechanisms. Through reasonable allocation of building rights and guided development strategies, private investment can be attracted to improve land use efficiency while ensuring public functions.

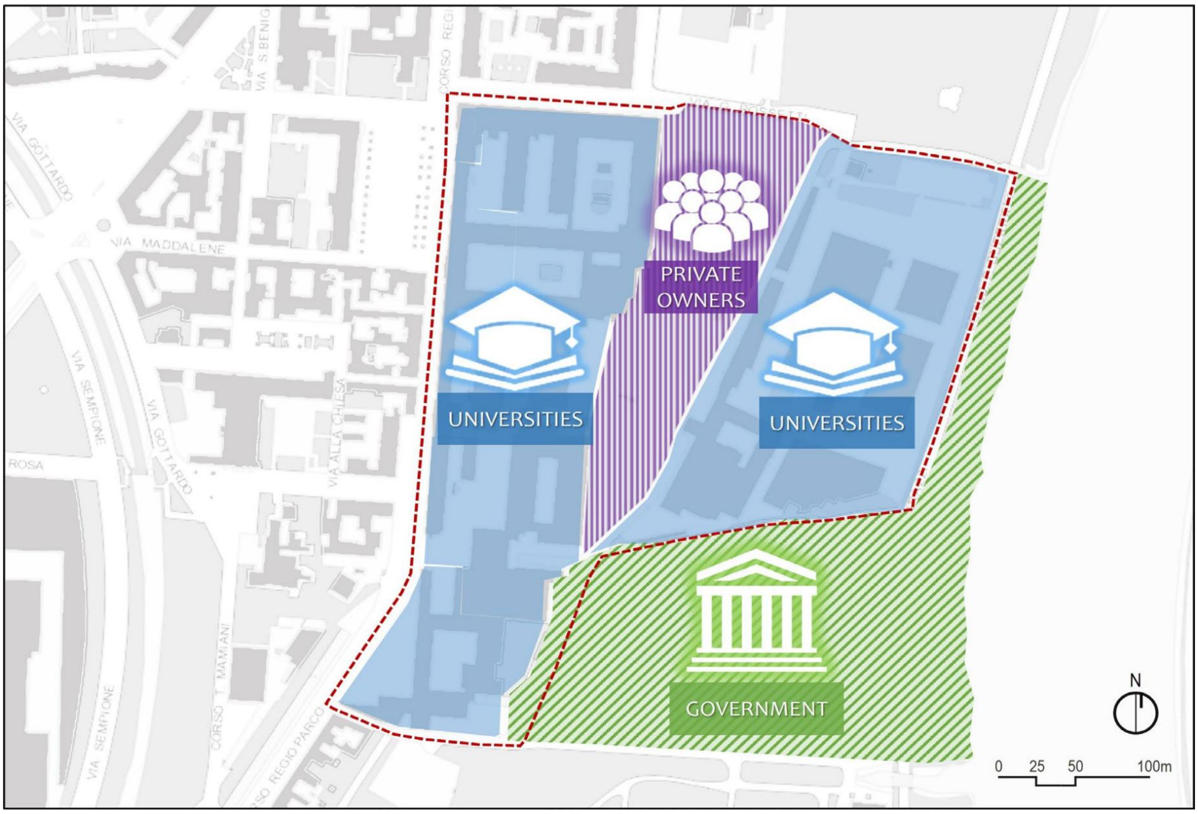

Figure 5-26 Land Ownership Simplification
(Source: Drawn by the author)

Overall, the site presents a pattern of "multiple ownership coexistence, dispersed property rights," making future development and renewal difficult to rely on a single government-led model, requiring coordination of multiple entity relationships through building rights control mechanisms and urban equalization policies, promoting simultaneous optimization of interests and spatial structures. For this, in subsequent design simulations, this paper will categorize relevant stakeholders into three main entities: universities (including developers commissioned by universities), the government, and private owners, correspondingly simplifying spatial ownership distribution, and based on this, exploring the systematic transmission mechanism between building rights allocation logic and spatial strategies.

5.6 Development Issues of the Turin Tobacco Factory and Intervention of Urban Equalization Policy

5.6.1 Key Redevelopment Issues

With the retreat of industrial functions and the increase of urban regeneration demands, the Turin tobacco factory plot, as an important node in Turin's northeastern area, has been assigned multiple objectives of renewal activation, functional transformation, and spatial integration. However, through systematic analysis of the site's natural environment, built environment, and socioeconomic functions in previous sections, it can be seen that this plot still faces multiple difficulties in the actual transformation process. These issues not only affect the achievement of renewal results but also reveal the limitations of existing development paths in addressing complex urban areas, specifically manifested in the following three aspects:

(1) Enclosed Spatial Interfaces

The tobacco factory's overall spatial structure continues its enclosed pattern from the industrial era, with building distribution mainly characterized by axial strip factory buildings, forming multiple semi-enclosed courtyard spaces, lacking internal connectivity and open sharing organizational logic. At the same time, the western main street interface of the plot is enclosed, with almost no public openings, isolated from urban spaces, difficult to integrate into urban textures; the eastern side, although adjacent to the Po River, is difficult to realize public transformation of waterfront resources due to building obstruction and wall separation. This spatial fragmentation not only weakens physical connections and visual interactions with surrounding blocks but also constrains its ability to participate in the overall urban network as a public open space.

(2) Fragmented Functional Organization

The tobacco factory plot and textile factory plot are separated by a private plot, breaking potential functional axes; buildings within each plot are mostly designed for single purposes, with spatial interfaces lacking transitions, difficult to meet the flexibility and mixing of daily use. Overall, the project fails to form a multi-dimensional interactive urban life system, with a low degree of functional complexity, unfavorable for maximizing land use efficiency and service coverage for diverse urban groups.

(3) Difficulties in Interest Coordination

The plot involves multiple property entities, including the National Property Agency, municipal government, University of Turin, and private institutions, presenting typical characteristics of "dispersed property rights, diverse demands." The various parties have significant differences in development demands, revenue expectations, and planning visions, with planning implementation processes facing high negotiation and game costs. Unclear rights-responsibility relationships and easy marginalization of public goals further exacerbate uncertainties in governance structures and execution gaps.

5.6.2 Dilemmas Under Traditional Models

When facing complex renewal tasks in urban core areas, traditional redevelopment models often focus on single goal-oriented planning designs and top-down resource allocation, with government-led models usually relying on land acquisition, planning adjustments, and public investment to promote spatial transformation and functional restructuring. However, for plots like the Turin tobacco factory, which are located in the urban core, have special use positioning, and complex property relationships, this model exposes significant limitations in practice:

(1) Fiscal Constraints Limit Government-Led Development

The tobacco factory plot was originally positioned as university function land, with clear public objectives but limited market transformation capability, and relatively small development profit space. If still using traditional methods of full government acquisition and bearing transformation costs, it would not only bring huge fiscal burdens but also require long-term responsibility for subsequent maintenance and operations, which is already difficult to continue under the current general local fiscal contraction background. At the same time, due to relatively singular functions, the plot's development lacks sufficient "blood-making" capability, further compressing the feasibility of public sector-led development.

(2) Single Development Models Fail to Meet Diverse Demands

The plot itself is located at a convergence node of multiple urban functions, with surrounding residential and commercial areas, as well as waterfront ecological potential. From an urban spatial structure perspective, this plot urgently needs to undertake urban functions beyond education, such as cultural creativity, commercial supporting facilities, ecological corridors, and public services, to truly integrate with urban textures. However, traditional development models, advancing linear processes through single entities, lack cross-domain coordination mechanisms, unfavorable for functional complexity and dynamic resource allocation, ultimately often leading to use fragmentation, discontinuous interfaces, and insufficient vitality.

(3) Multiples Stakeholders Struggle to Coordinate Effectively

The plot contains multiple property subjects such as national, local government, universities, and private owners; if adopting traditional acquisition and one-time compensation methods, it not only becomes difficult to effectively integrate land resources but also deprives original property owners of opportunities to participate in future benefits and operations, reducing cooperation enthusiasm. At the same time, traditional development mechanisms lack horizontal coordination and long-term game management capabilities; facing complex development patterns with complex property rights and diverse demands, they often lead to extended project advancement cycles, with public goals marginalized in realistic games.

The tobacco factory project is not only an important node of urban redevelopment but also a representative plot with diverse functions, complex property rights, and composite goals. Fiscal pressure, functional integration obstacles, lack of coordination mechanisms, and weakening of public values jointly constitute structural bottlenecks that traditional development paths cannot reconcile. Facing this situation, there is an urgent need to introduce a new type of policy mechanism that can both achieve shared development benefits and coordinate multiple goals and entities.

5.6.3 How Can Urban Equalization Policy Influence the Full Development Process of the Turin Tobacco Factory

In Turin's urban renewal policy system, urban equalization policy has become the dominant land development mechanism, with its core being promoting optimal allocation of land resources through building rights transfers, land exchanges, and public interest balancing. In the renewal process of the Turin tobacco factory, the intervention of this policy has already to some extent influenced the development model, transforming it from a traditional model dominated by a single entity to a more flexible public-private cooperation model. However, how equalization policy influences the development decisions, land use, and spatial form of this plot at the operational level still lacks systematic research.

From the current planning framework, equalization policy in the redevelopment of the Turin tobacco factory may involve the following key issues:

(1) Land Use Adjustment: How does equalization policy influence land use allocation of the site? Has it changed the distribution method of development rights, thereby affecting the layout of functions such as universities, commerce, and public spaces?

(2) Development Rights and Public Returns: Under the framework of equalization policy, how do developers undertake corresponding public responsibilities while obtaining higher development intensity? How does the policy guide developers to provide more open spaces, green infrastructure, or cultural facilities?

(3) Spatial Openness and Accessibility: Has equalization policy promoted the transformation of the tobacco factory from a closed industrial area to a more open, integrated urban space? Has the organization of pedestrian systems, street interfaces, and public spaces

within the site been influenced by the policy?

(4) Interaction Modes of Stakeholders: How does equalization policy change the distribution of rights and responsibilities among government, universities, private investors, and communities? Has this policy enhanced multi-entity collaboration, making land resource utilization more efficient?

Since the current application of equalization policy is mainly concentrated at the land development level, how it further acts on the evolution of spatial form is still an area not fully discussed. In subsequent chapters, this research will first conduct in-depth analysis of land development rights and urban equalization policy, then summarize the "policy—development model—spatial design" framework under urban equalization policy, and further through full-process design of the Turin tobacco factory under the influence of urban equalization policy, intuitively demonstrate the impact of this policy on the renewal of the Turin tobacco factory, and explore how to maximize its public value and development benefits under the equalization policy framework through spatial strategies.

Chapter 6 Redevelopment and Spatial Design of the Tobacco Factory

6.1 Design Background and Model Construction

6.1.1 Renewal Background and Existing Dilemmas

Located in the northeastern waterfront area of Turin, the former Royal Tobacco Factory is a typical industrial heritage site slated for transformation into a university-led cultural facility. Based on the previous site analysis, this area possesses a favorable location and rich historical value, yet also faces several major challenges:First, the spatial interface has remained closed over a long period, making it difficult to establish organic connections with the surrounding urban fabric.Second, the current land use pattern is fragmented and functionally singular, lacking spatial organization that supports flexibility and functional integration.Third, the site involves multiple ownership types and interest groups, which results in high negotiation costs and a tendency for public goals to be marginalized.Traditional government-led redevelopment approaches have struggled to effectively coordinate these diverse resources. In contrast, the urban equalization policy offers an institutional mechanism capable of systematically managing space, function, and stakeholder interests to facilitate an orderly and balanced redevelopment process.

6.1.2 Design Objectives

This chapter takes the urban equalization policy as its foundation and applies the mechanism of "building rights allocation and transfer" as the core spatial intervention method. The goal is to implement the logical chain of “Policy — Land Development — Spatial Strategy” by testing two types of redevelopment models, thereby verifying the adaptability and implementation strategies of the equalization mechanism under different real-world conditions.

The main objectives of the design research are as follows:

（1）To explore the interactive mechanisms among development intensity, rights allocation, and spatial structure from the perspective of building rights;

（2）Under stable ownership structures and varying development intensities, to simulate building rights operations under two regulatory strategies and examine their respective paths of spatial adaptation and feasibility;

（3）To respond to the four land development strategies and four spatial design strategies proposed in Chapter 4, promoting their implementation within the site through the support of institutional logic.

6.1.3 Design Framework and Content Development Approach

To systematically explore the spatial adaptation of the urban equalization policy, this chapter constructs two representative redevelopment models:a university-led redevelopment model (Scheme I), and a university-city collaborative redevelopment model (Scheme II).

These two models differ fundamentally in their leading actors and functional composition: The former is driven solely by the university, adopting a restricted equalization model that emphasizes campus-oriented renewal and ecological restoration. The latter introduces government investment and multi-stakeholder cooperation, combining both extended and restricted equalization models to focus on integrated university-city functional development.

Based on this setup, the chapter is structured into three major sections:

Part I (Sections 6.2–6.3): Presents the planning and design processes of the two redevelopment models, focusing on boundary optimization, building rights allocation, development intensity, and value distribution. It highlights the adaptation mechanisms between institutional tools and land use realities.

Part II (Section 6.4): Conducts a comparative analysis of the two models across three dimensions—land use organization, building rights transfer, and stakeholder collaboration—to identify redevelopment logic and implementation paths under different institutional settings.

Part III (Section 6.5): Performs a cross-sectional evaluation of the four spatial strategies, assessing how each model translates institutional logic into spatial systems, and summarizes universally applicable design methodologies.

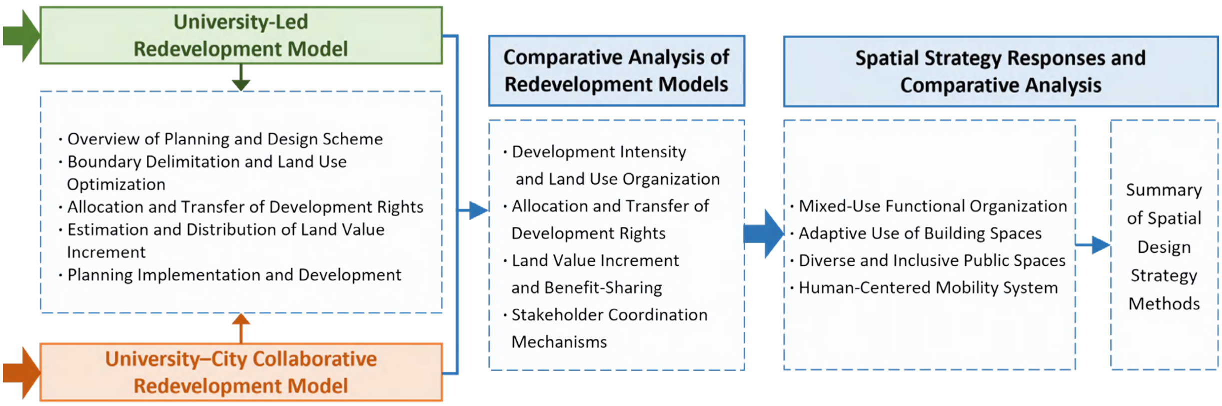

Figure 6-1 Design Framework
(Source: Drawn by the author)

6.2 University-Led Redevelopment Model

6.2.1 Overview of the Planning and Design Proposal

This scheme establishes a university-led redevelopment model under the premise of maintaining the existing land ownership structure, planning control boundaries, and development intensity constraints. The core feature of the model is the concentration of development initiative in the hands of the university. Strategically, the model emphasizes institutional compatibility and implementation feasibility, adopting a building rights regulation mechanism based on “restricted equalization.” Spatial optimization and functional expansion are centered around the university’s internal development needs.

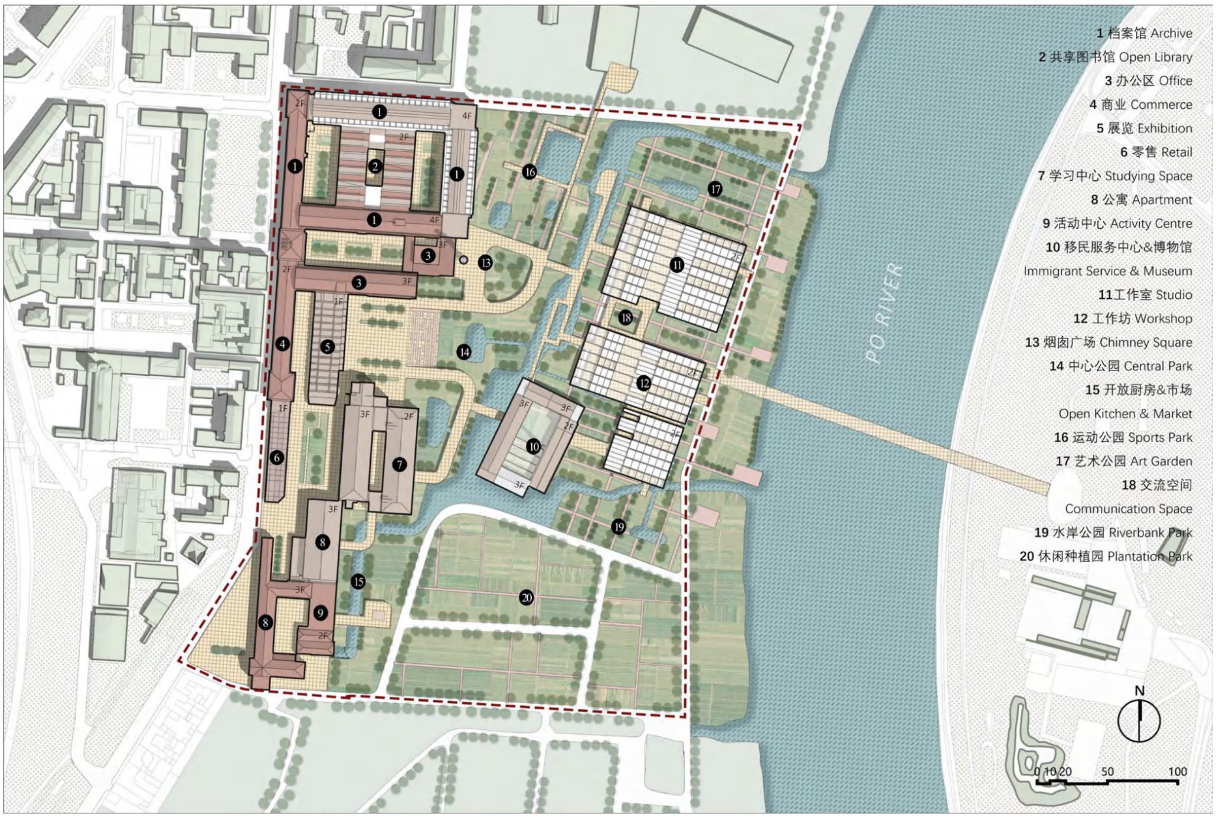

Figure 6-2 Urban Design Master Plan of Scheme I
(Source: Drawn by the author)

By employing a “restricted equalization” model, the proposal introduces fine-grained adjustments to internal plot boundaries and land use designations, treating the entire site as a unified equalization area. This enables the orderly circulation of building rights within the site. The design goal is to demonstrate the operational feasibility of the equalization policy under real-world conditions, using rational building rights reallocation among plots to optimize spatial structure and enhance functional integration.

In terms of spatial strategy, the scheme emphasizes ecological value and public accessibility by transforming certain areas into urban green space or open public space, thereby strengthening the site’s ecological performance and environmental resilience. Simultaneously, the design promotes integration between urban and university functions. While preserving the industrial heritage fabric, the site is infused with hybrid functions such as a migrant services center, an urban culture museum, and creative office spaces.

Regarding architectural transformation, the proposal adheres to the principles of "minimal intervention and adaptive reuse," converting historic factory buildings through spatial reorganization. This ensures the retention of structural heritage and spatial memory while enabling contemporary usage. Shared courtyards, public corridors, and open interfaces are introduced to foster a diverse and inclusive public space network.

6.2.2 Boundary Delimitation and Land Use Optimization

（1）Adjustment Strategy

According to Turin's homogeneous zoning classification, the site is located in the D14 zone as defined by the city's master plan [80]. The zonal development intensity indicator (Indice di Territoriale, IT) is set at 1.00, and land use is designated for university educational facilities (U) and public green space (V).

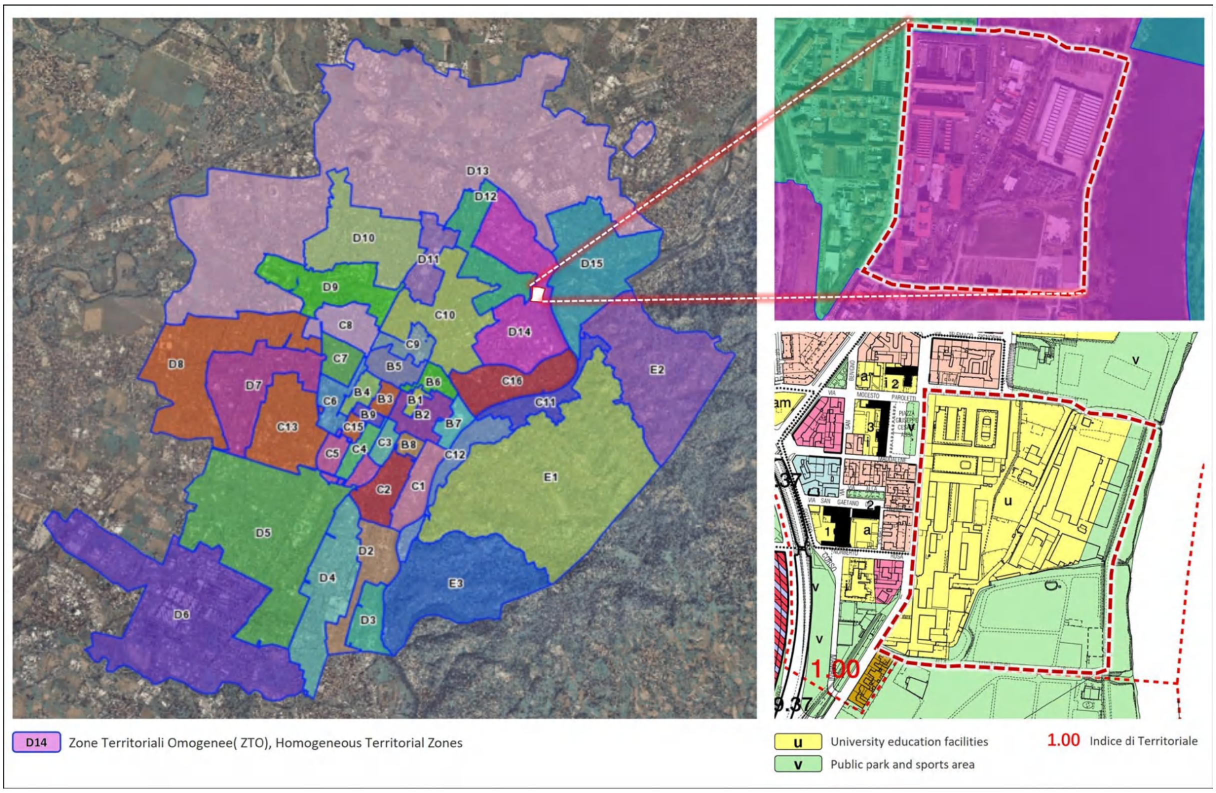

Figure 6-3 Zoning and Land Use Map
(Source: Reference [80])

The original boundary of the Royal Tobacco Factory site covers approximately 9.9 hectares. Based on ownership and land use conditions, the site is subdivided into three plots:

①Plot A: The main historic factory complex, purchased and held by the government. It consists of brick masonry industrial heritage buildings, with a Floor Area Ratio (FAR) of 1.45—the highest development intensity within the site;

②Plot B: Privately owned and currently used as a surface parking lot with partially abandoned buildings. Although designated as construction land, its utilization rate is low and FAR significantly below neighboring areas;

③Plot C: The former textile factory site acquired by the government. Following the decline of industrial functions, it is now largely vacant and exhibits low development intensity but high transformation potential.

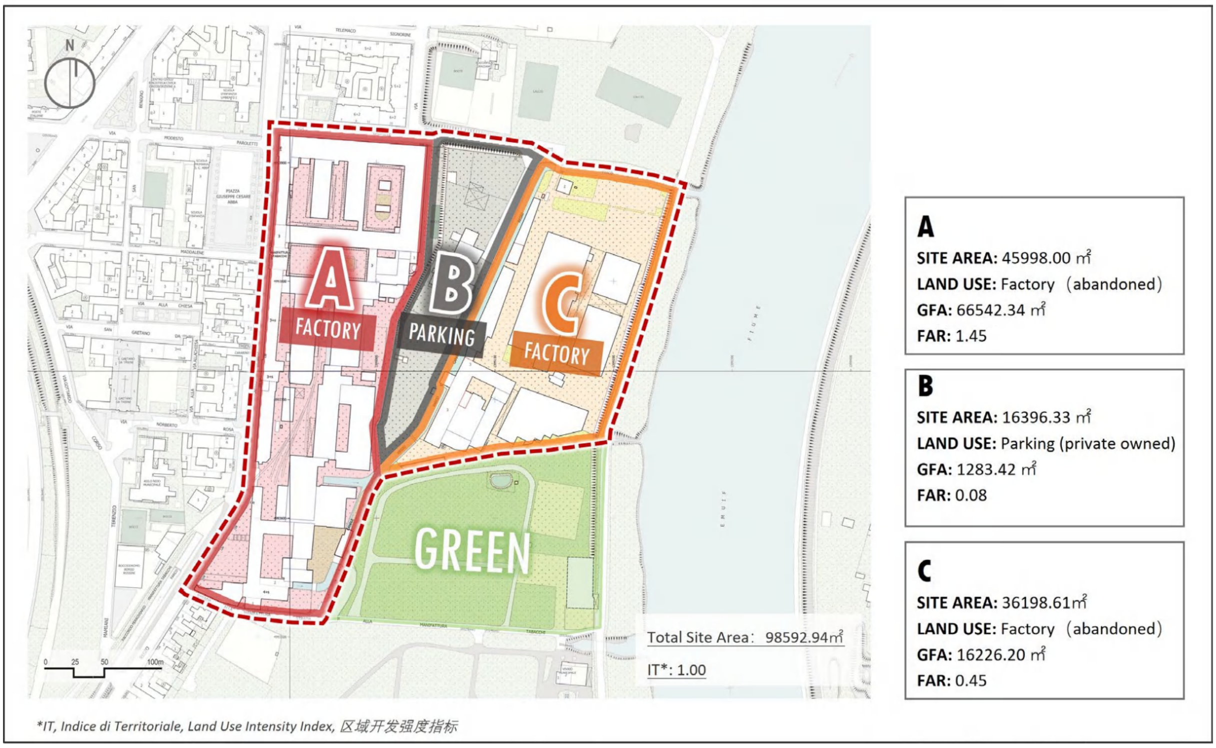

Figure 6-4 Original Site Boundaries and Existing Plot Uses
(Source: Drawn by the author)

Currently, Plot A has high development intensity but low spatial efficiency and is overly enclosed, limiting the implementation of university cultural facilities. Plots B and C both have low FARs and singular functions, reflecting land use imbalances and wasted spatial resources. In particular, Plot B, a typical underutilized area, lacks urban integration and spatial vitality. Moreover, the three plots are poorly integrated with the surrounding environment and with one another, lacking any overarching coordination strategy.

To address these issues, the following boundary optimization and redevelopment strategies are proposed:

① Reclassification of Plot B: Originally a privately owned parking lot located in a narrow north-south corridor between two government-owned vacant factory sites. It connects to city-scale green space to the north and south and borders the Po River ecological corridor to the east, offering strong ecological and access potential. If maintained as construction land, its public value will be underutilized, creating spatial and visual fragmentation. The proposal recommends converting Plot B into urban public green space, creating a vital link in the north-south ecological network and delivering continuous open space for the university, surrounding community, and city.

② Transfer of Building Rights for Plot B: In a conventional model, land use change for Plot B would require government acquisition and compensation, which is a complex and contentious process. With the equalization policy in place, the building rights of Plot B can be transferred—via institutional compensation mechanisms—to developable plots such as Plot C. This simultaneously ensures rights compensation and functional transformation, generating greater public value for the city as a whole.

③ Inclusion of Southeastern Corner Public Green Space (Plot D): This area currently serves as an urban community garden held by the municipality. It borders the Po River to the east and the parking lot to the northwest, offering strong ecological continuity and spatial integration potential. Though not slated for development, its role in maintaining landscape coherence and ecological connectivity is crucial. Together with Plot B, it will form a continuous riverside green corridor, safeguarding the integrity of both the ecological system and public space network.

（2）Land Use Optimization

Following boundary adjustment and land use optimization, the total project area expands from approximately 9.9 hectares to 12.64 hectares, comprising four functionally distinct sub-plots:

- Plot A (original Tobacco Factory, planned for university facilities),
- Plot B (former parking lot, to be converted into green space),
- Plot C (former textile site, for cultural facility mixed-use), and
- Plot D (newly included municipal green space).

The revised plot layout and existing indicators are shown in Figure 6-4 and Table 6-1. These modifications provide a new functional and institutional foundation for building rights redistribution and rational development allocation.

Table 6-1 Current Development Indicators of Site Plots
(Source: Compiled by the author)

Plot	Total Floor Area (㎡)	Land Area (㎡)	FAR
A	66542.34	45998.00	1.45
B	1283.42	16396.33	0.08
C	16226.20	36198.61	0.45
D	953.29	27829.20	0.03
Total	85,005.25	126,422.14	0.67

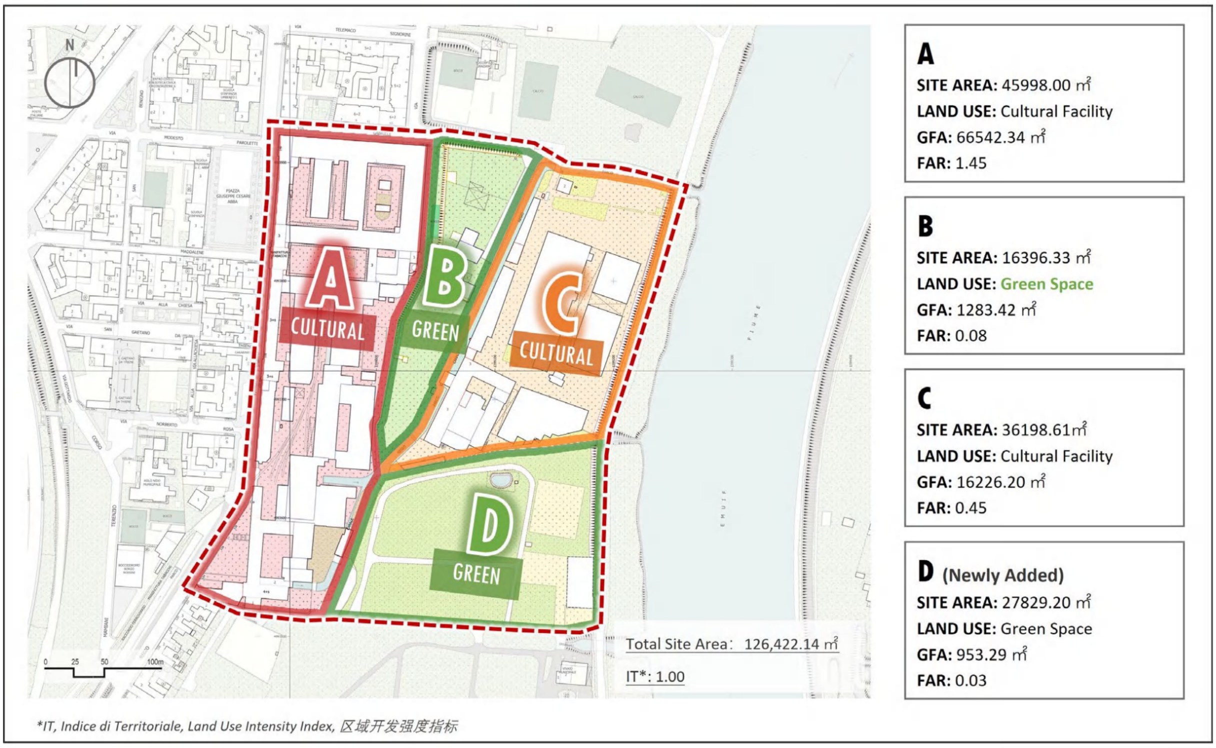

Figure 6-5 Revised Site Boundaries and Plot Use of Scheme I
(Source: Drawn by the author)

The design uses "IT = 1.00" as the regulatory baseline for development intensity. Under this unified constraint, internal building rights transfers are simulated to achieve dual optimization of development intensity and ecological quality. Specifically, the building rights of Plot B, a private plot, are transferred to government-owned Plot C, enabling spatial-functional transformation without increasing the overall development volume—thus demonstrating the redistributive capacity of the equalization mechanism.

The design proposes the following strategies for each plot based on their current development conditions:

·Plot A: With a FAR significantly above average, it is designated as a historic preservation zone and should follow a "development reduction" strategy. Through functional optimization and spatial reorganization, it will be transformed into a low-intensity zone housing university archives, libraries, classrooms, and dormitories.

·Plot B: A minimally developed plot to be reclassified as green space. Its associated building rights will be transferred to Plot C under institutional arrangements, contributing additional development potential.

·Plot C: A medium-intensity plot with capacity for moderate expansion. As the primary receiver of building rights, it will host urban cultural and service facilities, as well as innovation and entrepreneurial offices, to enhance development intensity and functional diversity.

·Plot D: A newly added public green space with no development capacity. It plays a key ecological role, extending the Po River green corridor and linking with Plot B to create a coherent ecological green belt and public axis. This facilitates the spatial integration of the university and the city, improving openness and accessibility for citizens.

6.2.3 Allocation and Transfer of Building Rights

（1）Initial Allocation of Building Rights

Under the guidance of the urban equalization policy, building rights serve as an essential institutional tool for coordinating land use changes and compensating for lost development value. When a parcel of land is converted from construction land to public use (e.g., green space), the original development rights become invalid. To safeguard the legitimate interests of landowners, the policy mandates compensation in the form of transferable building rights. As transferable development indicators, building rights can be applied to other plots, helping reconcile the tension between "development reduction" and "equity compensation."

In this scheme, Plot B is a typical case of rights compensation. Originally a privately owned surface parking lot, its utilization was extremely low, though it remained designated as construction land. Once its use is reclassified as public green space, its development rights are institutionally "frozen." As such, it becomes necessary to quantify the compensable building rights, which then serve as the starting point for the building rights transfer mechanism.

This case study simplifies and simulates the equalization policy within the design area, considering only the building rights generated from Plot B as compensation. Since there are few existing structures on Plot B, the calculation excludes existing buildings (which would normally require structural evaluation and depreciation analysis). Instead, it focuses solely on the rights generated by the land use conversion.

Based on the building rights formula presented in Chapter 4 and referencing empirical values from previous urban equalization studies [13], this case assumes an IP (equalization index) of 0.15. Thus, as Plot B is converted from construction land to public green space, it is granted a compensable development right of DE_{b1} = 2,459.45 ㎡, which can be applied elsewhere. As the designated sending plot, Plot B no longer carries construction tasks. Its building rights will be transferred to other eligible plots in subsequent sections, while the plot itself becomes part of the public green space network.

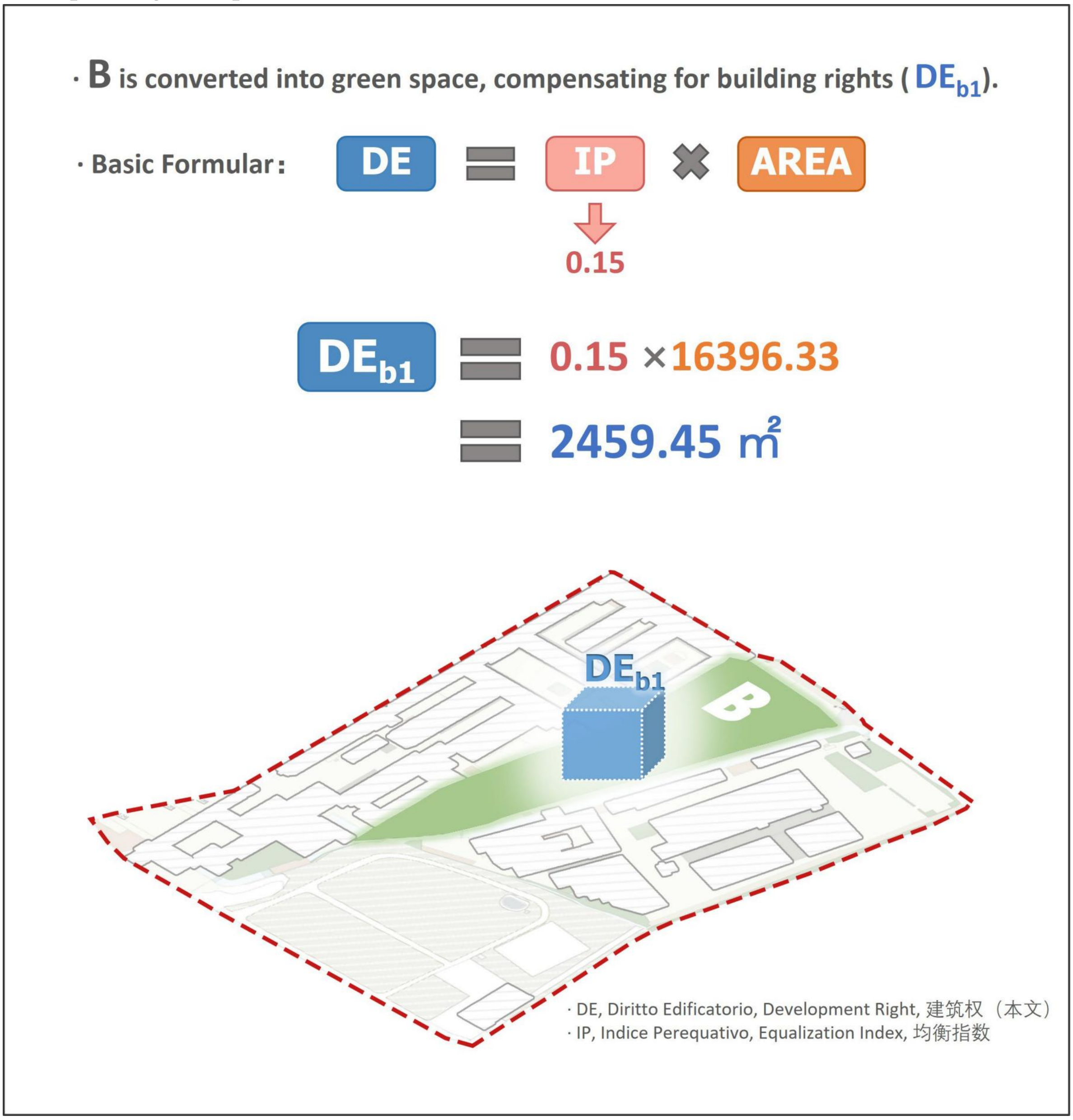

Figure 6-6 Initial Allocation of Building Rights in Scheme I
(Source: Drawn by the author)

（2）Transfer of Building Rights

In a building rights transfer mechanism, the rights obtained by a sending plot are not necessarily equivalent to the buildable volume of the receiving plot. Differences in functional designation, land use type, or development conditions among plots often require the application of conversion coefficients during transfers to balance institutional fairness with practical feasibility.

In this scheme, as described above, Plot B receives compensatory building rights DE_{b1} after being reclassified as public green space. These rights are transferred to Plot C, which is publicly owned and planned for university and cultural service facilities, making it the main receiving plot for additional development capacity.

Since original building rights are typically calculated using residential standards, and Plot C is intended for cultural and office uses (non-residential), a conversion coefficient C must be applied to normalize the rights during transfer.

According to urban planning benchmarks, the coefficient for converting residential to office building rights (C_1) is 1.5 (as per Reference [51]). This means that residential building rights transferred for office use are increased by a factor of 1.5. Accordingly, the 2,459.45 ㎡ of building rights from Plot B equates to 3,689.18 ㎡ of buildable floor area in Plot C, designated for innovation office space.

To summarize, the simplified building rights transfer pathway in this case is as follows:

① Sending Plot (Plot B): Loses development rights due to land use conversion; receives 2,459.45 ㎡ in transferable building rights through the equalization mechanism.

② Receiving Plot (Plot C): Gains 3,689.18 ㎡ of buildable floor area based on a 1.5 conversion factor.

③ Spatial Regulation Mechanism: Establishes an institutional pathway for reallocating building rights from “ecological concession zones” to “public development zones,” enabling cross-plot development transfers while balancing ecological preservation with public facility construction.

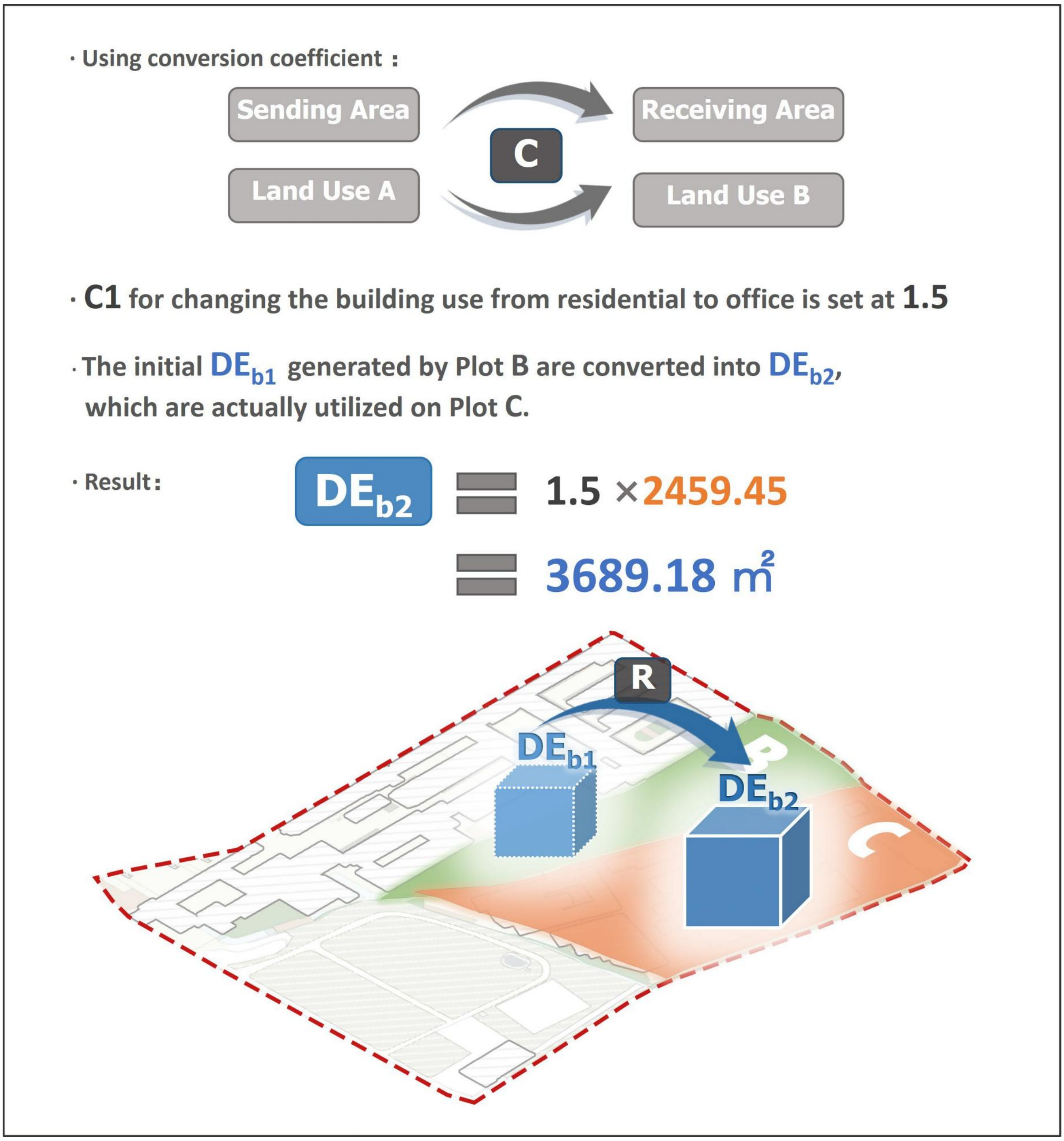

Figure 6-7 Building Rights Transfer Process in Scheme I
(Source: Drawn by the author)

（3）Effect of Building Rights Allocation and Development Control

The reallocation of building rights is not merely an institutional procedure; it also drives structural transformation of site morphology and functional layout. Upon completing the transfer described above, the following effects are achieved:

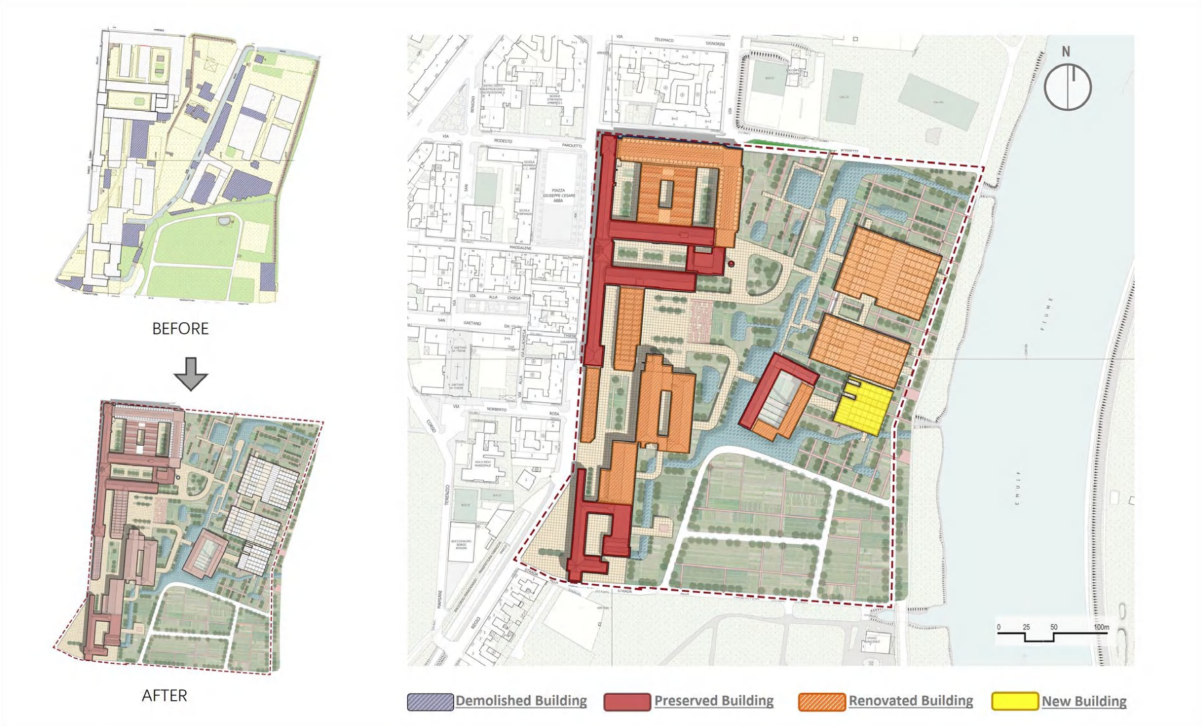

Figure 6-8 Building Renewal Strategies of Scheme I
(Source: Drawn by the author)

① Strategies for Preservation, Renovation, and New Development

Within the site, buildings are categorized into four types based on structural condition, historical value, and functional adaptability:

a. Demolished buildings are primarily deteriorated factory structures in Plots B and C that cannot be repurposed;
b. Preserved buildings are concentrated in Plot A, retaining their historic façades and forms, and repurposed as archives, university offices, classrooms, and student housing;
c. Renovated buildings are found in Plot A and part of Plot C, where core structures are maintained and interior functions reorganized;
d. New buildings are concentrated in Plot C, constructed to accommodate the newly received development capacity, and designed for office, research, and creative industry use.

② Restructuring of Development Layout

Following the transfer of 2,459.45 ㎡ of building rights from Plot B to Plot C, and after applying the 1.5 conversion factor, Plot C receives 3,689.18 ㎡ of additional development capacity. This makes it the primary recipient of newly institutionalized buildable volume.

High-density Plot A undergoes “development reduction,” creating more open interface and space for public and cultural-educational functions. Plot C, as the receiving plot, experiences “incremental development,” enabling a hybrid program of university and cultural services. Meanwhile, Plots B and D are unified into a continuous green system through integrated landscape design, establishing a north-south ecological corridor that enhances the visual and functional link between city and campus.

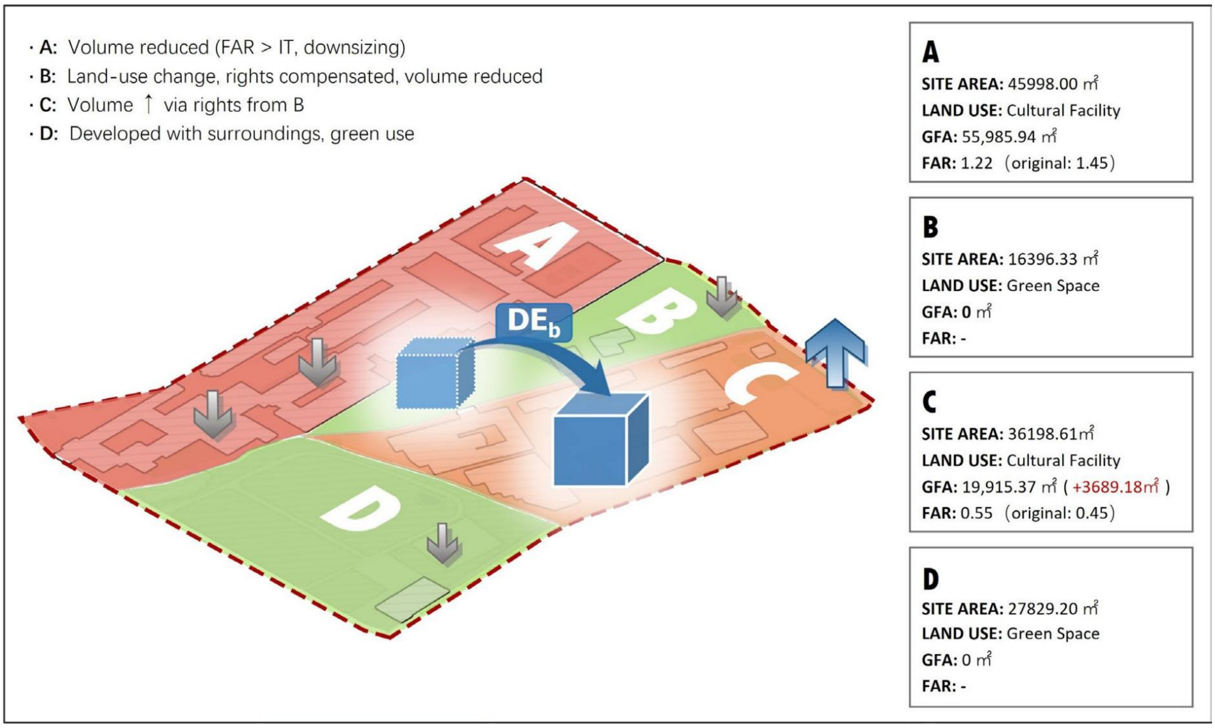

Figure 6-9 Buildable Volume of Each Plot After Rights Transfer in Scheme I
(Source: Drawn by the author)

The summary of development outcomes for each plot is as follows:

Table 6-2 Development Indicators for Scheme I Plots
(Source: Compiled by the author)

Plot	Total Floor Area (㎡)	Land Area (㎡)	FAR
A	55,985.94	45,998.00	1.22
B	0	16,396.33	-
C	19,915.37	36,198.61	0.55
D	0	27,829.20	-
Total	75,901.31	126,422.14	0.60

6.2.4 Estimation and Distribution of Land Value Increment

The previous section detailed the full process of the generation and transfer of development rights. This section continues to use the development rights transfer from Plot B as a case study to elaborate on the full cycle of negotiation, value estimation, and stakeholder distribution, illustrating how institutional design under the equalization policy translates into an actionable and measurable economic mechanism.

（1）Stakeholders and Development Rights Pricing Negotiation

The transfer of development rights from Plot B to be received by Plot C involves three primary stakeholders: the government, the university and its developer, and the original private landowner of Plot B. Each party has distinct roles and interests in the process:

The government, as institutional designer and regulator, provides a reference through the OMI[81] (real estate market price map). In the D21 value-equivalent zone, the price range for standard residential properties in normal condition is €860–1300/㎡ (Figure 6-9). To promote public development and curb speculative gains, the government derives a reference range for development rights based on land-use conversion coefficients: €1290–1950/㎡.

The private landowner, having lost development eligibility, seeks economic compensation.

The university/developer, typically constrained by limited funding and return margins, aims to obtain development rights at a fair price.

Eventually, the three parties agree on a transaction price of €1350/㎡, serving as the basis for valuation and benefit allocation (Figure 6-10, Step 1: Negotiation). This agreement reflects a fair market transaction guided by institutional policy and establishes a sustainable non-expropriatory rights transfer mechanism.

Table 6-3 Housing Prices in D21 Zone of Turin
(Source: Reference [81])

Tipologia	Stato conservativo	Valore Mercato (€/mq)		Superficie (L/N)	Valori Locazione (€/mq x mese)		Superficie (L/N)
		Min	Max		Min	Max	
Abitazioni civili	Ottimo	1300	1950	L	6,9	104	L
Abitazioni civili	Normale	860	1300	L	4,8	7,2	L
Abitazioni di tipo economico	Ottimo	930	1400	L	6,1	9,1	L
Abitazioni di tipo economico	Normale	640	960	L	4,3	6,4	L
Box	Normale	670	1000	L	3,8	5,7	L

（2）Development Rights Transaction Valuation

Given the price of €1350/㎡, the next step is to calculate the total value of the transferred development rights. The rights generated through institutional mechanisms for compensating the land-use change (CE) equal 2,459.45 ㎡ (DE_{b1})。

This volume, derived not from physical buildings but from institutional parameters, is what makes the rights a quantifiable, tradable asset. Thus, the total transaction value is about €3.32 million, to be paid by the Plot C developer to the landowner of Plot B (Figure 6-10, Step 2: Transaction).

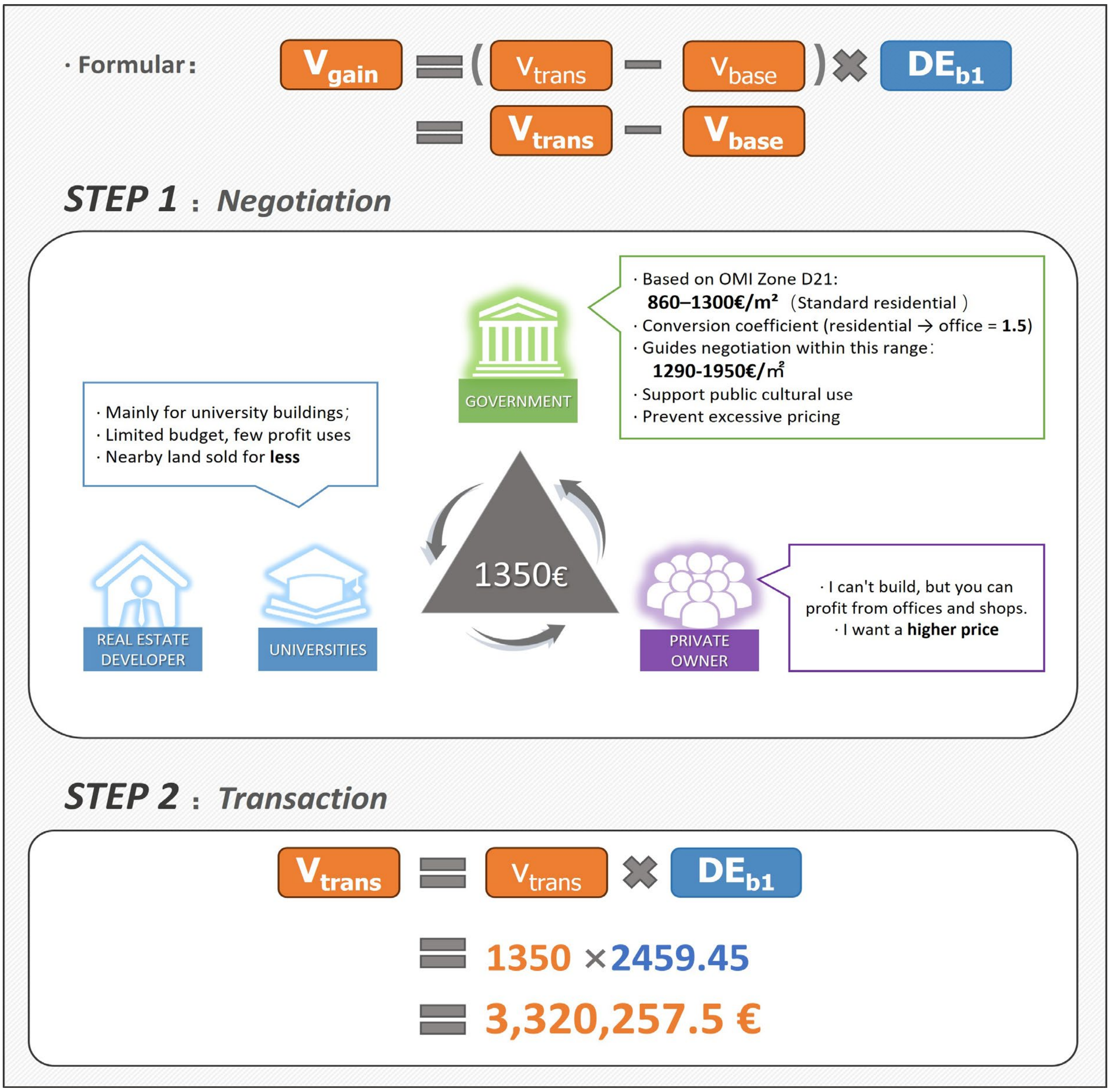

Figure 6-10 Negotiated Pricing and Initial Transaction Estimate
(Source: Drawn by the author)

（3）Calculation of Land Value Increment

The key value lies not just in completing a transaction but in the appreciation generated through land-use conversion. This added value, targeted by the equalization policy, is calculated as:

① V_{base}： = €900/㎡ (inferred from €1350/㎡ ÷ 1.5 conversion rate for residential to office use)；

② V_{trans} = €1350/㎡ (negotiated price)

Thus, the value increment = (1350 - 900) × 2459.45 = €1,106,752.50

This appreciation is a result of institutional redistribution, highlighting how landowners can benefit from increased land value while enabling public reinvestment (Figure 6-11, Step 3: Benefit Calculation).

（4）Tripartite Benefit Distribution

The realization of land value appreciation has introduced new possibilities for value redistribution among the three primary stakeholders. Beyond mere compensation and transaction facilitation, the institutional framework plays a pivotal role in channeling this added value back into public spaces and urban functions, thereby constructing a multi-party win–win model for urban regeneration.

First, the government, although not directly investing in land acquisition or development, benefits on two levels through institutional guidance and transaction regulation. On the one hand, in accordance with the urban value capture policy, it imposes a 15% value-added tax (VAT) on the land appreciation, generating fiscal revenue; on the other hand, this revenue can be reinvested into the enhancement of public spaces within the project area—such as upgrading the green infrastructure of Plots B and D, improving pedestrian paths, and completing essential infrastructure. With a total value appreciation of €1,106,752.50, the government can collect €166,012.88 in taxes. For the public sector, this mechanism represents a virtuous cycle of “zero-cost intervention, green space expansion, and fiscal reinvestment in construction.”

Second, the university and its partnered development entities, as recipients of the development rights, bear the full cost of development investment and the acquisition of transferable development rights. Although this entails significant upfront expenditure, the target projects—comprising educational spaces, cultural facilities, and office uses—hold substantial utility or potential rental returns. Particularly, the introduction of creative offices, partial commercial uses, and student apartments is expected to partially recoup the initial investment over time, thereby balancing social service delivery with economic sustainability.

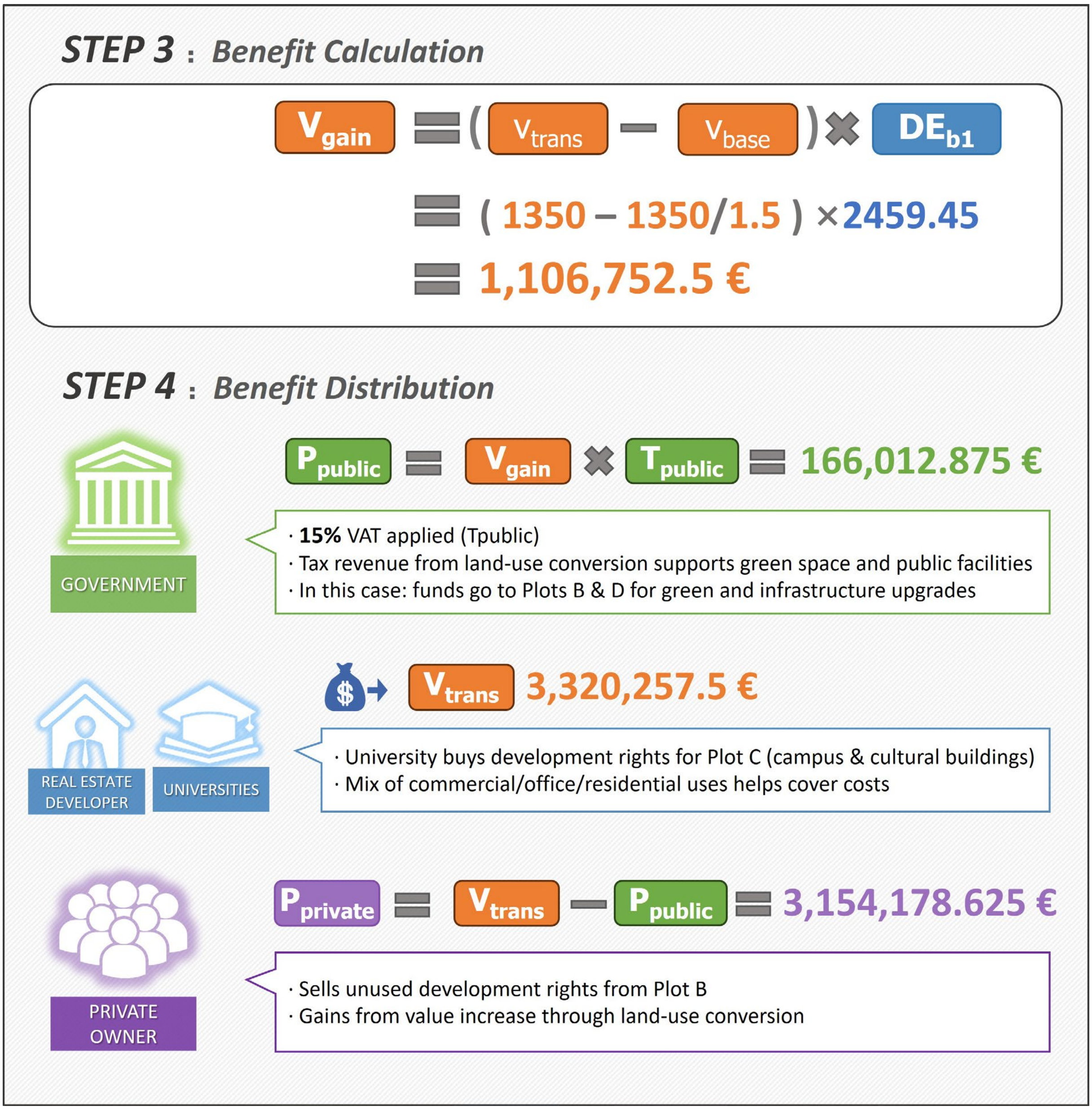

Figure 6-11 Land Value Increment Calculation and Distribution
(Source: Drawn by the author)

Finally, the private landowner of Plot B, although having lost the right to build due to land use conversion, did not lose development rights altogether. Instead, they received compensation through the development rights transfer mechanism. After deducting the VAT, the net financial gain reached €3,154,244.62. Compared with traditional expropriation-based compensation, this institutional approach enables landowners to avoid a passive “forced expropriation” situation and, through a market-based transfer, achieve returns exceeding the baseline land price. It thus represents an institutional activation of latent land value.

Through these four steps, the transfer of development rights from Plot B not only optimized spatial capacity and functional layout but also completed a rational redistribution of land value gains among all parties through institutionalized means. The government, the university/developer, and the private landowner formed a dynamic cooperation chain—linking planning regulations, institutional transactions, and financial returns. Ultimately, urban renewal is no longer solely dependent on either public leadership or market forces but is realized through a multidimensional balance of spatial efficiency, value redistribution, and public interest under institutional regulation—showcasing the practical effectiveness of urban equalization policies in complex urban contexts.

6.2.5 Planning Implementation and Development

To ensure the effective and orderly redevelopment of the Royal Tobacco Factory under institutional guidance, a phased development strategy is employed to address challenges including diverse ownership, land-use change, and rights transfer complexity. Phased implementation aligns institutional timing with spatial evolution and financial feasibility.

The development strategy is divided into three stages, each addressing specific goals and spatial units:

（1）Phase I: Infrastructure and Public Space Construction

① Land-use conversion in Plot B: Reclassified to public green space and integrated into the Open Space System.

② Infrastructure improvements: Roads, public transport, and underground utilities.

③ Landscape upgrades in Plots B and D: Enhance accessibility and provide shared activity zones.

（2）Phase II: University Expansion and Historic Preservation

①Plot A: Preserve and adapt industrial buildings; remove dilapidated structures; introduce university and cultural functions.

②Plot C: Use transferred development rights to construct offices and cultural facilities, enhancing land use.

③ Shared space activation: Create campus- and city-scale Co-Created Vibrant Spaces in Plots A and C.

（3）Phase III: Industrial Integration and Spatial Optimization

① Plot C: Introduce cultural-creative and R&D industries.

② Green building upgrades: Promote Climate-Responsive architecture in Plots A and C.

③ Mobility enhancements: Expand the Human-Centered Mobility System with Active Mobility Optimization.

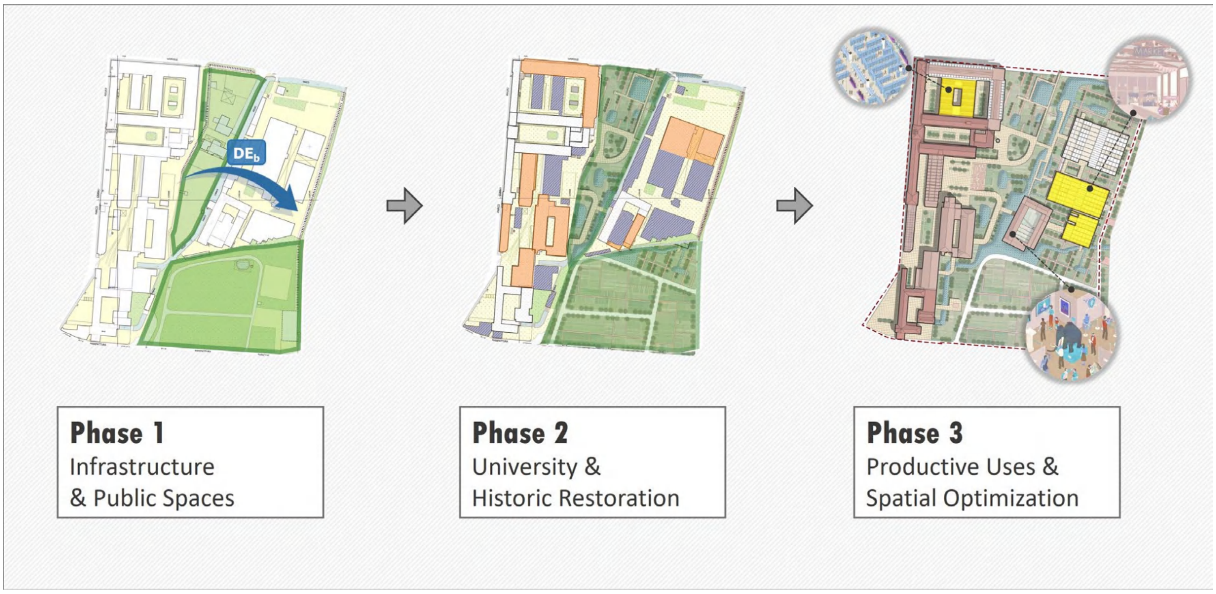

Figure 6-12 Phased Development Strategy for Scheme I
(Source: Drawn by the author)

This strategy—"Public Space First → Educational Functions → Industry and Ecology Integration"—balances regulatory intent with practical phasing. Using development rights transfer as a core driver and public space as a starting point, it enables full-cycle linkage from institutional design to on-ground urban transformation.

6.3 University-City Collaborative Redevelopment Model

6.3.1 Overview of the Planning and Design Proposal

Scheme II proposes a university-city collaborative redevelopment model that maintains the current land ownership structure while introducing moderate spatial restructuring and institutional mechanism enhancement. The development leadership shifts from a university-led approach to a multi-stakeholder co-development system, involving the university, government, and private entities. This model is designed to test the scalability and flexibility of the urban equalization policy under broader spatial and institutional conditions.

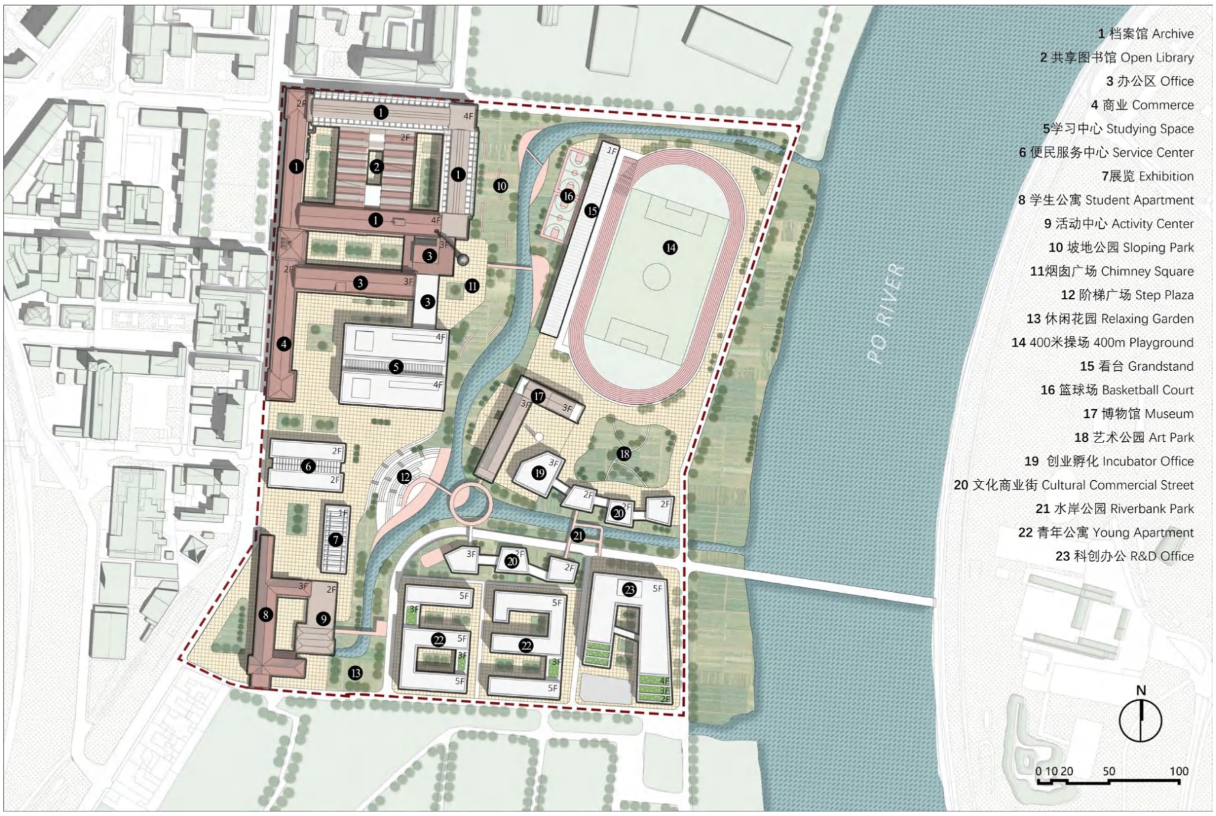

Figure 6-13 Urban Design Master Plan of Scheme II
(Source: Drawn by the author)

Specifically, Scheme II integrates both restricted equalization and extended equalization approaches to form a composite logic for the allocation and transfer of Development Rights. First, as in Scheme I, Plot B is converted from private construction land to public green space, with its released Development Rights serving as institutional compensation transferred to the newly established Plot D. Second, an external plot (Plot X) located in a different Value Equivalent Zone is introduced as an additional source of Development Rights. These rights are transferred cross-zone to Plot D after being adjusted using an equivalency coefficient, thus creating a compound Development Rights base capable of supporting high-intensity mixed-use development.

The implementation of Plot D is led by the university and supported by government fiscal investment. Meanwhile, the original landowners of Plots B and X participate as investment partners, forming a multi-stakeholder redevelopment mechanism characterized by benefit linkage, joint development, and shared governance.

In terms of spatial strategy, the scheme respects the preservation of historic buildings while emphasizing compatibility and multifunctionality of new construction with the surrounding urban spatial scale. In addition to renovating selected factory structures, a large number of new urban programs are introduced—including a learning center, cultural venues, urban commercial blocks, youth housing, and terraced innovation office spaces—ultimately forming a Mixed-Use Functional Organization with layered spatial composition and diverse functions.

6.3.2 Boundary Delimitation and Land Use Optimization

（1）Adjustment Strategy

This scheme retains the general boundary logic established in Scheme I, with no change to the planning red line. The project area remains within Turin's D14 Value Equivalent Zone, with a total site area of approximately 12.64 hectares and a unified IT (Indice Territoriale) development index of 1.00. The internal site is divided into four plots—A, B, C, and D—based on land ownership and redevelopment objectives. While plot boundaries remain consistent with Scheme I, the Development Rights Transfer strategies and land use mechanisms are adjusted and expanded through the following approaches:

① Land Use Conversion of Plot B: Consistent with Scheme I, Plot B—originally private construction land—is reclassified as public green space. Situated along a north-south corridor, it acts as a critical ecological link between the Po River system and the urban green axis. Its conversion enhances ecological continuity and spatial openness, contributing to higher public environmental value.

② Development Rights Transfer from Plot B (Restricted equalization): The Development Rights generated by the land use conversion of Plot B are transferred to Plot D under the institutional compensation mechanism of the urban equalization policy. These rights are used for commercial development, forming a spatial reallocation model that balances public interest gains with private compensation, characteristic of a restricted equalization strategy.

③ Inclusion of Southeastern Green Space for Development: The original community garden in the southeastern corner is included within the planning boundary and reclassified as a Mixed-Use Development Plot. This area now supports student housing, innovation offices, and commercial programs, enhancing functional diversity and activating the waterfront zone.

④ Introduction of Development Rights from Plot X (Extended Equalization): To support high-density development in Plot D, additional Development Rights are sourced from an external plot (Plot X) located in a different Value Equivalent Zone. These rights are transferred across zones via the city's Development Rights Transfer mechanism and converted using OMI-based equivalency coefficients before being injected into Plot D, enabling the realization of intensified, multi-functional urban development.

（2）Land Use Optimization

Following the revised boundary and optimization strategy, the site includes four clearly defined functional plots:

·Plot A (former Royal Tobacco Factory – university core),

·Plot B (former parking lot – reclassified as public green space),

·Plot C (former textile factory – low-density cultural and sports facilities),

·Plot D (expanded mixed-use development zone – student housing, R&D, commerce).

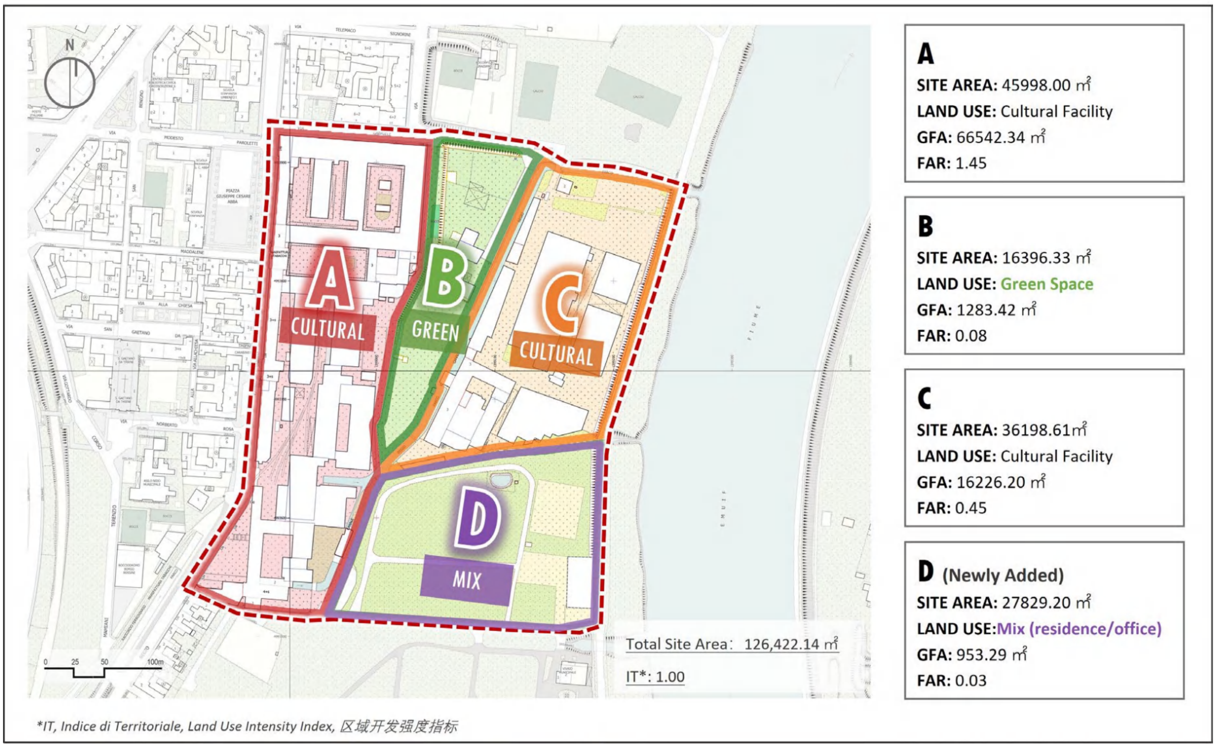

Figure 6-14 Adjusted Site Boundaries and Plot Uses in Scheme II
(Source: Drawn by the author）

The general land use indicators remain consistent with those in Scheme I (see Table 6-1), and the adjusted layout is shown in Figure 6-14. Each plot is assigned a differentiated spatial transformation strategy and development intensity based on its location, historical context, and renewal potential:

·Plot A: Retains the main historical factory structures and serves as the core functional area for university programs. With a Floor Area Ratio (FAR) of 1.45, it holds the highest development intensity within the site. Selective demolition of structurally inferior or less historically valuable buildings allows for the insertion of libraries, classrooms, and dormitories. The plot's spatial structure is reconfigured to open formerly enclosed areas, creating a continuous and accessible public space system.

·Plot B: Formerly used for private parking and derelict industrial buildings, this plot is fully converted into urban public green space, with no new construction permitted. All Development Rights generated from its conversion are transferred to Plot D for commercial use, achieving both functional transformation and institutional compensation.

·Plot C: With a current FAR of 0.45, this plot supports medium-intensity development. Due to potential hydrological risk and its adjacency to the university's living area, it is designated for urban sports facilities and small-scale cultural-commercial buildings, emphasizing low density and spatial openness.

·Plot D: Newly added as a Mixed-Use Development Plot, it originally consisted of green and agricultural land. With Development Rights injected from both Plot B (Restricted equalization) and Plot X (Extended Equalization), Plot D is planned to accommodate a comprehensive mix of functions including housing, dormitories, R&D offices, and cultural-commercial activities. It is envisioned as a high-density urban cluster integrating education, living, innovation, and public services—emerging as the new spatial core of university-city synergy.

6.3.3 Allocation and Transfer of Development Rights

（1）Initial Allocation of Development Rights

The initial development rights in Scheme II originate from two sources: Plot B generates 2,459.45 ㎡ of development rights through the institutional compensation mechanism after its reclassification from private construction land to public green space. This process mirrors the restricted equalization logic used in Scheme I.The second and more substantial portion comes from cross-zone transferred development rights originating in Plot X, a representative aggregate of multiple plots located in Zone C23, which functions as a secondary urban center. These rights are introduced via the Extended Equalization mechanism and serve as the primary additional development capacity for Plot D.

Zone C23 was originally designated as a medium- to high-intensity Mixed-Use Functional Zone. Due to urban renewal requirements, several plots in C23 have been reclassified as green space or open space, thereby releasing residual development rights (DEx_0) into the urban development rights market.

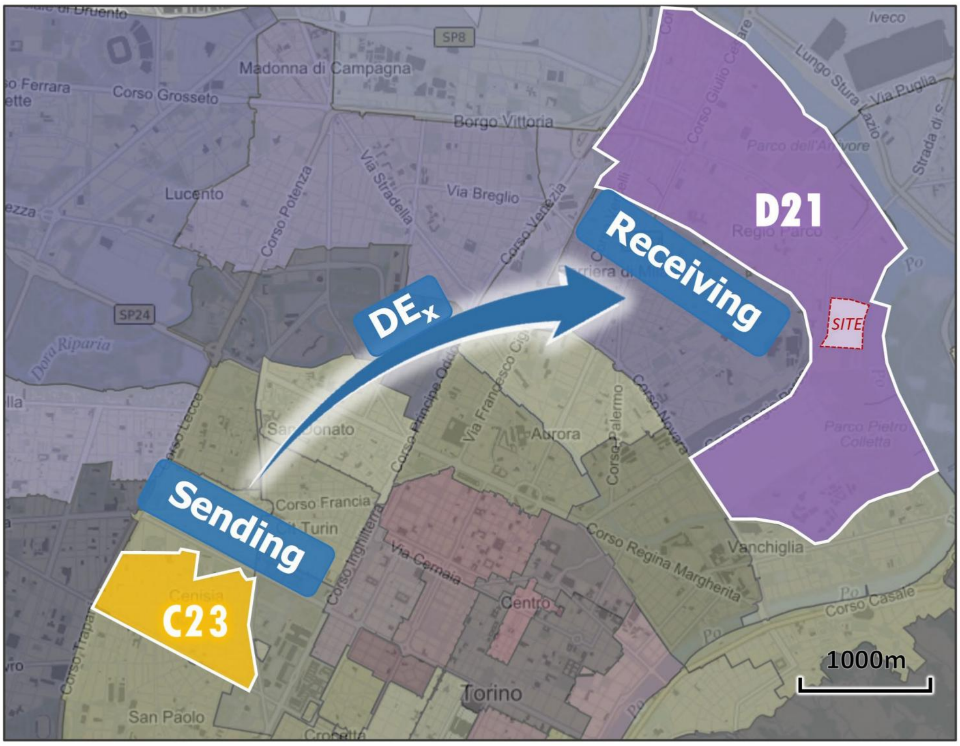

Figure 6-15 Generation of Initial Development Rights under Extended Equalization
(Source: Drawn by the author, based on Reference [81])

Since the project site lies within Zone D21, which is distinct from C23 in terms of land value, the transfer of development rights requires conversion via a Value Equivalent Coefficient. According to the OMI land price map, the coefficient for transferring rights from C23 to D21 is calculated as 2.03 [81].

After conversion, the original rights DEx_0 from Zone C23 are transformed into approximately 29,085.80 ㎡ of buildable development rights (DEx_1) within the D21 zone. These rights are fully allocated to Plot D, forming the core development capacity for high-density, mixed-use programs. This mechanism reflects how development rights can flow institutionally and spatially across different parts of the city and land value zones.

It exemplifies the practical application of the Extended Equalization model within the design, achieving not only inter-zonal compensation but also strategic urban intensification at targeted nodes.

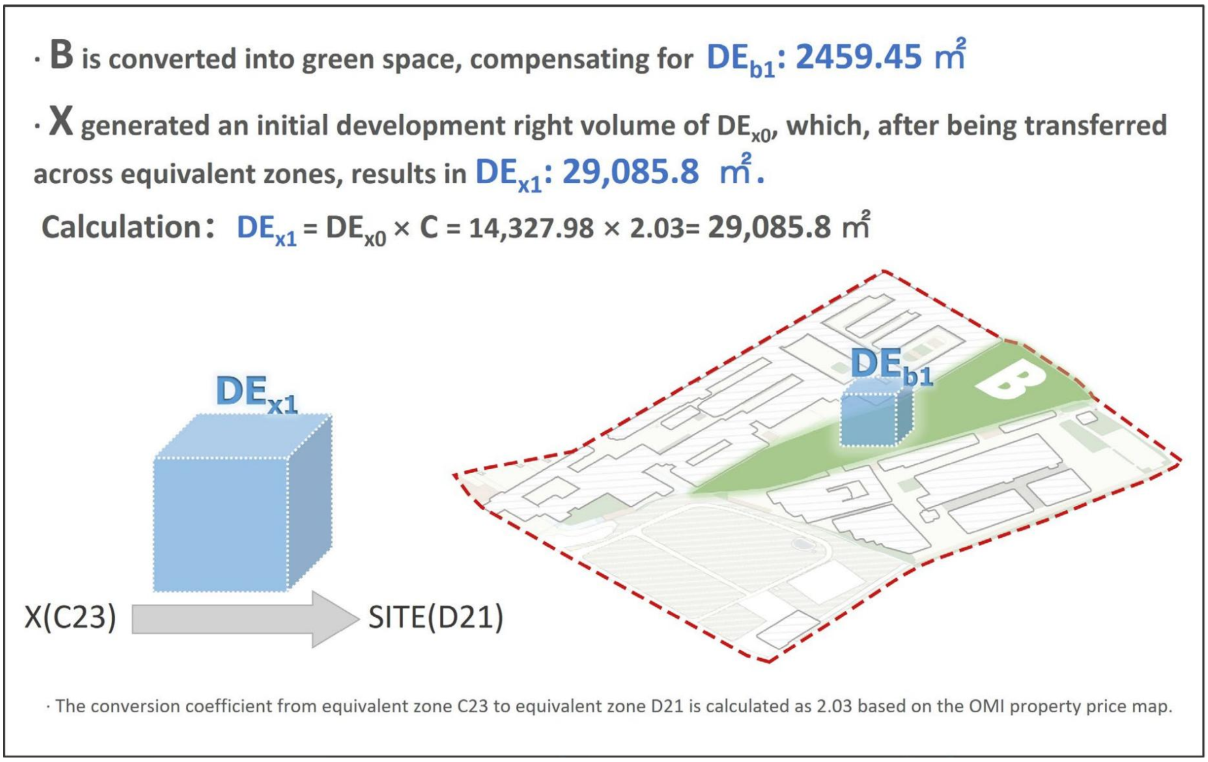

Figure 6-16 Generation of Initial Development Rights in Scheme II
(Source: Drawn by the author)

（2）Development Rights Transfer

Once the development rights are injected into the receiving plot, they must undergo use-type conversion according to the intended land use, in order to align functional adaptation with development intensity control. In this scheme, the development rights introduced into Plot D follow two distinct conversion paths, involving residential, office, and commercial functions. The corresponding conversion coefficients and calculation results are summarized in Table 6-4.

First, Plot B, after being converted into public green space, receives institutional compensation rights of 2,459.45 ㎡ (DEb_1). These rights, classified initially as residential-use, are transferred into Plot D. Since part of Plot D is planned for ground-floor commercial space, the residential rights from Plot B are converted to commercial use. Based on established urban planning practice, the conversion coefficient from residential to commercial use is $C_2 = 1.3$, resulting in a final commercial-use development right of $DEb_3 = 3,197.29$ ㎡.。

Second, from Plot X, the total transferred development rights amount to 29,085.80 ㎡ (DEx_1). According to the mixed-use programming of Plot D, this is divided into two parts:

·8,792.8 ㎡ of rights are converted from residential to office use, applying a conversion coefficient of $C_1 = 1.5$, yielding 13,189.20 ㎡ (DEx_2) in office development capacity;

·The remaining 20,293.00 ㎡ retain their residential designation without conversion, forming DEx_3 = 20,293.00 ㎡ of residential-use development rights.

In summary, the conversion and transfer logic in Scheme II is as follows:

① Development Rights from Plot B originate as residential-use and are converted to commercial-use via C_2 = 1.3, generating 3,197.29 ㎡ of commercial development rights for Plot D.

② Development Rights from Plot X are subdivided into: 8,792.8 ㎡, converted from residential to office use (C_1 = 1.5), resulting in 13,189.20 ㎡ of office-use rights; 20,293.00 ㎡, retained as residential-use without conversion.

③ Plot D, as the sole receiving area in this scheme, integrates all transferred rights from Plots B and X. Based on its Mixed-Use Functional Organization, the rights are spatially deployed across commercial, office, and residential programs.

Table 6-4 Pre- and Post-Conversion Statistics of Development Rights in Scheme II
(Source: Compiled and calculated by the author)

Source	Original Use	Target Use	Conversion Coefficient	Pre-Conversion Area (㎡)		Post-Conversion Area (㎡)
DE_x	Residential	Office	C1=1.5	DE_{x1}=29,085.80	8792.8	DE_{x2}=13189.20
		Residential	1		20293	DE_{x3}=20293.00
DE_b	Residential	Commercial	C2=1.3	DE_{b1} = 2459.45		DE_{b3} = 3197.29

（3）Outcomes of Development Rights Allocation and Development Index Control

Upon completing the transfer and use-type conversion of development rights, the site undergoes two major layers of structural adjustment and spatial transformation:

① Strategies for Preservation, Renovation, and New Development

In Plots A and C, only the primary factory structures or iconic heritage buildings with designated protection value are preserved. All other structures are demolished to allow for spatial reconfiguration and optimized functional layout.

In Plot A, new construction is concentrated in the central and southern zones, accommodating a learning center, civic service facilities, and exhibition spaces, thereby strengthening the mix of educational and public service functions.

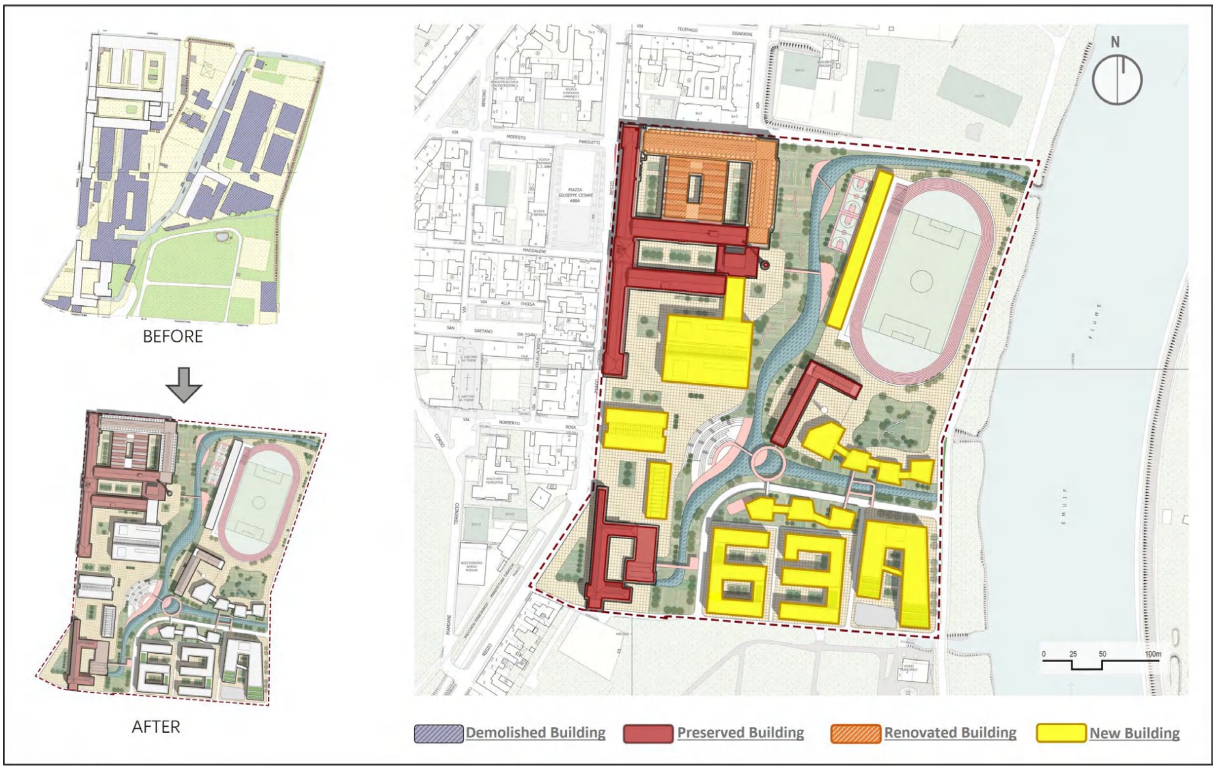

Figure 6-17 Building Renewal Strategies in Scheme II
(Source: Drawn by the author)

The north side of Plot A retains historic buildings, which are renovated into an archive and library. Their original structural framework and industrial façades are preserved while embedding contemporary university functions, blending heritage protection with educational adaptability.

As the main receiver of development rights, Plot D accommodates extensive new construction, including youth apartments, R&D office buildings, and commercial spaces along active street frontages, forming a mixed-use, porous urban block.

In contrast, Plot C features only limited new construction at its southern riverfront edge, primarily for urban sports and cultural facilities, maintaining a low-intensity and open-space character.

② Restructuring of Development Intensity After Development Rights Transfer

The cross-plot transfer of development rights significantly reconfigures development intensities and functional allocations across the site:

·Plot A remains the university core zone, with its Floor Area Ratio (FAR) decreasing from 1.45 to 1.30 to allow more open space and public interfaces;

·Plot B, reclassified as green space, undertakes no construction tasks and has its FAR reduced to zero. Its development rights are fully transferred to Plot D;

·Plot C, under a development reduction strategy, maintains minimal sports and cultural functions. Its FAR is reduced to 0.28;

·Plot D, having absorbed development rights from both Plot B and Plot X, experiences a significant increase in development intensity, with its FAR rising from 0.03 to 1.32. It emerges as the principal carrier of architectural capacity and a focal point of mixed-use clustering in the scheme.

Table 6-5 Development Index Summary for Scheme II
（Source: Compiled by the author）

Plot	Total Floor Area (㎡)	Land Area (㎡)	FAR
A	59,841.96	45,998.00	1.30
B	0	16,396.33	-
C	9,963.18	36,198.61	0.28
D	36,679.49	27,829.20	1.32
Total	106,484.63	126,422.14	0.84

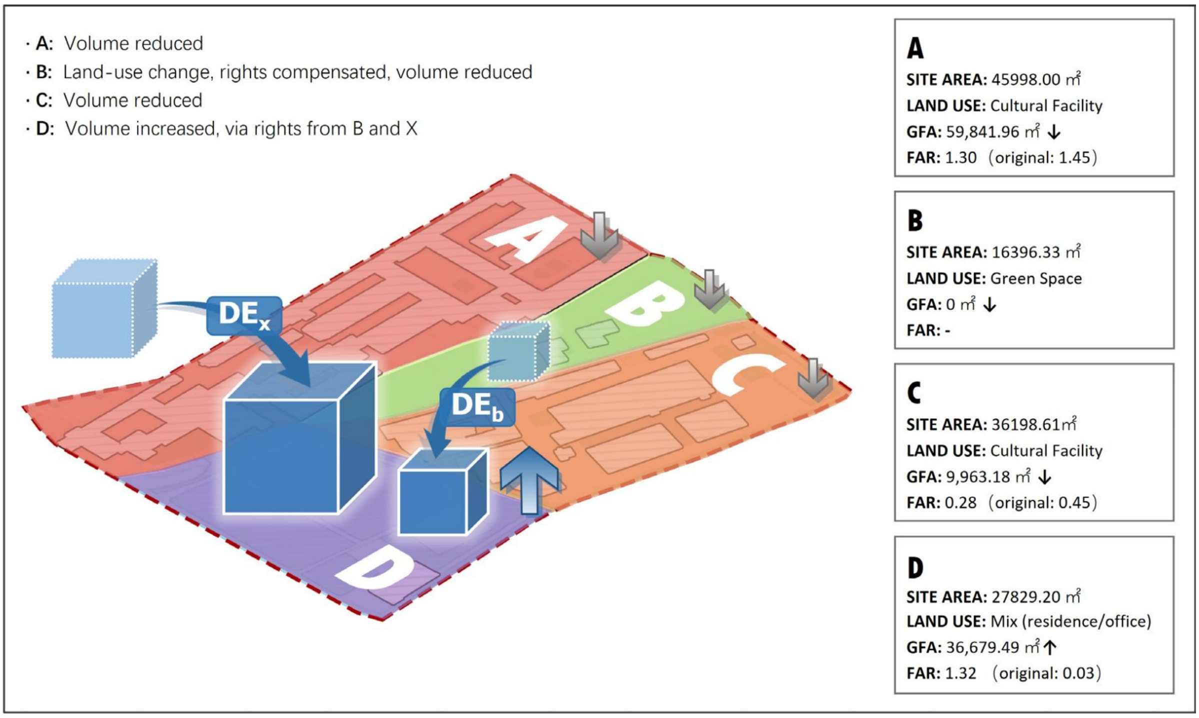

Figure 6-18 Development Volume by Plot After Rights Transfer in Scheme II
(Source: Drawn by the author)

Ultimately, the plan achieves an orderly redistribution of development rights from underutilized to priority functional plots, fulfilling institutional rationale and development balance. It enables structural spatial reorganization and optimization of development potential across the site.

6.3.4 Estimation and Distribution of Land Value Increment

（1）Calculation of Land Value Increment

This scheme adopts the same transaction price system as Scheme I. The unit price for residential development rights is set at €900/㎡, while conversion-adjusted prices are applied for other use types:

·Office use applies a conversion coefficient of 1.5, resulting in a unit price of €1,350/㎡;

·Commercial use applies a conversion coefficient of 1.3, with a resulting unit price of €1,170/㎡.

Based on this pricing structure, the development rights transferred from Plot X and Plot B into Plot D are evaluated as follows:

·From Plot X, a total of 29,085.80 ㎡ of development rights are transferred to Plot D, divided into: 20,293.00 ㎡ retained as residential use, maintaining a pre- and post-conversion value of €18,263,700; 8,792.80 ㎡ converted to office use. Its value increases from a pre-conversion total of €7,913,520 to a post-conversion value of €11,870,280, generating an increment of €3,956,760.

·From Plot B, 2,459.45 ㎡ of development rights originally classified as residential use are converted to commercial use.

Their value increases from €2,213,505 (residential) to €2,877,561 (commercial), producing an increment of €664,056.As shown in Table 6-6, the total land value increment for Scheme II is €4,620,816, of which: 86% originates from residential-to-office conversions, and 14% from residential-to-commercial conversions.

This value increment serves as the basis for subsequent benefit distribution and public regulation mechanisms. It also provides economic support for the functional optimization and Mixed-Use Functional Development within the project area.

Table 6-6 Development Rights Value and Land Value Increment – Scheme II
(Source: Compiled and calculated by the author)

Source	Pre-Conversion Area (m²)		Pre-Conversion Value (€)	Post-Conversion Area (m²)	Post-Conversion Value (€)	Value Increment (€)
DE_x	29,085.80	8792.80	7,913,520	13189.20	11,870,280	3,956,760
		20293.00	18,263,700	20293.00	18,263,700	-
DE_b	2459.45		2,213,505	3197.29	2,877,561	664,056
Total	31,545.25		28,390,725	36,679.49	33,011,541	4,620,816

（2）Distribution of Value Among the Three Parties

The distribution mechanism for land value increment in Scheme II involves three primary stakeholders: Private landowners (original owners of Plots X and B), The government (including municipal investment platforms), The university and its development entity.

Following the conversion and spatial allocation of development rights, each ownership party receives corresponding benefits and assumes development responsibilities based on their institutional roles and rights origins.

Table 6-7 summarizes the value increment from both types of development rights and the taxes levied by the government. A 15% tax is applied to the increment generated from residential-to-office conversions, and a 20% tax is applied to residential-to-commercial conversions. This results in €593,514 and €132,811.20 respectively, totaling €726,325.20 (see Table 6-7). Rather than being absorbed into the general municipal treasury, this tax revenue is earmarked for urban facility development in Plot D, establishing an institutional reinvestment mechanism within the equalization policy framework.

Table 6-7 Tax Calculation on Development Rights Value Increment – Scheme II
(Source: Compiled and calculated by the author)

Development Rights	Value Increment (€)	Tax Rate	Tax Amount (€)	Post-Tax Increment
DEx	3,956,760.00	15%	593,514.00	3,363,246.00
DEb	664,056.00	20%	132,811.20	531,244.80
Total			726,325.20	

The landowner of Plot X receives a total revenue of €29,540,466.00 from the development rights transaction. Of this, 15% (€4,431,069.90) is reinvested into Plot D’s construction, while the remainder becomes freely disposable income. Similarly, the owner of Plot B receives €2,744,749.80, of which 10% (€274,474.98) is also invested in Plot D.

This mechanism not only ensures the legitimate economic returns of private stakeholders, but also supplies financial resources for public space development in the regeneration area.

Beyond collecting €726,325.20 in taxes for Plot D development, the government contributes an additional €10 million to support the construction of innovation-oriented office spaces and youth housing projects. This expanded contribution illustrates the government’s proactive public role, extending beyond equalization mechanisms into functional spatial guidance and strategic investment.

As the primary implementation actors in Plot D, the university and its development entity bear a total construction cost of €17,579,670.92. Of this:

• The government investment platform provides €10,726,325.20,

• The landowners of Plots X and B collectively contribute €4,705,544.88, completing their development responsibilities and realizing functional delivery in the newly activated plot.

Table 6-8 Revenue and Expenditure Summary by Stakeholder – Scheme II
(Source: Compiled and calculated by the author)

Stakeholder	**Revenue (€)**	**Revenue Source**	**Expenditure (€)**	**Expenditure Description**	**Net Revenue (€)**
Plot X Landowner	29,540,466.00	Sale of Development Rights	4,431,069.90	15%reinvested into Plot D construction	+25,109,396.10
Plot B Landowner	2,744,749.80	Sale of Development Rights	274,474.98	10% reinvested into Plot D construction	+2,470,274.82
Government	726,325.20	Tax on Development Rights	10,726,325.20	Investment in Plot D urban functions	-10,726,325.20
University /Developer	10,726,325.20 4,705,544.88	Government investment Private capital investment	33,011,541.00	Purchase of rights + Plot D construction	-17,579,670.92

6.3.5 Planning Implementation and Development

To ensure effective implementation of this scheme under the development rights regulation mechanism—and to achieve multiple objectives of spatial renewal, institutional realization, and functional transformation—a phased development strategy is adopted. This strategy is designed to address issues such as complex land ownership, frequent land use conversion, and diverse development rights generation paths, while fostering coordination between fiscal investment, spatial evolution, and institutional operation. The overall development is divided into three stages, each advancing with a distinct implementation focus and constructing a progressive urban regeneration pathway linking policy guidance with operational practice (see Figure 6-19).

（1）Phase I: Institutional Activation and Public Space Construction

① Generation and Transfer of Development Rights from Plot X: Through the Extended Equalization mechanism, development rights (DEx) are generated in Plot X (within the C23 urban sub-center) and evaluated for transfer eligibility. The rights are partially retained as residential and partially converted into office use. The full DE_{x1} = 29,085.8 ㎡ is transferred into Plot D, designated for education and R&D functions.

② Land Use Conversion and Development Rights Release from Plot B: Plot B is reclassified from construction land to public green space, triggering the generation of DEb, which then enters the institutional transfer mechanism. Site clearance and initial greening work are conducted to transform it into a north-south ecological landscape corridor.

③ Infrastructure Improvements: With a focus on Plot D, construction of the road system, underground utilities, and public transit nodes enhances accessibility and capacity across the development area.

④ Public Open Space Activation: Plot B is integrated into the urban green space system. Additionally, block-scale open spaces are constructed along the riverfront of Plot D, forming the core public activity interface shared by the future university district and surrounding community.

Figure 6-19 Phased Development Diagram of Scheme II
(Source: Drawn by the author)

（2）Phase II: Introduction of University Functions and Cultural Facilities

① Renovation and New Development in Plot A: The preserved industrial buildings on the north side of Plot A are repurposed as an archive and open-access library, embedding cultural and educational functions. The central area receives new construction including a learning center, civic service hub, and exhibition space, strengthening the organizational core of the campus.

② Open Space Reorganization in Plot C: After the removal of inefficient buildings, Plot C undergoes development reduction, with reclaimed land allocated to sports fields, basketball courts, and cultural public facilities such as the Chimney Plaza, a museum, and a cultural-commercial pedestrian street along the southern edge. Plot C no longer receives development rights and is restructured into an open green system for leisure and cultural activities.

③ First Round of Development in Plot D: As the primary receiver of DEx and DEb, Plot D begins with the construction of youth apartments and part of the residential component in the southern section. Simultaneously, the cultural plaza and main access nodes are initiated, forming the framework for functional connection and public circulation.

④ Establishment of an Open Space Network: A multilevel open space system is established across Plots A, C, and D, integrating a continuous green axis from north to south and laying the spatial foundation for shared development between the university and local community.

（3）Phase III: Integration of Mixed Functions and Spatial Quality Enhancement

① Mixed-Use Development and Functional Integration in Plot D: The northern and central sections of Plot D continue development, introducing creative industries, science and technology R&D, innovation offices, block-format commercial spaces, and youth housing, forming a compact innovation cluster that integrates living, working, and collaboration. It becomes a demonstration node of university-industry synergy.

② Green Architecture and Ecological Design Implementation: In newly constructed buildings across Plots D and A, green building concepts are fully integrated—such as low-energy materials, green roofs, and sponge city systems—to enhance environmental responsiveness and project-wide sustainability.

③ Optimization of Pedestrian Network and System Integration: Following a pedestrian-priority strategy, new walkways, student commuting greenways, and open-access alleys are built. These enhance connectivity between Plot D, the adjacent university zone, riverfront green space, and metro nodes—facilitating a modal shift toward active mobility and improved public accessibility.

The overall development rhythm follows a sequence of:“Public Space First → Educational Function Introduction → Mixed-Use Integration”. The development rights mechanism serves as the main thread throughout all phases, enabling a closed-loop process from rights generation to value realization to spatial deployment. Through phased advancement and layered functional nesting, the scheme effectively reconciles ecological preservation, heritage revitalization, and functional upgrading. It presents a replicable model for institutionally driven urban regeneration.

6.4 Comparative Analysis of Redevelopment Models

6.4.1 Land Use Organization and Development Intensity

The two redevelopment schemes exhibit distinct approaches to land use organization and development intensity control, reflecting different interpretations and practices in land resource allocation under varying development leadership models.

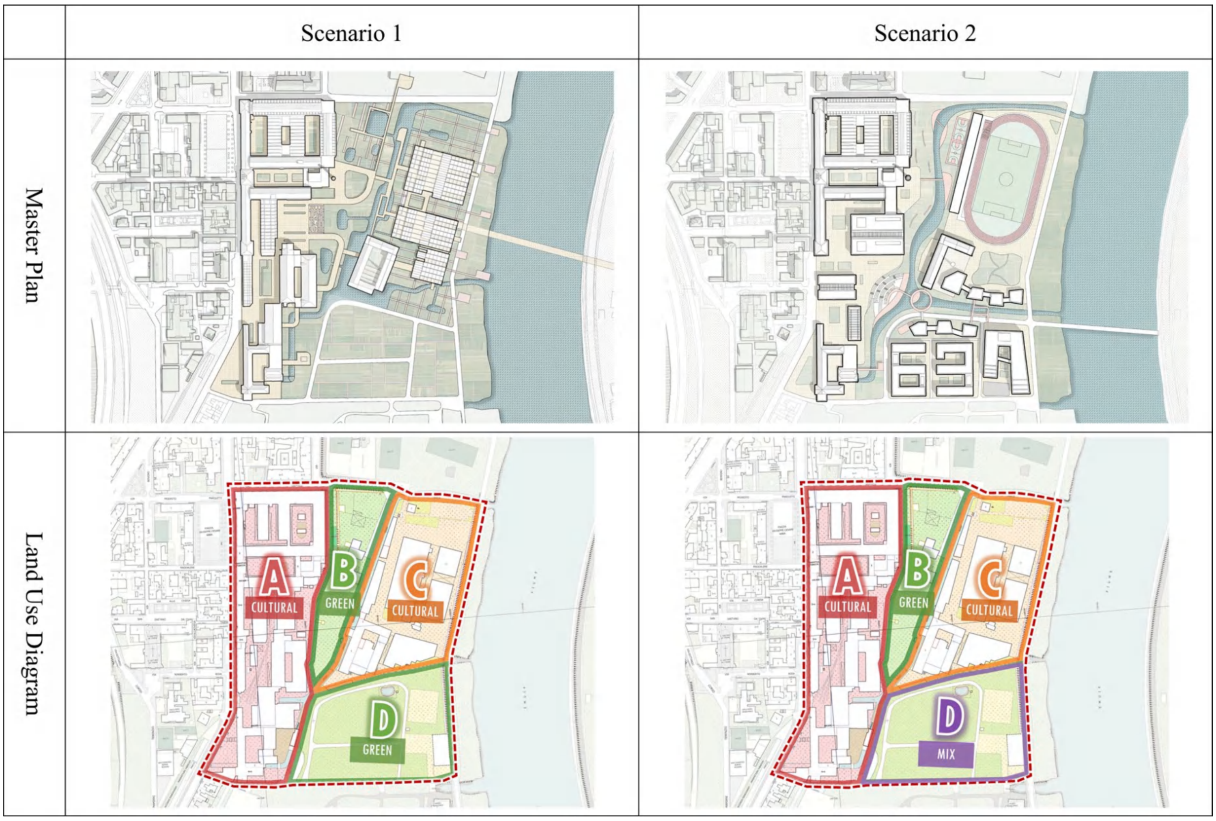

Figure 6-20 Master Plans and Land Use Comparison of the Two Schemes
(Source: Drawn by the author)

In the University-Led Redevelopment Model (Scheme I), land use optimization is grounded in respect for the existing spatial structure, with minor adjustments made to reactivate underutilized internal space. Only Plot B undergoes land use conversion (from construction land to green space), and its corresponding development rights are transferred to Plot C. The overall strategy follows a "development reduction + internal reallocation" logic:

·The originally high-intensity Plot A is strategically lightened and reprogrammed with low-intensity public functions such as an archive and library.

·Plot C absorbs new development capacity through transferred rights and supports programmatic expansion.

·Plots B and D, which bear no construction tasks, are designed as part of a continuous ecological green corridor, enhancing openness and ecological resilience.

This model emphasizes a low-intervention, internally balanced optimization strategy, maintaining overall development within controllable limits. The total Floor Area Ratio (FAR) of the site is held at 0.60.

In contrast, the University-City Collaborative Redevelopment Model (Scheme II) introduces larger-scale land restructuring and a higher-intensity development framework. Beyond the conversion of Plot B, Plot D is transformed from green space to a Mixed-Use Development Plot. Development rights from Plot X are introduced to significantly increase capacity, enabling the formation of a high-density, multifunctional urban block.

Meanwhile, Plot C is downscaled due to topographic constraints and programmatic repositioning. It now accommodates primarily recreational and cultural facilities, thereby transferring more institutional and spatial capacity to Plot D. Ultimately, Plot D reaches a FAR of 1.32, becoming the primary high-intensity development carrier, while the overall site intensity increases to 0.84, defining a redevelopment model centered on high-density, mixed-use urban transformation.

These two models demonstrate differing implementation outcomes under distinct policy instruments and institutional constraints:

·Scheme I relies on internal functional reallocation and intensity reduction, emphasizing a balance between resource redistribution and public value generation.

·Scheme II, by contrast, features institutional innovation and cross-zone resource integration, showcasing enhanced spatial transformation capacity and development potential.

They establish contrasting equilibrium mechanisms in terms of land use efficiency, development phasing, and ecological integration, offering a clear comparison of policy adaptability and strategic pathways.

Table 6-9 Comparison of Functional Composition and Development Intensity Indicators
(Source: Compiled by the author)

Plot	**Functional Composition (Scheme I)**	**Functional Composition (Scheme II)**	**FAR (Scheme I)**	**FAR (Scheme II)**
A	University + Partial Urban Functions	University + Urban Functions	1.22	1.30
B	Green Space	Green Space	-	-
C	Cultural + Office	Cultural + Sports Facilities + Commercial	0.55	0.28
D	Green Space (Undeveloped)	Commercial, Office, Residential, Services	-	1.32
Total	Partial University-City Integration + Ecology	High-Intensity University-City Integration	0.60	0.84

6.4.2 Allocation and Transfer of Development Rights

Within the two redevelopment models presented in this chapter, the strategies for allocating and transferring development rights, along with the strength of institutional regulation, constitute the core differences between the approaches. Comparative analysis reveals that the two schemes diverge significantly in terms of rights origin, use-type conversion logic, and spatial capacity modulation, illustrating the adaptability and operational flexibility of the urban equalization policy under different development objectives and governance structures.

In the University-Led Redevelopment Model (Scheme I), the logic of development rights regulation follows a principle of "on-site transfer and localized balance", representing a typical application of restricted equalization. Specifically, development rights originating from Plot B are transferred—after conversion from residential to office use—to Plot C. This reallocation occurs within the same planning-controlled zone, maintaining the overall development intensity while redistributing spatial resources. The conversion coefficient applied is 1.5, resulting in an added development capacity of 3,689.18 ㎡ for office use in Plot C. The transfer process is relatively straightforward, involving a short transaction chain and simple stakeholder relationships, with emphasis on respecting existing ownership and coordinating with ecologically sensitive areas.

In contrast, the University-City Collaborative Redevelopment Model (Scheme II) simulates a more complex and institutionally intensive development rights transfer mechanism. On top of the restricted equalization logic, the scheme introduces an extended equalization component, integrating cross-zone development rights from Plot X—an external potential development site—into the overall redistribution framework. This empowers Plot D with new development capacity. In Scheme II: Development rights released from Plot B are converted from residential to commercial use at a conversion coefficient of 1.3, then transferred to Plot D. Development rights contributed by Plot X are divided into:A portion converted from residential to office use (conversion coefficient 1.5); The remainder retained as residential-use rights without conversion.

Ultimately, Plot D receives a total of 36,679.49 ㎡ of development rights, significantly increasing its development intensity and functional complexity.

Table 6-10 Comparison of Development Rights Allocation and Use-Type Conversion
(Source: Compiled and calculated by the author)

Scheme	Sending	Initial DE (㎡)	Use Conversion	Coefficient	Receiving	Final DE (㎡)
SchemeI	Plot B	2459.45	Residential → Office	1.5	Plot C	3689.18
Total		2459.45				3689.18
Scheme II	Plot B	2459.45	Residential → Commercial	1.3	Plot D	3197.29
	Plot X	8792.80	Residential → Office	1.5	Plot D	13189.20
		20293.00	Residential	-	Plot D	20293.00
Total		31,545.25				36,679.49

6.4.3 Land Value Increment and Multi-Stakeholder Collaboration Mechanism

The estimation and distribution of land value increment represent a crucial component of whether the urban equalization policy can truly achieve multi-party benefit in practice. The two redevelopment schemes demonstrate significant differences in the mechanism of development rights generation, profit distribution models, and stakeholder structures, revealing how institutional embedding and resource coordination differ under varying development leadership models.

In the University-Led Redevelopment Model (Scheme I), development rights are generated from Plot B, which is reclassified from construction land to public green space, and then fully transferred to Plot C. With the overall development intensity kept at a relatively low level and the process led solely by the university, institutional intervention mainly takes the form of compensating individual private landowners, resulting in a closed-loop redevelopment cycle.

The land value increment arises primarily from the conversion of residential development rights to office use, with a total gain of approximately €1.1 million. The government collects a 15% value-added tax (VAT) on this increment, yielding around €160,000, which is reinvested into green space and public infrastructure improvements. Under this model, the university and developer undertake the bulk of development responsibilities, while private landowners receive compensation, and the government uses limited intervention to catalyze ecological and cultural renewal. This creates a single-stakeholder, regulation-centered mechanism.

In contrast, the University-City Collaborative Redevelopment Model (Scheme II) introduces a more complex value redistribution system and multi-stakeholder participation pathway. Development rights are generated not only from Plot B, but also from Plot X, with the latter representing institutional release from an external area and being transferred to Plot

D for mixed-use development.

This scheme incorporates both residential-to-office and residential-to-commercial conversions, resulting in a significant increase in unit development value. The total land value increment reaches approximately €4.6 million. The government implements differentiated tax rates for each conversion type, recovering €720,000 in tax revenue. Additionally, it commits a €10 million investment to support youth housing and public services, reinforcing the integration of civic functions.

In terms of stakeholder composition, this model breaks away from a university-dominated approach, establishing a collaborative system involving the government, university, private landowners of Plots B and X, and institutional investors. Notably, private stakeholders who transferred their rights benefit from substantial value gains and reinvest a portion into the development area—demonstrating the equalization policy's capacity to activate private capital via institutional incentives.

Overall, Scheme II establishes a coordinated model with stronger economic leverage and urban functional integration potential.

The comparison shows that Scheme I leans toward a "public regulation + closed execution" static equilibrium model, whereas Scheme II reflects a "market incentive + government regulation" dynamic redistribution approach. This not only illustrates the institutional flexibility of the urban equalization policy under various governance contexts but also validates its scalability in high-intensity urban redevelopment tasks.

Table 6-11 Comparison of Land Value Increment and Institutional Coordination Mechanisms
(Source: Summarized by the author)

Dimension	**University-Led Redevelopment Model (Scheme I)**	**University-City Collaborative Redevelopment Model (Scheme II)**
Source of DE	Plot B	Plot B + Plot X
Policy Mechanism	Restricted equalization	Extended Equalization + Restricted equalization
Stakeholders Involved	Government, University, Developer, Plot B Owner	Government, University, Developer, Plot B and X Owners
Total Land Value Increment	Approx. €1.1 million	Over €4.6 million
Government Tax Revenue	Approx. €160,000	Approx. €720,000
Spatial Outcome	Spatial Restoration and Structural Optimization	High-Intensity Mixed-Use Development

6.5 Spatial Strategy Response and Comparative Analysis

6.5.1 Mixed-Use Functional Organization

（1）Strategic Logic Overview

As the first spatial strategy proposed in this chapter, Mixed-Use Functional Organization aims to achieve spatial integration of diverse functions and efficient land use through rational layout and structural coordination. It encompasses both horizontal integration and vertical layering as core tactics. This strategy responds to the dual demands of land use mixing and functional stacking within urban renewal, while also providing a spatial framework to anchor development rights allocation through actual built forms.

By organizing education, residential, productive, and public service functions within a single site, this strategy constructs an urban district with high integration, openness, and adaptive flexibility.

Across the two redevelopment models constructed in this chapter, this strategy unfolds along differentiated trajectories based on their respective institutional contexts and development leadership structures:

·In the University-Led Redevelopment Model, the strategy emphasizes internal coordination within the university system and the integration of shared resources, focusing on cohesive spatial structures and education-oriented programmatic interfaces;

·In contrast, the University-City Collaborative Redevelopment Model places the strategy within a more complex, multi-stakeholder governance framework, highlighting a stronger orientation toward urban sharing and functional layering at the district scale.

The following sections analyze each model in turn.

（2）University-Led Redevelopment Model

In this model, the Mixed-Use Functional Organization strategy is embedded within a development logic led by a single university stakeholder. Functional configuration is oriented primarily toward supporting academic, research, and residential needs, with a secondary layer of cultural and urban service programs, resulting in partial openness and limited sharing with the broader urban environment.

Specifically, the scheme adopts both horizontal and vertical strategies to spatially arrange internal functions across the site.

Horizontally, the site is divided into four primary functional zones, respectively dedicated to:

·Academic Core: The northern historical buildings are renovated into an archive, library, and academic offices;

·Student Residential Zone: Located in the southwest, comprising dormitories and supporting amenities;

·Knowledge Transfer and R&D Zone: Integrated into the eastern section, including creative office and innovation labs;

·Shared Civic Services: At the center, a convenience services center and cultural exhibition space serve as an urban interface.

These functional zones are programmatically independent, yet spatially coupled through a central campus axis and a system of shared open spaces, creating a university-centered mixed-use structure.

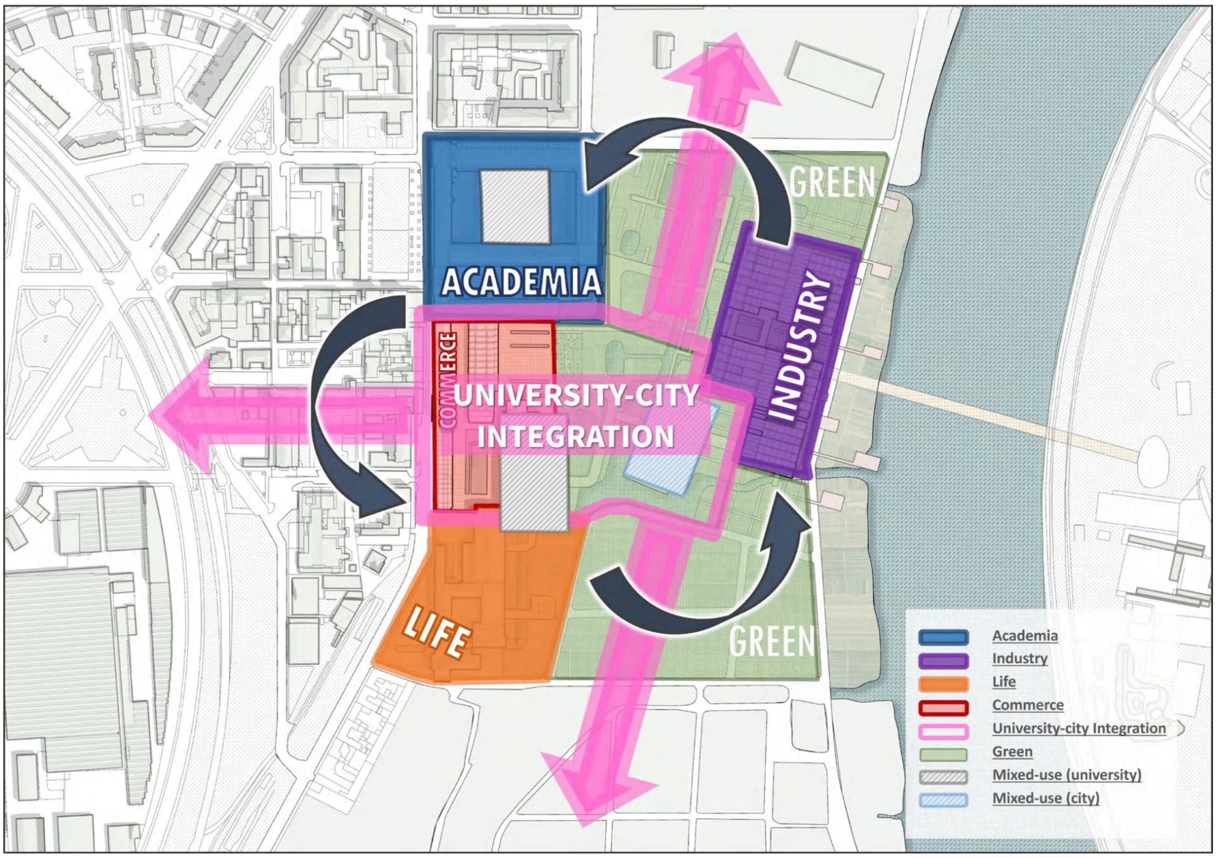

Figure 6-21 Functional Structure Analysis – Scheme I
(Source: Drawn by the author)

Vertically, the architecture reinforces functional layering and efficient deployment of development rights:

·The library includes reception, storage, and research workspaces on different floors to accommodate diverse user needs;

·The learning center incorporates elevated corridors and open passageways, forming a visual and social link to the city;

·The newly constructed dormitory block in the south features a multifunctional ground floor open to the public, with residential units above—an example of vertically stacked living and activity space;

·The former textile factory in the southeast is repurposed into a service center and heritage space, integrating social support and historical memory functions.

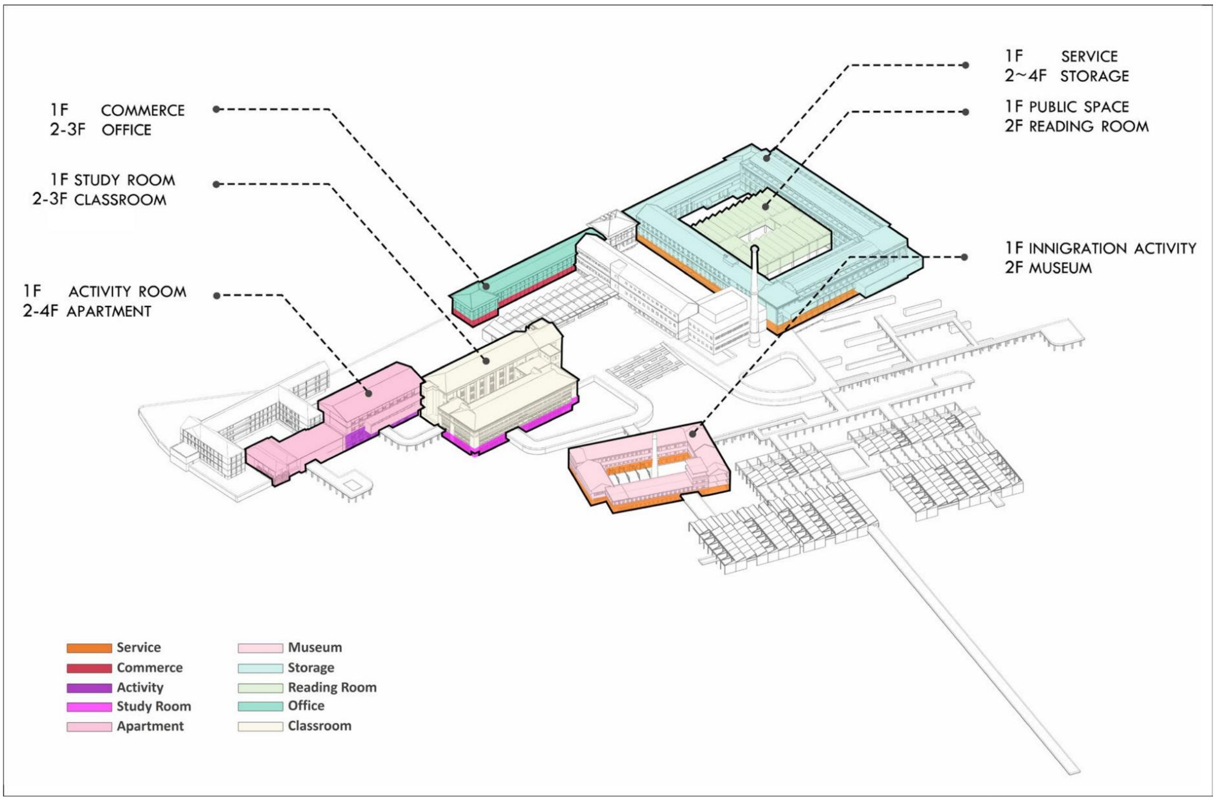

Figure 6-22 Vertical Functional Integration Diagram – Scheme I
(Source: Drawn by the author)

In summary, under this model, the Mixed-Use Functional Organization strategy focuses on internal system coordination and campus-centric spatial integration. The functional logic is structured around an academic–residential–output cycle. The development structure is cohesive and stable, and while the scheme effectively supports the university's core missions, its urban-sharing capacity remains limited, reflecting an inward-facing application of the strategy under single-entity control.

（3）University-City Collaborative Redevelopment Model

In contrast to the university-led organizational logic of Scheme I, Scheme II establishes a “university-city collaborative” redevelopment mechanism involving the university, government, and original landowners. Here, spatial structure is no longer centered solely on academic functions; instead, guided by institutional mechanisms, multi-party resource integration is pursued to achieve high-intensity and flexible mixed-use development.

For horizontal functional organization, the site is divided into six functional zones:

Academic and research core, Residential and student life area, Integrated services and cultural-commercial zone, Innovation and R&D cluster, Urban sports facilities and Ecological green system.

These zones are not spatially isolated but interlinked through a system of public space corridors, transitional interfaces, and shared nodes, forming a cohesive mixed-use structure.

·The northern part of Plot A, centered around preserved industrial buildings, hosts the archive, library, and teaching/office space, maintaining the area's academic core status.

·Student dormitories and youth apartments are located in southern Plot A and the southwest edge of Plot D, addressing diverse housing demands.

·A continuous cultural-commercial street along the river at the junction of Plots C and D features exhibition spaces, shops, and event venues, reinforcing contact zones between the university and the city.

·The southeastern section of Plot D accommodates a cluster of innovation-oriented office towers, forming a university-industry collaboration platform.

·In northern Plot C, existing athletic fields are retained and new basketball courts and stands are added, serving both academic and community fitness needs.

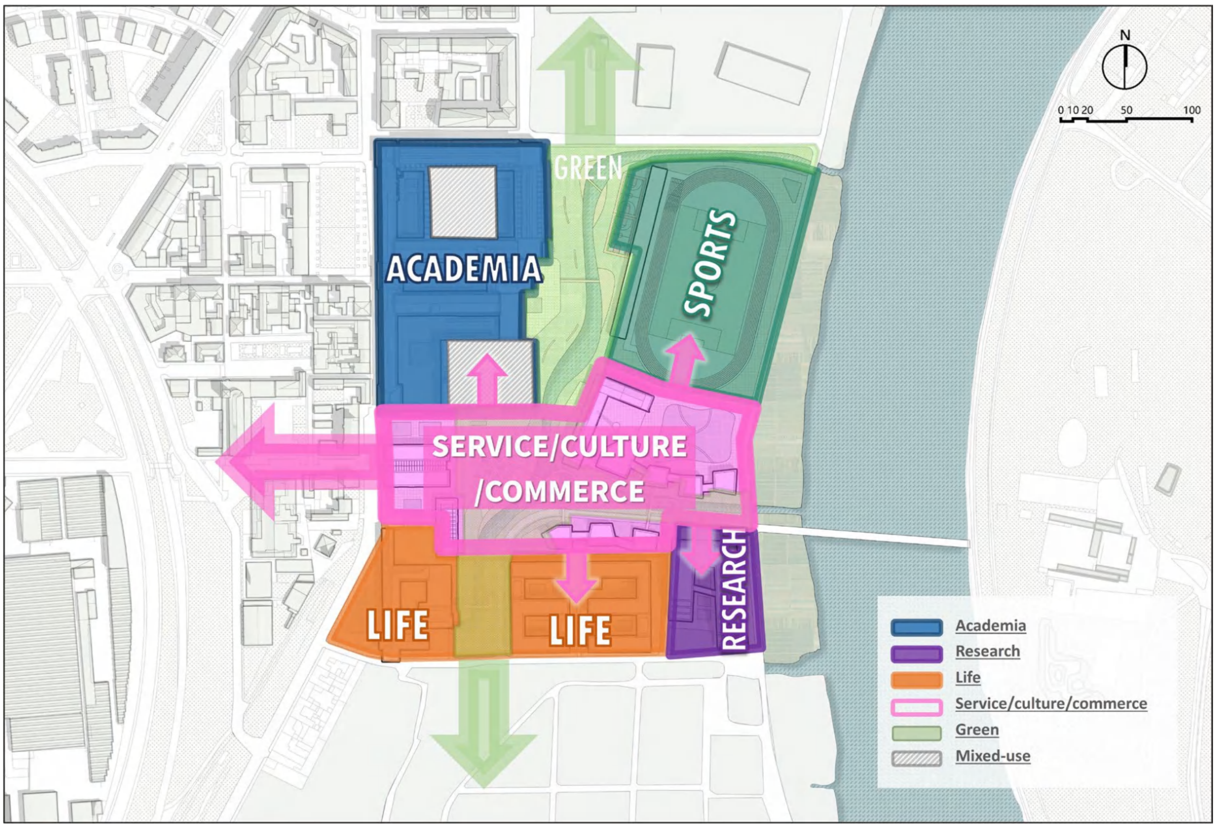

Figure 6-23 Functional Structure Diagram – Scheme II
(Source: Drawn by the author)

These spatial arrangements respond to diverse user demands for flexibility, shared use, and operational efficiency, embodying the vertical extension of mixed-use strategies at the urban scale.

In summary, the University-City Collaborative Redevelopment Model emphasizes functional integration across multiple stakeholders and the creation of shared spatial boundaries. Through horizontal coupling and vertical layering, the scheme establishes a composite, flexible, and open urban district, jointly shaped by institutional frameworks and urban objectives. It provides a richer spatial translation model for implementing urban equalization policies.

(4) Strategic Differences and Applicability Analysis

As demonstrated through the comparison of the two schemes, the "Mixed-Use Functional Organization" strategy unfolds along distinct trajectories depending on the redevelopment model.

In the University-Led Redevelopment Model, the strategy emphasizes the dominant role of educational functions, with academic, residential, and service spaces organized around the university's internal system. The logic of mixed-use integration follows an inward-oriented structure, forming composite spatial relationships through "internal coordination – controlled sharing". This model is well-suited to campus renewal scenarios characterized by clear ownership, single-stakeholder leadership, and relatively defined functional needs.

In contrast, the University-City Collaborative Model reveals a higher degree of institutional intervention and functional diversification. It introduces additional urban functions such as research, commerce, and sports, and treats public space as the shared interface between the university and the city. As such, the mixed-use logic in this scheme demonstrates greater openness and integration, making it better suited for complex urban renewal tasks with multiple stakeholders and high-intensity functional demands.

The specific differences and applicability of the two strategies are summarized in the following table.

Table 6-12 Comparative Analysis of the "Mixed-Use Functional Organization" Strategy
(Source: Summarized by the author)

Comparison Dimension	University-Led Redevelopment Model (Scheme I)	University-City Collaborative Redevelopment Model (Scheme II)
Leadership Model	Single-stakeholder (university-led)	Multi-stakeholder collaboration (university + government + private)
Functional Organization Focus	Primarily academic, residential, and cultural/office functions; university system as the core	Education, research, commerce, sports, and urban services; broader openness in functional organization
Horizontal Integration Strategy	Inward-oriented "academic–residential–production" structure centered on university needs	Distributed functional layout; emphasizes shared university-city nodes and service networks
Vertical Integration Strategy	Layered functions within university buildings (e.g., library, learning center, dormitory)	Spatial mixing introduced in new buildings (e.g., innovation towers, commercial streets, service hubs)
Spatial Openness	Relatively enclosed; permeable but filtered campus boundaries	Highly open; public service interfaces directly engage with the city
Applicability Evaluation	Suitable for university-only led projects with centralized ownership and defined functional needs	Suitable for multi-stakeholder, high-density urban renewal with strong mixed-use demand

6.5.2 Adaptive Use of Building Spaces

（1）Strategic Logic Overview

As the second spatial strategy proposed in this chapter, Adaptive Use of Building Spaces emphasizes the importance of flexibility, multifunctionality, and openness in architectural design—particularly when facing complex existing conditions, dynamic environmental factors, and diverse programmatic needs. The aim of this strategy is to restructure and optimize built space to transition from single-purpose configurations toward multi-scenario usability, thereby improving both land adaptability and spatial resilience.

In the context of urban regeneration, adaptive architecture accommodates the development capacity and functional objectives derived from institutional mechanisms, while also responding to governance demands such as sustainability, shared use, and spatial versatility. This is achieved through three main operational paths: Multifunctional Expansion, Climatic Adaptability and Scenario Flexibility.

Together, these form a space system capable of adjusting over time and accommodating social diversity.

Across the two redevelopment models examined in this chapter, the strategy manifests differently under varying development intensities:

In the University-Led Redevelopment Model, the focus lies in moderate intervention and low-impact activation of existing spaces. The strategy emphasizes adaptive reuse of heritage buildings and fine-grained integration of new functions, embodying a preservation-oriented approach.

In contrast, the University-City Collaborative Redevelopment Model builds on institutional restructuring and introduces large-scale new construction integrating ecological, educational, and cultural functions—showcasing a forward-looking, composite building space strategy.

（2）University-Led Redevelopment Model

In the University-Led Redevelopment Model, building space renewal is guided by the university's core functions, emphasizing heritage continuity while integrating multifunctional use and adaptive technologies to enhance the efficiency of spatinal regeneration and flexibility of future usage.

This scheme places special focus on the adaptive reuse of former industrial buildings, systematically constructing a spatial adaptation framework based on Functional expansion, Ecological adaptability, and Scenario-based flexibility. The goal is to activate heritage space as a platform for contemporary expression and mixed-use potential.

The Royal Tobacco Factory complex in Plot A and the former textile workshop in Plot C are the primary carriers of this strategy. Their structural characteristics and historical textures are preserved, while architectural layout, interface articulation, and programmatic layering are reconfigured to support a transition from single-use to diversified service functions.

First, at the level of spatial structure, the scheme enhances multifunctional expansion:

·The main building of the tobacco factory on the northern side of Plot A, originally a closed production facility, is converted into a university knowledge hub integrating library services, exhibition space, and administrative functions through embedded renovations and volumetric extensions.

·An eastern annex is added to establish visual and functional connections with the new service center and urban commercial street, reinforcing the building's interaction with the city interface.

·In Plot C, the textile workshop adopts a modular reconstruction strategy, reserving flexible structural units for use as cultural exhibition venues, experimental classrooms, and community service spaces, offering high adaptability and structural responsiveness.

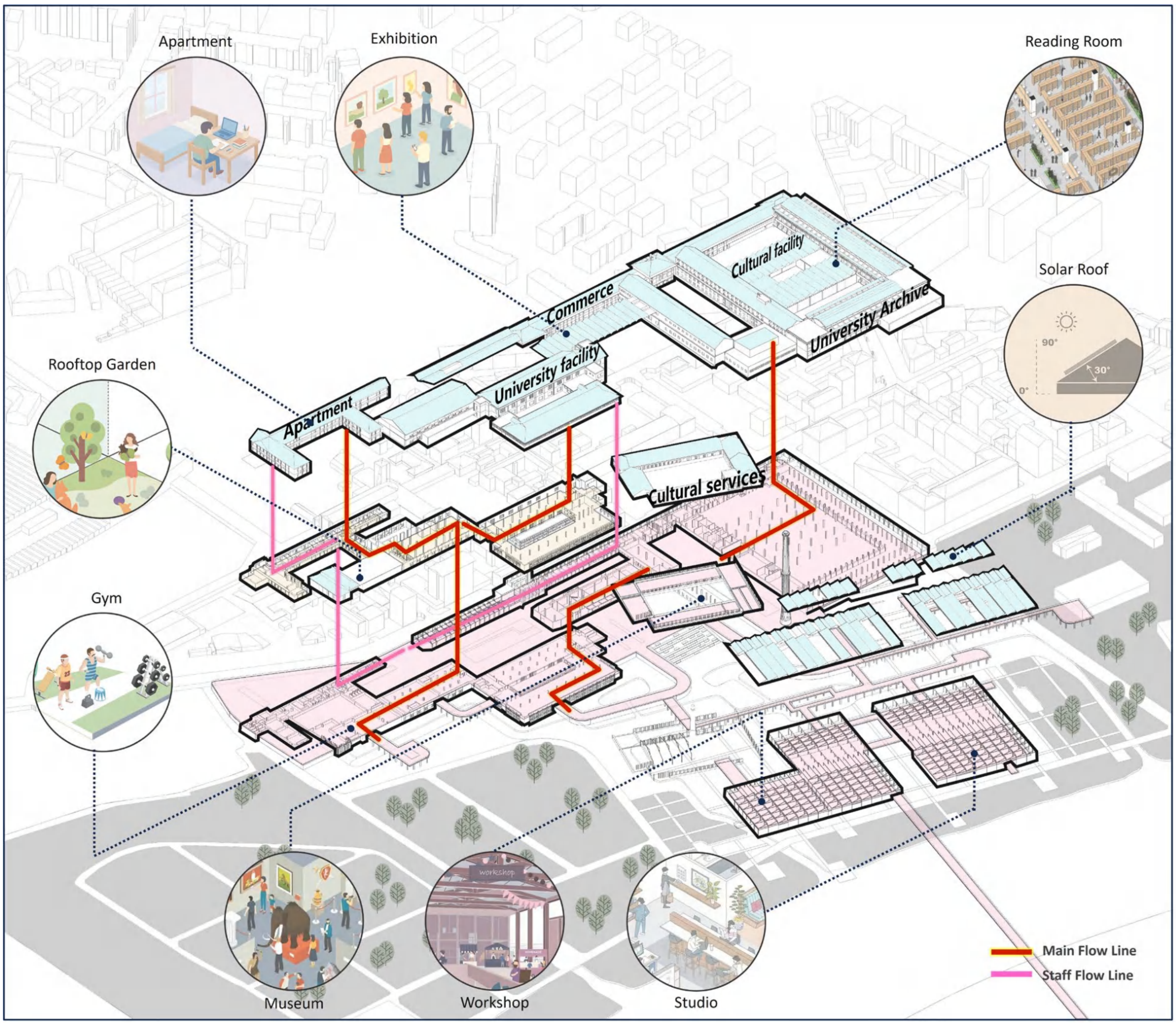

Figure 6-24 Adaptive Use of Building Spaces – Scheme I
(Source: Drawn by the author)

Second, on the ecological performance level, climate-adaptive strategies are introduced:

·Responding to climate change and potential hydrological risks along the Po River, the scheme incorporates green roofs, photovoltaic systems, and modular volume designs. On Plot A, parts of the historic buildings are retrofitted with roof gardens, which serve both greening and stormwater retention functions. In Plot C, solar panels are embedded into new structures to promote energy self-sufficiency. Additionally, mobile structural components allow for adjustments to spatial configurations in response to changing climate conditions or occupancy needs, ensuring long-term flexibility for future upgrades.

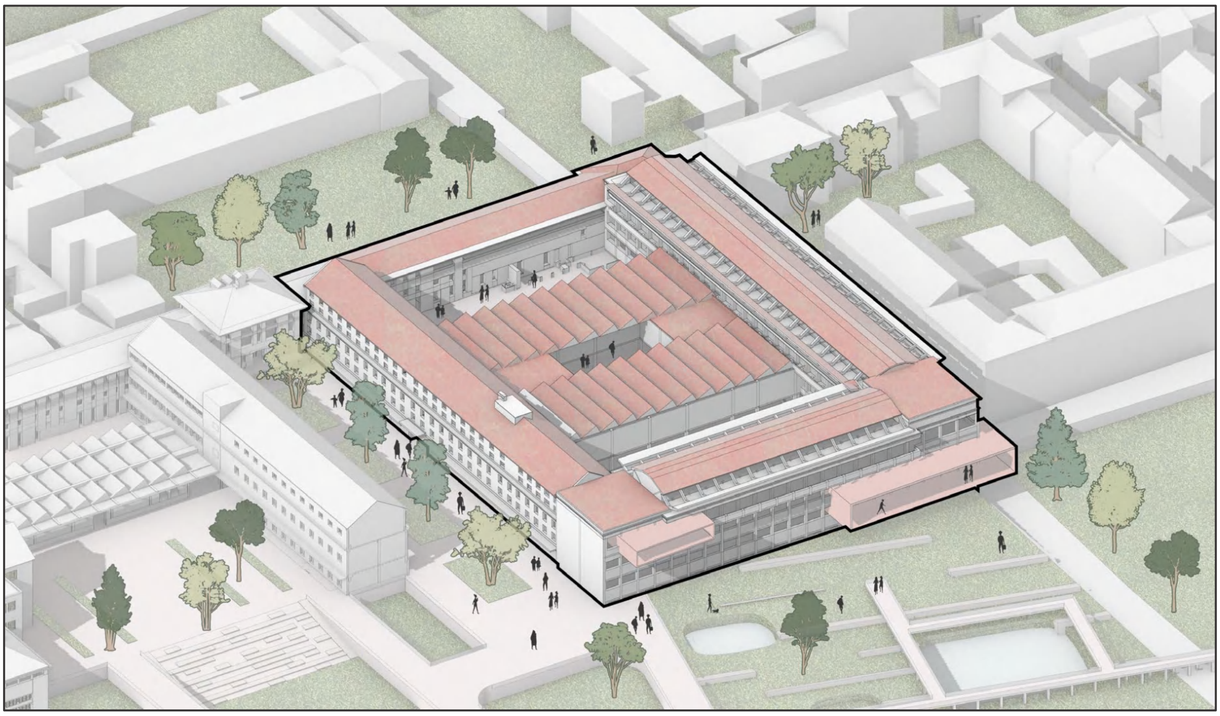

Figure 6-25 Tobacco Factory Renovation Diagram
(Source: Drawn by the author)

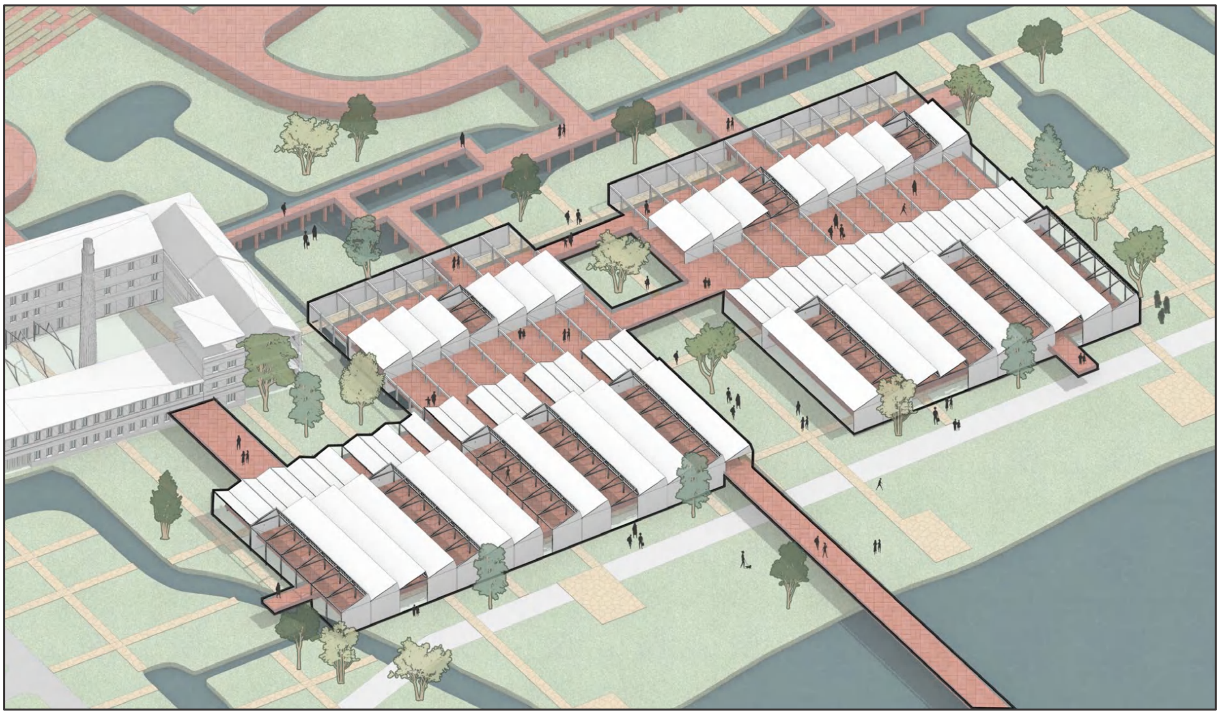

Figure 6-26 Textile Workshop Renovation Diagram – Scheme I
(Source: Drawn by the author)

Third, in terms of programmatic organization, the design emphasizes multi-user coordination and shared access:

·The central courtyard of the tobacco factory is transformed into an open exhibition venue for both student-led and public cultural events (Figure 6-27);

·Shared reading rooms are situated at the university-city transition zone, serving both academic users and neighborhood residents (Figure 6-28);

·Dormitory buildings are equipped with public halls and fitness rooms to enhance the diversity and quality of the living environment;

·The workshop-type spaces are programmed as innovation incubators and creative studios, supporting real-time translation of research outcomes into urban industrial applications.

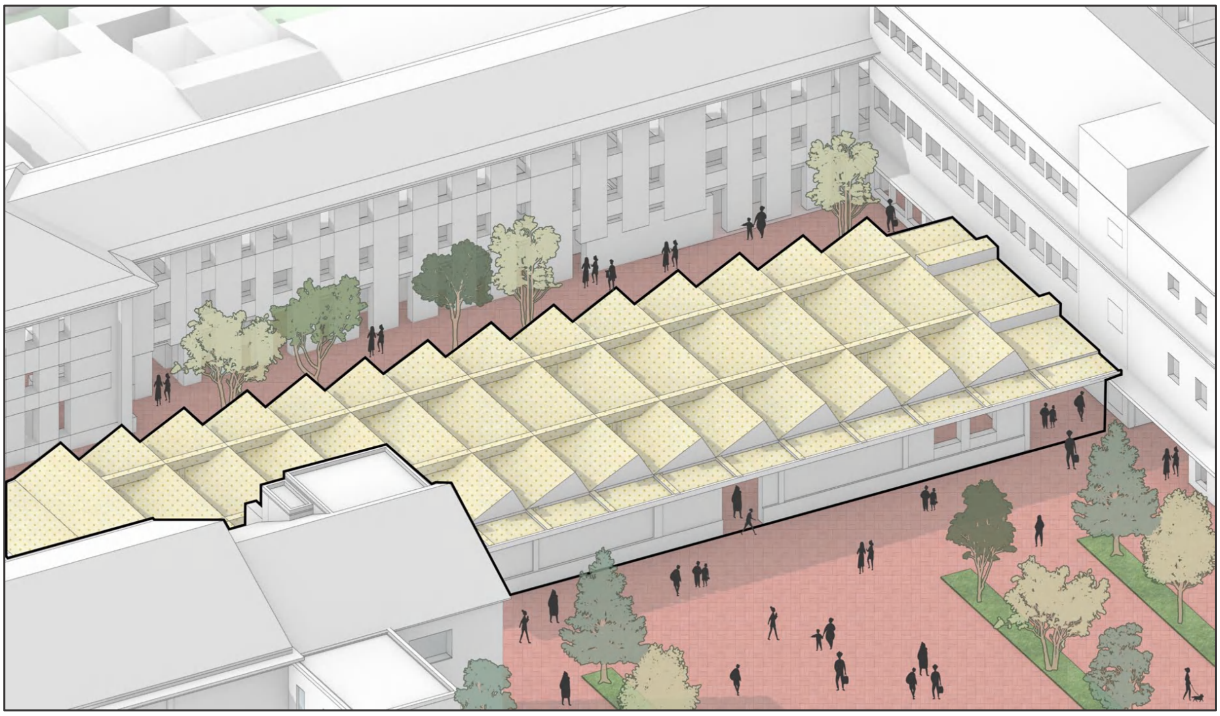

Figure 6-27 Exhibition Space Usage – Scheme I
(Source: Drawn by the author)

Through this integrated strategy, the University-Led Redevelopment Model achieves: The reactivation of heritage assets under spatial constraints, An ecological response to future risks, and The fine-grained organization of multi-scenario functions. It ultimately constructs an adaptive architectural system that is sustainable, open, and rooted in educational and cultural identity.

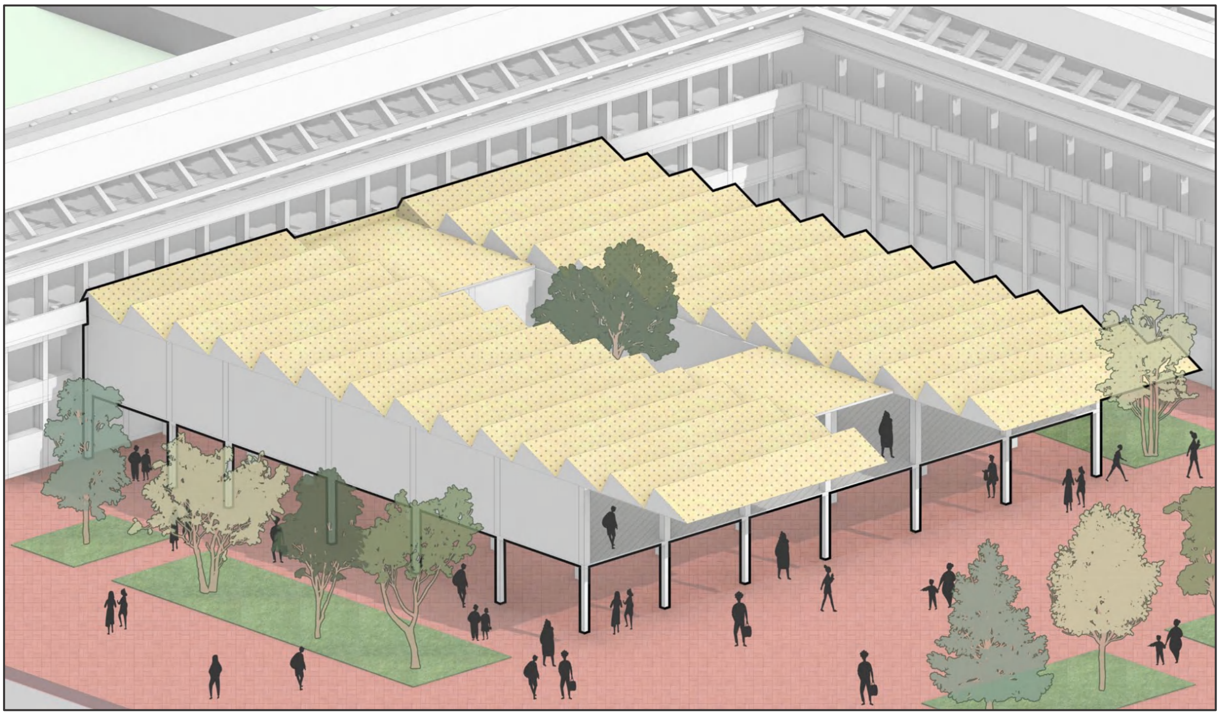

Figure 6-28 Shared Reading Space Utilization – Scheme I
(Source: Drawn by the author)

（3）University-City Collaborative Redevelopment Model

In Scheme II, the organization and design of building space emphasize the interactive logic of institutional regulation and multi-stakeholder collaboration. Unlike Scheme I, where the university acts as the sole leader, this model seeks a balance among the university, government, and community actors, constructing a spatial system that integrates education, research, culture, and urban services.

Compared to the modest renovation approach of Scheme I, this scheme adopts a “selective preservation + large-scale new construction” strategy. While preserving the site's historical identity, it transitions toward a higher intensity and more complex functional structure.

The historic factory buildings on the northern edge of Plot A are preserved and upgraded into an archive and open-access library. Maintaining their brick masonry structures and industrial façades, they are retrofitted with modern document management systems and reading areas, consistent with the strategy applied in Scheme I. This renewal not only honors site memory but also extends the university’s cultural outreach into the city through shared facilities.

New construction is concentrated in central Plot A and Plot D:

·The new learning center in Plot A serves as the core space for university teaching and study. It adopts a symmetrical layout, with two main volumes linked by a double-height corridor, forming a continuous and open learning environment. The lower level of the corridor features stepped platforms responding to the site's north-south elevation difference and creating a visual corridor that connects to the Po River and Plot C, strengthening the relationship between campus and city through both landscape and circulation.

·The southern part of Plot D accommodates a youth residential cluster, designed under the concept of "green and shared" living for young researchers and early-career residents. The buildings are arranged around courtyard-style atriums and include rooftop gardens and communal terraces, balancing residential privacy with public interaction.

·The southeastern edge of Plot D is dedicated to a cluster of innovation office buildings. These feature stepped volumetrics, interfacing with both the waterfront and adjacent urban roads. Internal functions include R&D labs, academic exchange areas, and incubation spaces, forming a spatial platform for university-industry collaboration and knowledge transfer.

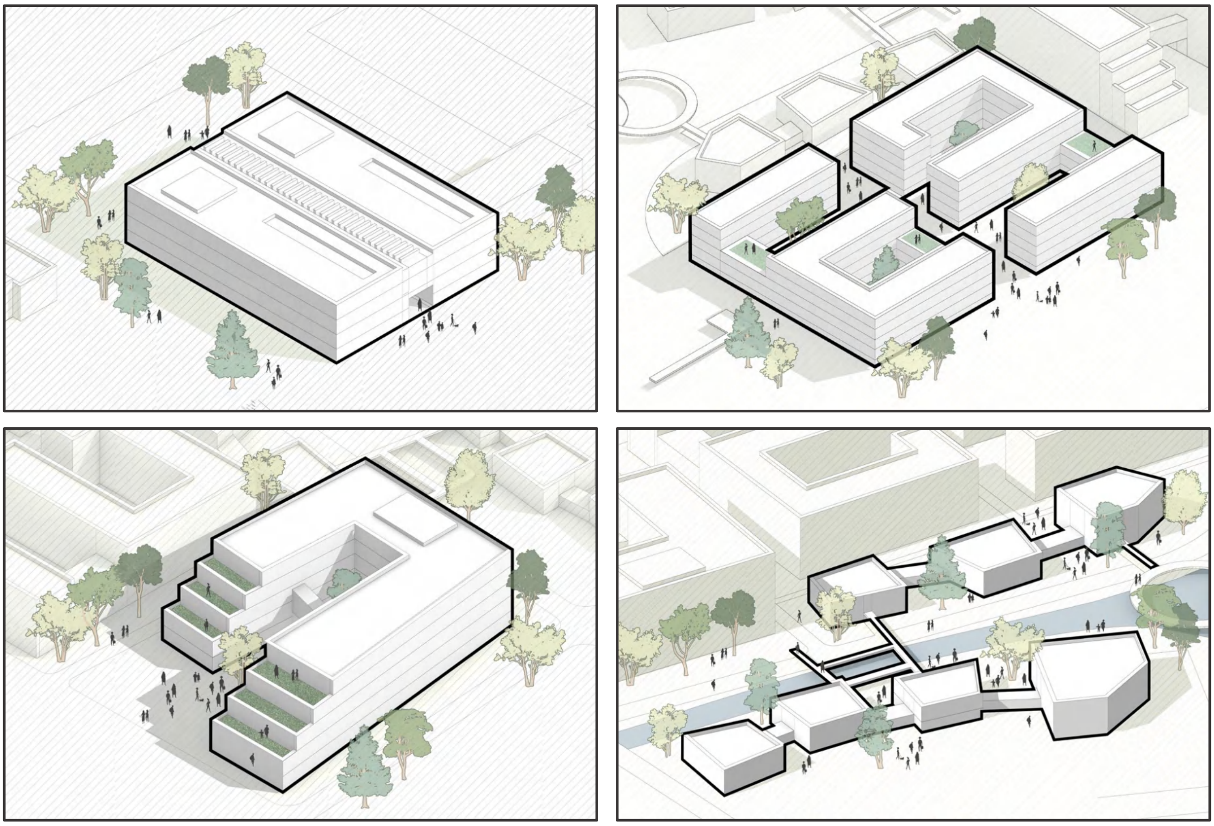

Figure 6-29 New Buildings in Scheme II
(Learning Center + Youth Housing + Innovation Offices + Commercial Street)
(Source: Drawn by the author)

Along the inner river interface between Plots C and D, a series of small-scale commercial blocks are introduced, creating a pedestrian-friendly, visually rich retail corridor. This area focuses on creative exhibitions, artisanal workshops, light dining, and pop-up installations, forming a shared interface between the university and the city. It serves both the daily needs of university users and engages surrounding communities, reinforcing co-creation and shared everyday life between campus and city.

(4) Strategic Differences and Applicability Analysis

From a comparative perspective, the University-Led Redevelopment Model emphasizes activation and optimization of existing space in its adaptive strategy. The design adheres to low-intervention reuse principles, aiming to maximize spatial reuse efficiency under limited resource conditions. This reflects a conservative spatial modulation logic rooted in the university system's cultural continuity and functional stability.

In contrast, the University-City Collaborative Model presents adaptive architecture as the product of new construction integrated with broader urban systems. Its adaptive logic goes beyond the continuation of historical spaces; instead, it explores flexible spatial structures that respond to functional transformation, multi-scalar integration, and diverse stakeholder needs.

Table 6-13 Comparative Analysis of the "Adaptive Use of Building Spaces" Strategy
(Source: Summarized by the author)

Strategy Dimension	**University-Led Redevelopment Model (Scheme I)**	**University-City Collaborative Redevelopment Model (Scheme II)**
Adaptive Strategy Focus	Activation and fine-grained reconfiguration of existing buildings	Flexible organization of new volumes and integration of urban functions
Multifunctional Expansion	Conversion of industrial heritage into libraries, museums, and creative spaces through additive design based on existing structures	Integration of new learning centers, housing, and office programs; more complex spatial compositions
Climatic Adaptability	Green roofs, photovoltaic panels, modular structures; focus on Po River climate and hydrological resilience	Green roofs, stepped terraces, and open platforms in new buildings; integration with ecological systems
Scenario Flexibility	Emphasis on shared spaces for students and communities; supports teaching, culture, and services	Mixed-use of commercial streets, exhibition areas, and apartments for broader urban interaction
Key Spatial Expressions	Open courtyards, structural extensions, modular insertions	Stepped greening, rooftop platforms, shared zones, and functional coupling
Applicability Evaluation	Suitable for university campus renewal with centralized ownership, well-preserved structures, and limited development intensity	Suitable for high-density, multi-stakeholder functional districts with strong urban-sharing demands

6.5.3 Diverse and Inclusive Public Spaces

（1）Strategic Logic Overview

As the third spatial strategy proposed in this chapter, Diverse and Inclusive Public Spaces focuses on reinforcing the spatial and social integration between the university and the city through the construction of open space systems and the insertion of composite programmatic nodes. The strategy shifts the role of public space from being a background amenity to serving as an active medium for interaction.

It is implemented through three core principles: Continuity of open space, Activation of interfaces, and Co-construction of shared nodes.

Together, these foster the systemic embedding of urban publicness within the redevelopment site.

In the two redevelopment models, the public space strategy reflects distinct organizational logics and value orientations:

·The University-Led Model places greater emphasis on the preservation of existing ecological patterns and restoration of endogenous systems, prioritizing spatial sustainability and academic spatial compatibility.

·The University-City Collaborative Model, while also ensuring accessibility and shared utility, leans toward activating urban participation through strategic node placement and event programming, creating public spaces centered around social vitality and urban convergence.

The following sections elaborate on each model individually.

（2）University-Led Redevelopment Model

In the University-Led Model, the public space system is guided by an ecology-first strategy. It integrates green infrastructure, enhances visual and circulation continuity, and activates spatial nodes to create an open space network that serves both the university community and urban users.

The overall structure is anchored by a north-south green spine formed through the transformation of the site's internal waterway. This connects Plot B and Plot D into a continuous green belt and extends transversal green corridors into adjacent functional plots, constructing a spatial framework that balances ecological access with functional organization.

Special attention is paid to ecological continuity and the integration of campus atmosphere:

·The north-south axis acts not only as a visual and pedestrian corridor but also as an ecological linkage, merging former community gardens and the natural shoreline of the Po River into a cohesive blue-green system.

·On the western edge, the network penetrates into Plot A's historical building cluster, where open courtyards and shared atriums offer everyday accessible leisure spaces. These are further connected to the urban street grid through multi-functional spatial interfaces.

·On the eastern side, the design uses axial guidance and platform articulation to link the central plaza to the riverside green space, creating both visual alignment and physical permeability, thus embedding formerly isolated waterfront resources into the overall open space structure.

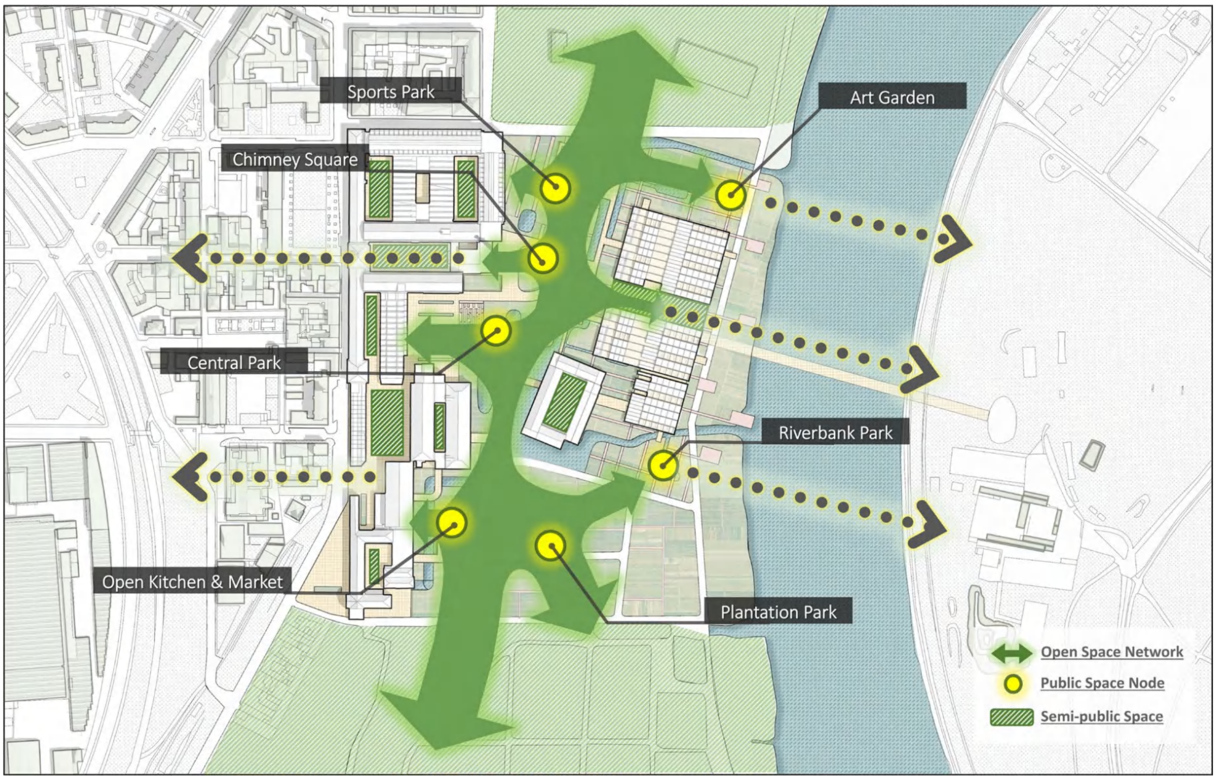

Figure 6-30 Open Space System Analysis – Scheme I
(Source: Drawn by the author)

The design strategy also focuses on the reconstruction of open building interfaces. By reorganizing the spatial boundaries of the former industrial site, enclosed perimeter walls are removed, while the original structural contours are preserved. At the same time, street-facing programs and active interfaces are introduced.

·On the western edge, new access points and activity zones are added to guide pedestrians from surrounding urban blocks naturally into the campus.

·On the eastern edge, the strategy involves demolishing inefficient units, inserting composite volumes, and connecting multiple elevation levels to create an open stepped plaza facing the Po River, which serves both educational functions and public civic activities.

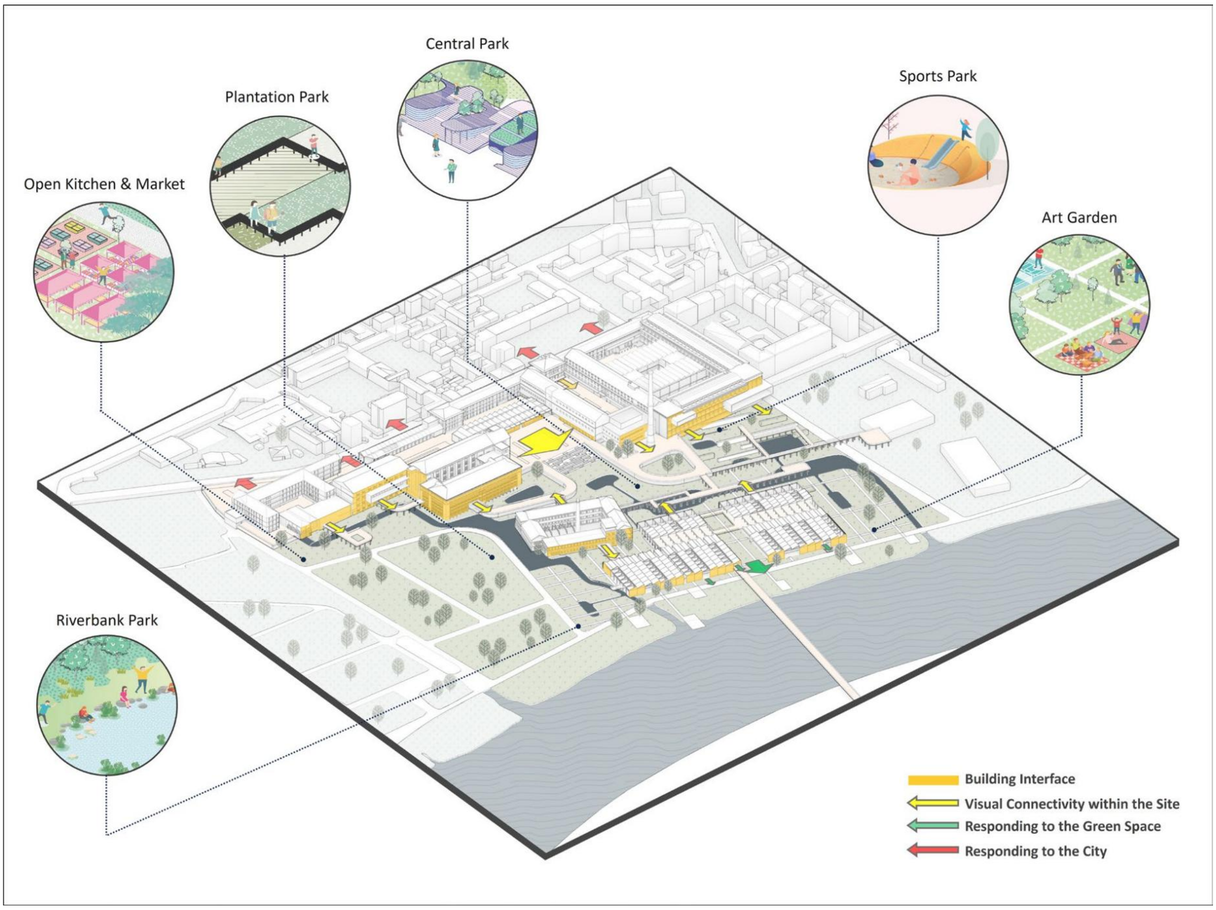

Figure 6-31 Boundary Space Analysis and Activated Scene Diagram – Scheme I
(Source: Drawn by the author)

At the level of spatial nodes, the University-Led Model includes a number of ecological and public-compatible high-frequency activity nodes, such as the Chimney Plaza, Central Park, Riverside Park, and a leisure-oriented urban garden.

These spaces function not only as the terminal expressions of the ecological system, but also as interaction platforms between the university, community, and city. Together, they constitute a green-oriented framework for shared urban public life.

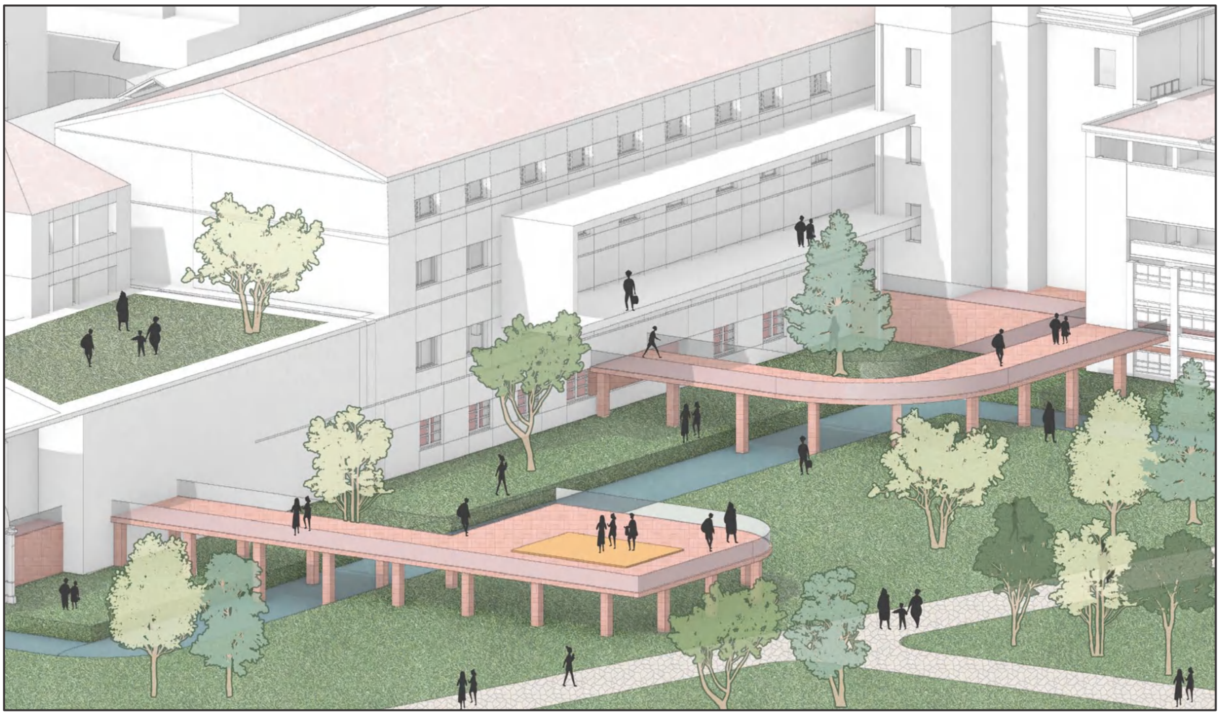

Figure 6-32 Southern Open Space – Scheme I
(Source: Drawn by the author)

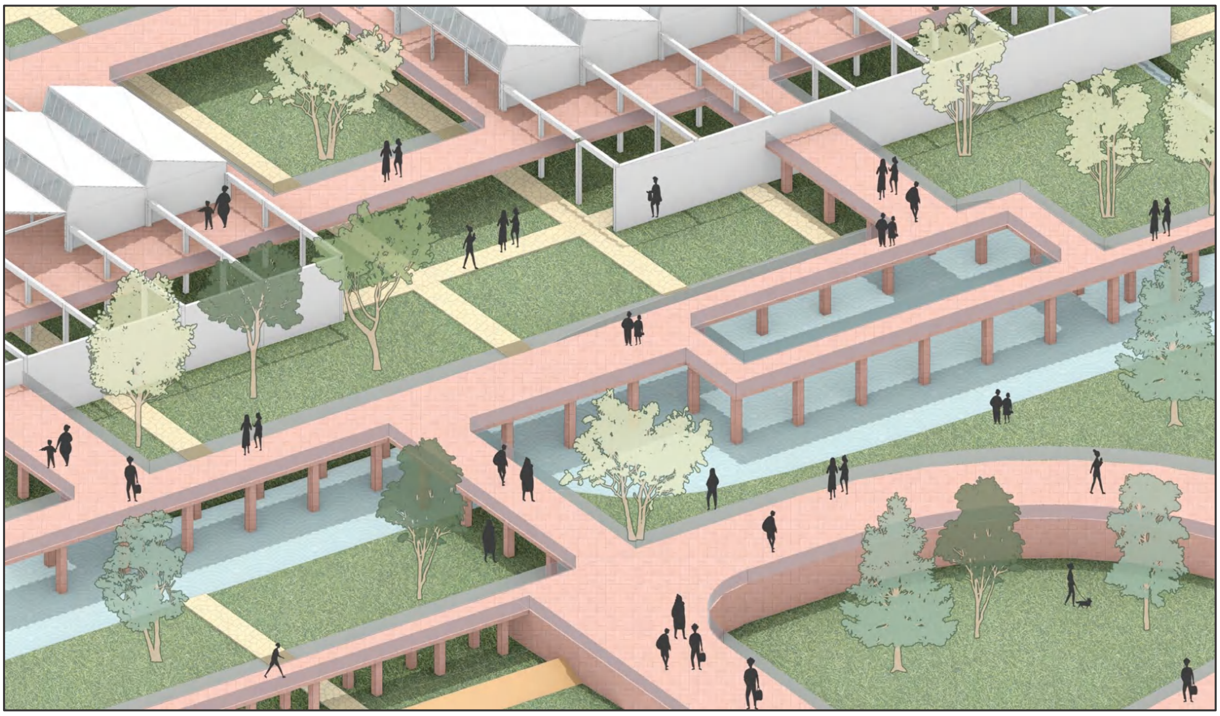

Figure 6-33 Central Open Space – Scheme I
(Source: Drawn by the author)

（3）University-City Collaborative Redevelopment Model

In the University-City Collaborative Model, public space serves not only as a functional carrier, but also as a strategic tool for coordinated urban development—a means of aligning multi-stakeholder interests, accommodating mixed-use programs, and constructing a shared socio-spatial framework.

The scheme uses the inner river ecological corridor as the central structural spine, extending into a multi-level open space system that connects north–south continuity and east–west permeability. This is achieved through a spatial layout that combines nodes, corridors, and surfaces, forming a woven, interactive spatial structure between the university and the city.

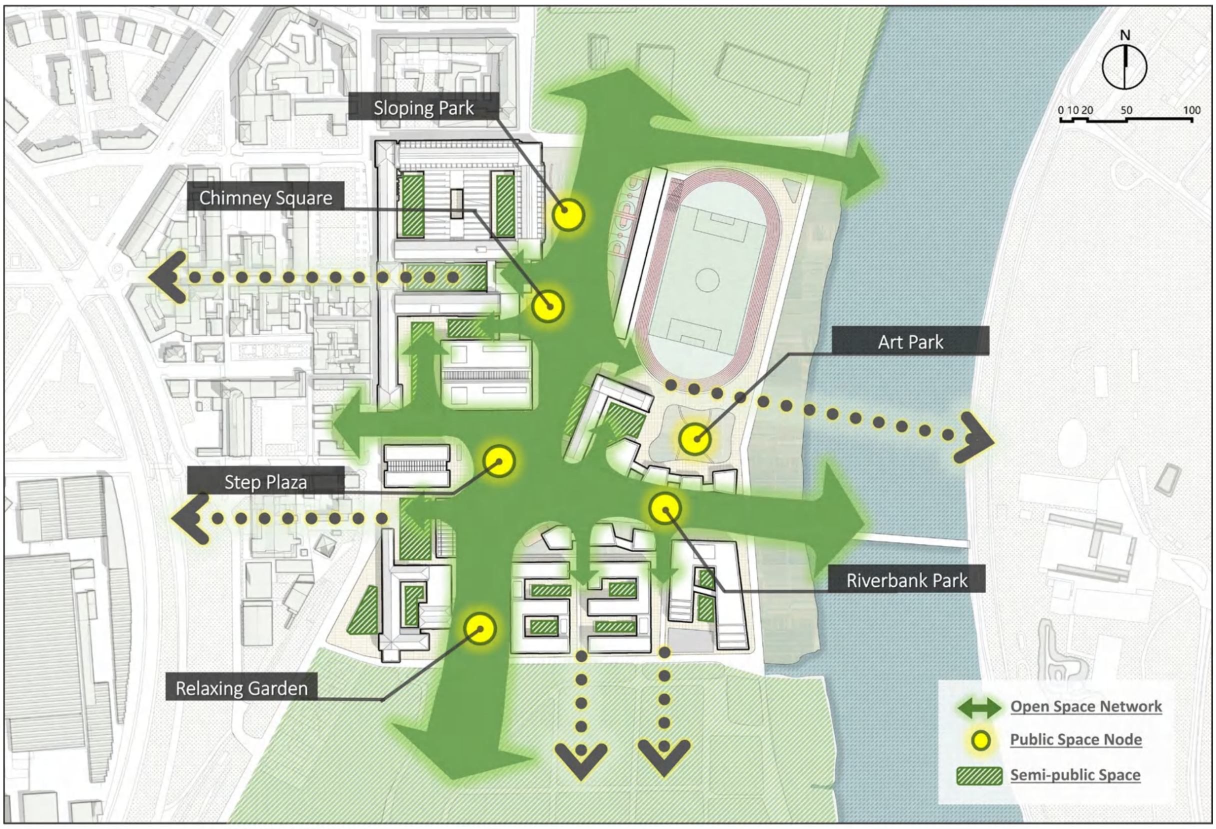

Figure 6-34 Open Space System Analysis – Scheme II
(Source: Drawn by the author)

The green space system exhibits a more composite logic:

·Longitudinally, the inner water system connects Plot D to public green spaces at the northern and southern edges of the city, establishing a continuous ecological corridor.

·Latitudinally, a green axis traverses Plots A, C, and D, channeling pedestrian flows through the site into the campus, while clustered nodes enhance accessibility and dwell time.

This cross-woven system strengthens both ecological performance and provides a spatial foundation for multi-stakeholder shared activities.

In terms of interface and block relationships, the design departs from the traditional "inward-facing, enclosed" campus model, and instead proposes a dual strategy of "block urbanization" and "open boundary":

·In Plot A, street-facing entrances, permeable courtyards, and public squares integrate the campus with the western urban blocks;

·In Plot D, continuous block-scaled development connects to the southern urban interface, aligning building scale and urban rhythm, thus transforming the "campus edge" into an urban spatial node.

Along both banks of the inner river, small-scale commercial streets are organized using continuous but varied architectural typologies, creating a public-oriented, livable, urban waterfront that merges university functions with everyday city life on a single spatial platform.

In terms of node organization, the scheme includes a series of frequently used, multifunctional, and diverse-scale public space nodes. These nodes support not only physical functions such as spatial transition, programmatic exchange, and elevation bridging, but also social roles such as urban participation and knowledge sharing.

Notably, at the intersection of the four plots, a stepped multifunctional plaza is planned as the convergence point of the north–south green spine and the east–west corridor. It incorporates topographic strategies to resolve height differences while offering rich spatial layers and strong visual permeability (see Figure 6-35). This node serves both as a key spatial translator and as the primary urban interface facing the campus.

Figure 6-35 Step Plaza Node – Scheme II
(Source: Drawn by the author)

Additional public spaces such as the slope park and recreational park reinforce the ecological foundation, while the Chimney Plaza and Art Park embody site memory and cultural programming, offering diverse activity grounds for university members and urban residents alike.

（4）Strategic Differences and Applicability Analysis

From a comparative perspective, the shared space strategy in the University-Led Redevelopment Model places greater emphasis on ecological preservation and internal openness. It builds a continuous and accessible open space network based on the existing river system and green corridors, primarily serving on-campus users. The spatial interfaces are more cohesive, reflecting the university's preference for controlled environments and cultural continuity.

Table 6-14 Comparative Analysis of the "Diverse and Inclusive Public Spaces" Strategy
(Source: Summarized by the author)

Strategy Dimension	**University-Led Redevelopment Model (Scheme I)**	**University-City Collaborative Redevelopment Model (Scheme II)**
Core Focus	Emphasizes ecological system integrity and internal spatial cohesion; enhances accessibility and usability of university public environments	Emphasizes spatial openness and urban integration; constructs a public platform shared by university and city
Open Space Network Structure	Organized around inner river green belt and north-south ecological spine; horizontally embedded into campus zones	Constructed from ecological spine and block-scale street grid; emphasizes urban participation and permeability
Building Interface and Boundary	Retains historic contours; introduces open courtyards and corridor systems to create internal shared interfaces	Breaks traditional campus boundaries; adopts block-style development and multi-scale entrances to link campus and city
Primary Public Node Types	Chimney Plaza, Central Park, Riverside Park—emphasizing ecological sharing and campus cultural ambiance	Step Plaza, Slope Park, Art Garden—emphasizing urban interaction, performative use, and civic expression
Main Spatial Expression	Dominated by ecological infiltration + university space openness; reflects a unidirectional university–ecology–community extension	Driven by nodal activation + network openness; enables multidirectional city–university–society convergence
Applicability Evaluation	Suitable for campus-centered areas with strong ecological resources and a dominant educational function; emphasizes autonomy and control	Suitable for urban districts with multiple stakeholders and higher development intensity; emphasizes coordinated openness and co-construction

In contrast, the University-City Collaborative Model prioritizes urban integration and functional sharing. Through block-scale development and interface restructuring, it establishes composite shared spaces that are public-facing, with more diverse node types and a wider range of service users. This approach demonstrates the openness and governance flexibility of shared spaces enabled by institutional coordination.

The two models form a sharp contrast in openness, functional hybridity, and institutional support structures, highlighting the adaptive variation of shared space strategies under different development logics.

6.5.4 Human-Centered Mobility System

（1）Strategic Logic Overview

As the fourth spatial strategy proposed in this chapter, the Human-Centered Mobility System aims to address the goals of green, low-carbon travel, equitable access, and enhanced spatial experience in urban regeneration. It seeks to optimize transportation organization, improve walkability and cycling accessibility, and support the functional integration of the site.

The strategy emphasizes the supportive role of mobility infrastructure in structuring space and coordinating with public functions. Through the integrated design of motor vehicle circulation and slow traffic systems, the scheme enables co-adaptation between transportation flows and public space use.

In the context of development rights-driven redevelopment, the mobility system not only provides the structural foundation for functional placement, but also becomes a critical indicator of spatial equity and public accessibility.

In the two redevelopment models, the mobility strategy reflects different organizational logics and spatial tendencies:

·The University-Led Model focuses on ensuring internal traffic efficiency and ecological quality. It emphasizes pedestrian-priority spatial structures by integrating green spaces and restricting vehicle access;

·The University-City Collaborative Model, by contrast, emphasizes urban connectivity and spatial openness, creating a high-density, block-scale mobility network with coordinated functional nodes, adapted to mixed-use programs and diverse user groups.

（2）University-Led Redevelopment Model

In the University-Led Redevelopment Model, the mobility system is centered on the functional needs of the university, emphasizing clear internal circulation, traffic safety, and a pedestrian-priority principle. The design proposes a structure of controlled vehicular access, a tiered slow traffic network, and ecology-oriented pedestrian experience corridors, providing

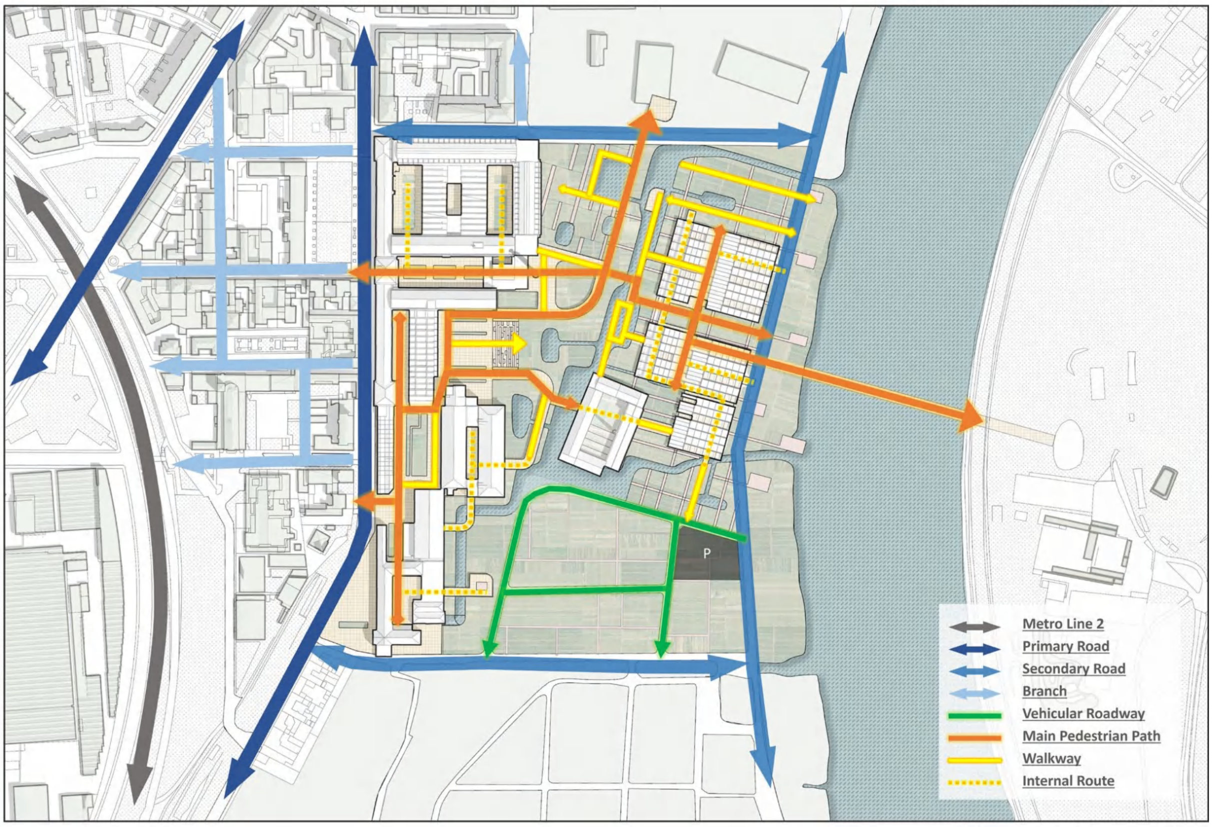

Figure 6-36 Site Road and Traffic System Analysis – Scheme I
(Source: Drawn by the author)

university users with convenient, efficient, and environmentally friendly mobility conditions.

At the motor vehicle level, the scheme leverages the existing urban arterial and sub-arterial road systems, establishing a single vehicular entrance on the south side. Motor vehicles are directed to a centralized parking area in the southern part of Plot D, effectively restricting vehicle access within the interior of the site. This creates an “external access – internal enclosure” model, which, while ensuring convenience, also maximizes the central area's allocation to slow traffic, thereby enhancing both safety and openness of the campus environment.

In addition, a pedestrian bridge is planned on the eastern edge, providing a direct link to the community across the Po River. This improves both spatial and visual connectivity, enhancing the campus’s external outreach and urban integration capacity.

For the slow traffic system, the design builds a multi-tiered network composed of both cycling and pedestrian paths:

·The cycling system runs along the river green corridor, linking the urban greenway system with the cycling arterial on the southern edge of the site, creating a continuous, unobstructed green mobility corridor;

·The pedestrian system, in coordination with site topography and programmatic distribution, includes a variety of route types such as Primary walkways, Natural garden paths, Sky corridors, and Riverside scenic promenades.

Together, they form a multi-path, multi-interface, multi-experience low-carbon travel network that enriches pedestrian journeys and enhances the human-scaled quality of the campus environment.

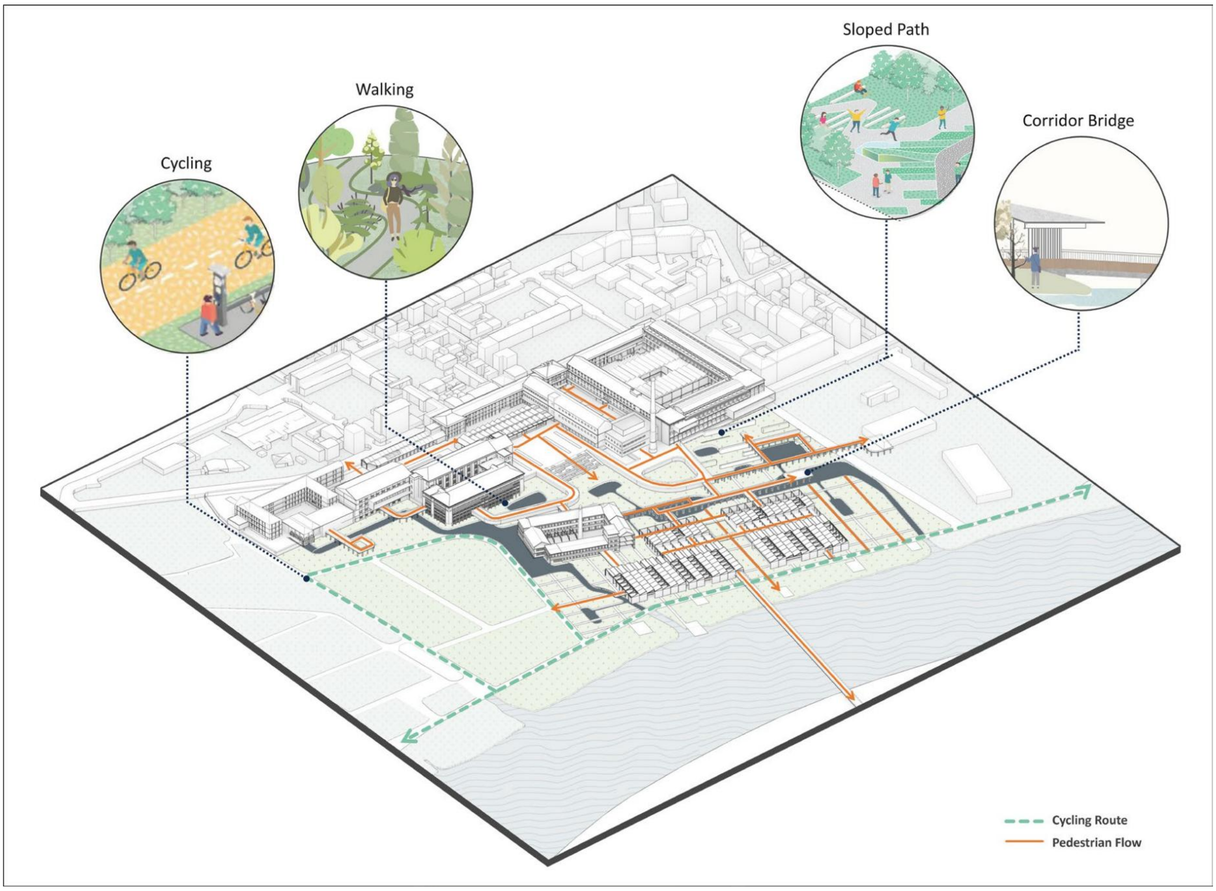

Figure 6-37 Cycling Routes and Pedestrian Circulation Analysis – Scheme I
(Source: Drawn by the author)

（3）University-City Collaborative Redevelopment Model

The overall transportation structure in this model reflects a strategic shift from motor-vehicle-oriented planning to human-centered mobility. While maintaining functional accessibility, the design prioritizes pedestrian experience and public transit access, responding to the high-quality demands of green mobility and everyday convenience in a mixed-use urban district.

Within the site, a clear hierarchy of vehicular and slow traffic networks is established:

·Vehicular roads primarily serve the development area in Plot D, ensuring essential access to R&D offices, commercial streets, and residential areas.

·In the remaining zones, vehicle access is deliberately limited, minimizing car interference and promoting a pleasant, walkable block-scale urban environment.

A primary pedestrian spine functions as the structural backbone of the system, linking the major entry points of Plots A, C, and D to key destinations such as the learning center, cultural plaza, and step plaza. This spine offers a transparent, efficient pedestrian flow network, while simultaneously acting as a functional axis that integrates various usage scenarios. It becomes a vital connector between university activities and city life.

An internal network of secondary pathways and pedestrian streets weaves across the plots, using varied circulation widths and open-space combinations to enhance both accessibility and daily convenience. High-frequency daily routes between residential units, apartments, and office areas foster community interaction and spatial vitality.

Additionally, semi-public interior corridors are embedded within building clusters, creating transitional grey space systems that enhance permeability between built form and open environment.

Figure 6-38 Site Road and Traffic System Analysis – Scheme II
(Source: Drawn by the author)

（4）Strategic Differences and Applicability Analysis

From a strategic perspective, the University-Led Redevelopment Model reinforces spatial exclusivity and order within the campus through a closed-loop slow traffic system, prioritizing clear internal circulation, safety, and a quiet academic environment.

In contrast, the University-City Collaborative Model adopts an open pedestrian network and a flexible zoning approach to vehicular circulation, enhancing mobility coordination among different user groups and offering greater route flexibility to accommodate the commuting and social needs of a mixed-use urban environment.

Table 6-15 Comparative Analysis of the “Human-Centered Mobility System” Strategy
(Source: Summarized by the author)

Comparison Dimension	University-Led Redevelopment Model (Scheme I)	University-City Collaborative Redevelopment Model (Scheme II)
Strategic Core	Closed slow traffic system with clear hierarchy; emphasizes internal order and quiet learning environment	Open pedestrian network with composite axial system; emphasizes accessibility and spatial integration for diverse users
Traffic Organization Method	Motor vehicle circulation is limited to site periphery; internal zones are fully pedestrianized	Motor vehicles are permitted within development areas only; zoning is adjusted to match programmatic layout
Slow Traffic Layout	North–south axial structure with sky corridors, viewing platforms, and riverside walkways	Interwoven main and secondary routes; integrated with courtyards, green corridors, and grey spaces
Primary User Group	Primarily university faculty and students; path system serves single-use activities such as teaching, reading, and daily routines	Designed for faculty, residents, office users, and visitors; supports diverse commuting and shared activities
Applicability Evaluation	Suitable for university-led redevelopment areas; prioritizes spatial order, independence, and academic exclusivity	Suitable for university–city collaborative districts; supports complex programs, diverse users, and urban-sharing models

6.5.5 Summary of Spatial Design Strategy Methods

Building upon the comparative analysis of the preceding spatial strategies and drawing from the three-tiered integration framework of "Equalization Policy – Land Development – Spatial Design" proposed in Chapter 4, this section summarizes the core methods and applicable pathways of spatial strategies. As the key medium for institutional implementation, spatial design not only accommodates the development indicators and spatial boundaries generated through development rights allocation, but also responds to institutional goals of equity, multi-functionality, and sustainability through concrete physical interventions.

The summary is organized around the following four strategies:

（1） Mixed-Use Functional Organization

This serves as the foundational strategy for balancing land development capacity with functional integration efficiency, utilizing both horizontal and vertical design approaches:

·Horizontal integration organizes land into coordinated programmatic zones, aligning educational, cultural, residential, office, and commercial functions within a multi-functional, proximity-based district system.

·Vertical integration focuses on the layered use of building interiors, employing public platforms, shared atriums, and hybrid façades to consolidate diverse use scenarios, thus enhancing the functional capacity and operational efficiency per unit of space.

This strategy achieves efficient use of spatial resources and provides a structural foundation for flexible development intensity adjustments.

（2） Adaptive Use of Building Spaces

This strategy addresses the dual challenge of existing stock renewal and climate adaptation, establishing a mediating mechanism between functional transformation and spatial flexibility:

·Multifunctional expansion emphasizes the reuse and structural transformation of existing buildings, enabling a shift from single-use to cultural, educational, and industrial hybrid capacities.

·Climatic adaptability is realized through the integration of green roofs, photovoltaic systems, and modular structures, enhancing environmental resilience.

·Scenario flexibility focuses on the ability to switch between everyday and public uses through variable interfaces and flexible use protocols.

This strategy improves a project’s resilience to future uncertainties while aligning with the sustainability principles central to urban regeneration.

（3）Diverse and Inclusive Public Spaces

This strategy emphasizes the transition from physical openness to social sharing, promoting improvements in spatial equity, community participation, and urban vitality:

·The open space system, structured around ecological corridors and pedestrian networks, links diverse open nodes into a coherent green infrastructure.

·Boundary space activation transforms traditional thresholds through permeable blocks, interface reinterpretation, and mixed-edge designs, enabling campus–city porosity.

·Co-created vibrant spaces introduce a range of public nodes across scales—such as performance plazas, art gardens, and community markets—forming a multi-functional, socially identifiable network of everyday public life.

This strategy directly supports the policy goal of “shared benefits”, while promoting daily accessibility and the social reconfiguration of public space.

（4）Human-Centered Mobility System

Focusing on mobility equity and accessibility, this strategy structures a composite circulation system led by slow traffic and supported by motorized transit:

·Urban transportation integration ensures seamless connections between the site and city roadways, rail, and green transit networks, improving overall accessibility.

·Vehicular regulations mitigate motorized interference in core areas through zoning control and intensive layout, safeguarding pedestrian environments.

·Slow traffic optimization focuses on path layout, spatial continuity, and experiential quality, building a three-dimensional pedestrian network composed of primary corridors, riverside promenades, skywalks, and scenic ramps—integrating architecture, open space, and ecological systems.

Together, these four spatial strategies demonstrate how urban equalization policy is translated from abstract goals into actionable design operations. They highlight design as an intermediary mechanism for institutional implementation and collaborative renewal. The strategy framework is shown to be adaptable across different development models and regulatory intensities, offering scalable strategic support and methodological logic for future urban regeneration under complex conditions.

6.6 Chapter Conclusion

This chapter, using the “University-Led Redevelopment Model” and the “University–City Collaborative Redevelopment Model” as two practical scenarios for the application of urban equalization policies, systematically explores how such policies can be implemented and spatially interpreted within a specific site. By centering on the development rights allocation mechanism, two distinct design schemes were developed, establishing a complete translation process from institutional logic to development operations, and finally to spatial outcomes.

In the first two sections, detailed analyses were provided on land boundary adjustment, development rights transfer, land value increment, and organizational modes of development under each model, revealing the mechanism by which development rights reallocation affects the development structure.

Subsequently, the comparative analysis demonstrated that the University-Led Model achieved stable optimization within an existing development framework, while the University–City Collaborative Model, through the mechanism of extended equalization, enabled a higher-intensity and more complex form of development, showcasing the adaptive capacity and operational flexibility of urban equalization policies under different conditions.

In Section 6.5, four core spatial strategies—Mixed-Use Functional Organization, Adaptive Use of Building Spaces, Diverse and Inclusive Public Spaces, and the Human-Centered Mobility System—were used as analytical lenses to systematically compare and summarize how each model responds to institutional goals at the spatial level. The discussion further identified design methods for spatial operations under varying stakeholder logics and institutional frameworks.

This process not only validated the feasibility of the "Policy–Land–Space" three-tiered transmission framework proposed in Chapter 4, but also reinforced the critical role of urban design as a medium for institutional implementation.

In summary, Chapter 6 responds to institutional logic through design practice by constructing an urban renewal strategy framework centered on the development rights mechanism. Through the dual-model, multi-dimensional, and strategy-specific explorations, it provides operable and comparable design pathways for the spatial translation of urban equalization policy.

Conclusion

1. Summary of Theoretical Research

This research starts from land development rights systems, systematically organizing their theoretical foundations and institutional evolution in international contexts, further focusing on core mechanisms and governance logic of Italy's urban equalization policy. Globally, land development rights, as a form of rights interest that can be independently confirmed and allocated separate from land ownership, have become a key link connecting government regulation with market mechanisms. The UK's government-led development model[1-2], the US's market-based development rights transfer mechanism[7], and France's legal density ceiling model[9] have all established relatively mature land management models. In recent years, China has also gradually shown a transition trend from single administrative allocation to diverse institutional design of development rights in reforms such as urban-rural construction land increase-decrease linking, urban renewal, and collective land entering markets, demonstrating adaptation and experimental exploration of land development rights mechanisms with Chinese characteristics.

Based on this, this paper focuses on Italy's urban equalization policy gradually established since the 1980s. The policy system is provided with a legal framework by the central government, with regional and provincial governments formulating regional regulations, and local governments responsible for specific implementation, forming a multi-level collaborative management model[16,39,41-42]. In terms of implementation mechanisms, the policy covers aspects such as land evaluation, use division, building rights confirmation and flow, and equalization zone designation, ensuring scientific allocation of land resources and effectiveness of market regulation[10,13,16-17]. Its core is managing building rights as assets that can be independently confirmed and market circulated, promoting dynamic reallocation of land use conversion and development rights interests through means such as setting building rights conversion coefficients, designating equalization zones, and establishing real estate value maps, thus achieving balanced development in spatial dimensions between cities and regions, efficient complex utilization in land use dimensions, and fair distribution of subject benefits in institutional dimensions.

2. Summary of Spatial Strategy Research

To explore how urban equalization policy can be effectively implemented in planning practice, this study constructs a comprehensive pathway framework based on the three-stage logic of policy–land development–spatial design. The framework clarifies how urban equalization policy—through mechanisms of confirming, circulating, and converting development rights—guides the transformation of land development models and further influences the generation of spatial design strategies. At the land development level, the framework consists of four core steps: delineation of development boundaries, allocation of development rights, estimation and distribution of value appreciation, and development implementation. At the spatial design level, this is translated into four strategies: composite functional land-use organization, adaptive architectural space utilization, diversified and inclusive public spaces, and a human-centered mobility system—collectively responding to the policy's demands for spatial flexibility, functional integration, and public value.

Under this framework, the study applies the redevelopment of the former Royal Tobacco Factory in Turin, Italy, as an empirical case to formulate two representative redevelopment models. The first is a campus-led redevelopment model, which emphasizes gradual development and rights circulation under a scenario of clear land ownership and limited institutional intervention, using a restricted equalization mechanism to restructure university spaces and optimize functional layouts. The second is a campus–city collaborative model, which, in the context of stronger institutional support, adopts an extended equalization mechanism and engages multiple investors. Through inter-zonal development rights transfer and land use conversion, it achieves high-intensity, mixed-use urban spatial reconstruction. These two models complement each other across dimensions such as institutional regulation intensity, development organization, and spatial strategy responses, collectively demonstrating the operational flexibility of the equalization policy in dealing with complex urban scenarios.

In practice, the research centers on the mechanism of development rights allocation, mapping the boundaries of stakeholder interests and rationally planning the transfer and reception of building rights across parcels. It also calculates value appreciation based on land price indices and land use conversion coefficients, and constructs a dynamic benefit distribution system involving the government, university, developers, and original landowners, thereby balancing economic compensation and public investment.

At the spatial design level, both schemes produce logically consistent yet strategically distinct spatial expressions under the guidance of equalization policy. The campus-led model emphasizes internal integration and retention of functional systems, embedding diverse academic and community service spaces within historical structures. In contrast, the campus–city collaborative model establishes a high-density, mixed-use development zone supported by the institutional framework of development rights, enabling the integration of educational, residential, cultural-creative, and commercial functions. It also systematically enhances accessibility and spatial sharing through comprehensive reconstruction of ecological and mobility systems.

Ultimately, these two design practices verify that urban equalization policy can serve not only as a regulatory instrument for planning management but also as a transformative pathway in urban redevelopment, enabled by precise rights allocation logic and a translatable spatial strategy framework.

3. Implications and Lessons for China

In recent years, China has continuously promoted institutional innovation in land management and spatial governance, gradually exploring diverse governance tools including "increase-decrease linking," "occupation-compensation balance," "substitute protection," "discounted indices," "ecological compensation," etc.[29-31,33,35,82-83], to some extent already reflecting mechanism logics of land development rights being transferable, compensable, and use-adjustable. However, compared to relatively mature land development rights systems in countries like Italy, China currently still lacks unified building rights confirmation systems, standardized use conversion mechanisms, and relatively complete development rights trading markets, leading to certain institutional constraints and implementation bottlenecks in aspects such as land use adjustment, resource coordinated allocation, and development interest coordination. Italy, with building rights systems as its core, effectively establishes transmission chains between policy objectives and market operations through confirmation, conversion, and flow mechanisms, providing an institutional model that can be referenced.

（1）Institutional Design Level: Constructing Standardized Value Assessment and Trading Systems

Currently, China's land development rights-related policies are still in pilot and exploration stages, lacking value assessment systems covering entire territories, with land use conversion still relying on administrative approval and index control, and limited market mechanism involvement. In this context, Italy's urban equalization policy, based on division of homogeneous zones and value-equivalent zones, constructs unified building rights assessment logic, introducing use conversion coefficients as key regulatory parameters, achieving adjustable values between different regions and different uses[37-38,43], while effectively guaranteeing fairness and efficiency in the use adjustment process. China can draw on this experience to construct land development rights assessment systems oriented towards markets, establish regional or national trading platforms, enhance policy transparency and transaction efficiency, guide equal participation of small and medium owners in development rights trading, and optimize market environments for use adjustments.

（2）Development Process Level: Separating Rights Structures, Reducing Fiscal Pressure, Stimulating Social Capital

Under China's current land finance structure, urban renewal and infrastructure construction heavily rely on government-led land acquisition and land transfer systems, leading to heavy fiscal burdens and inefficiencies in renewal[84]. Italy's equalization policy, by separating land ownership from building rights, allows governments to obtain space needed for public construction through building rights flow without direct land acquisition, reducing acquisition costs and social friction[39]. Meanwhile, this mechanism allows owners in ecologically sensitive or use-restricted plots to receive compensation through transferring building rights, both guaranteeing their property rights and relieving funding pressure for public space construction. China can explore establishment of "land development rights banks" or "urban renewal funds," guiding social capital participation in renewal projects through market-based methods, realizing reasonable sharing and benefit distribution of development rights among multiple entities.

（3）Spatial Governance Level: Promoting Fair Resource Allocation and Multi-entity Participation

With the evolution of China's territorial spatial governance system towards "multi-planning integration" and "differentiated control," there are still major challenges in aspects such as land rights coordination in use-restricted areas, development participation mechanism construction, etc.[3,6,85]. In urban renewal processes, landowners' participation models are mainly passive compensation, with development rights primarily concentrated in government or large development entities' hands, making interest sharing difficult to achieve. Italy's urban equalization policy, through institutional establishment of building rights markets and use conversion mechanisms, provides an adjustment method both respecting original ownership structures and guaranteeing spatial efficiency[18,37]. Especially in renewal projects, the policy encourages landowners to form joint transformation entities to participate in development processes together, enhancing institutional fairness and social acceptance[45]. For China, in advancing urban renewal and inefficient land redevelopment processes, reference can be made to its "joint development—value sharing" strategic path, expanding participation mechanisms of social diverse entities, strengthening institutional execution's coordination and social foundation.

Italy's urban equalization policy's practical foundation is built on its unique administrative system, local autonomy mechanisms, and mature cadastral systems, still showing significant differences from China's current land governance system in institutional environments, ownership structures, and policy objectives. Some mechanisms are difficult to directly transplant. However, its governance logic of linking development rights trading, use adjustment, and spatial strategies through institutional tools still has important reference value for optimizing current spatial governance systems and expanding institutional paths in China. In the future, China can gradually introduce related concepts and mechanisms in combination with local actualities in aspects such as land classification management, use adjustment mechanisms, and development rights market-based platforms, progressively promoting land governance from index control towards institutional coordination, achieving higher quality, more sustainable territorial spatial development.

4. Limitations and Future Outlook

This study constructs an integrated analytical framework grounded in the three-tiered logic of equalization policy–land development–spatial design, aiming to elucidate how institutional policy mechanisms translate into spatial strategies. The redevelopment of the former Royal Tobacco Factory in Turin, Italy, serves as a practical case to validate the operational logic and spatial translation methods of urban equalization policy in the context of complex urban regeneration. However, due to limitations in research perspective, methodological capacity, and contextual alignment, the study still presents several shortcomings:

In terms of theoretical research, although this thesis systematically reviews the institutional framework and operational mechanisms of Italy's urban equalization policy, limitations in language proficiency and access to source materials have resulted in an incomplete coverage of original Italian policy documents and local implementation rules. Consequently, the grasp of certain institutional details and localized practices may be constrained by informational gaps, potentially leading to omissions or insufficiently in-depth interpretations in the theoretical review and policy analysis. Furthermore, while the study is centered on the mechanism of development rights, it provides only limited discussion on topics such as land finance and planning gain distribution. Particularly in the context of Chinese urban governance, the fiscal dependency of land policy and the distribution of development gains merit further investigation, as these factors significantly influence the policy's transferability. Future studies could refine the core logic of land finance and systematically compare it with the "value capture" mechanisms embedded in equalization policies.

Regarding design research, this study establishes two development models—the "campus-led" and "campus–city collaborative" approaches—corresponding to basic institutional adaptation and expanded policy application. These models preliminarily validate how the development rights mechanism influences development organization and functional layout. However, while the spatial strategies proposed in the thesis are practically operable, they lack deeper integration with existing urban design theories. Further research could explore applicable theoretical frameworks in urban design to strengthen the theoretical grounding and methodological basis for policy-driven spatial strategies.

On case selection and applicability, the choice of Turin as the design context aimed to present a complete representation of the urban equalization policy’s operational logic and spatial outcomes within its native institutional setting. Although the study is problem-driven and inspired by Chinese institutional reform, the significant differences between the Italian and Chinese land systems mean that the local applicability of the proposed design scheme has not yet been empirically tested. Future research could build on this foundation by integrating China’s urban planning framework, public land ownership system, and ongoing urban regeneration practices to explore context-appropriate applications of the development rights mechanism.

In future work, research can be expanded by conducting comparative studies of equalization policy across different Italian regions to construct a more universally applicable institutional evaluation model, by integrating urban design theory to strengthen the transmission of policy logic into spatial strategies, and by adapting these approaches to China’s unique planning and land management context to offer actionable insights for addressing the country’s complex urban regeneration challenges.

References

[1] 何明俊. 城市规划、土地发展权与社会公平[J]. 城市规划, 2018, 42(08): 9-15.

[2] 田莉, 夏菁, 于江浩. 国土空间规划体系中的土地发展权: 理论溯源、国际经验与本土思考[J]. 经济纵横, 2022, (10): 35-42.

[3] 田莉, 夏菁. 区域—城乡发展失衡与规划公平：基于土地发展权的视角[J]. 规划师, 2022, 38(10): 12-20.

[4] 汪晖, 王兰兰, 陶然. 土地发展权转移与交易的中国地方试验——背景、模式、挑战与突破[J]. 城市规划, 2011, 35(07): 9-13, 19.

[5] 郭湘闽. 论土地发展权视角下旧城保护与复兴规划——以北京为例[J]. 城市规划, 2007, (12): 66-72.

[6] 陈磊, 姜海. 发达国家土地发展权配置: 典型模式与经验启示[J]. 农业经济问题, 2022, (04): 107-117.

[7] 何明俊. 作为公共政策的土地发展权——关于建立城乡统一的建设用地市场的思考[J]. 城市规划, 2022, 46(11): 14-20.

[8] Stephen, F. H. Property Rules and Liability Rules in the Regulation of Land Development: An Analysis of Development Control in Great Britain and Ontario[J]. International Review of Law and Economics, 1987, 7: 33-49.

[9] 马韶青. 土地发展权的国际实践及其启示[J]. 河北法学, 2013, 31(07): 77-84.

[10] 臧俊梅, 张文方, 李明月, 等. 土地发展权制度国际比较及对中国的借鉴[J]. 农村经济, 2010, (01): 125-129.

[11] Dettori, L. Perequazione urbanistica. Dallo zoning al mixté attraverso un vuoto normativo [D]. Università di Pisa, 2014.

[12] Lieto, P. D. La conformazione proprietaria nella pianificazione perequativa[D]. Università degli Studi di Salerno, 2017.

[13] Micelli, E. Perequazione urbanistica. Pubblico e privato per la trasformazione della città [M]. Venezia: Marsilio, 2004.

[14] Minichini, R. Perequazione urbanistica: genesi, evoluzione ed ultimi approdi in dottrina e giurisprudenza[D]. Università degli Studi di Salerno, 2020.

[15] Pontrandolfi, P., Azzato, A. Perequazione urbanistica e trasferimento dei diritti edificatori per l’attuazione di piani e progetti per la rigenerazione urbana[J]. Urbanistica Informazioni, 2013: 235-238.

[16] Micelli, E. Development Rights Markets to Manage Urban Plans in Italy[J]. Urban Studies, 2002, 39(1): 141-154.

[17] Maria, A. B., Bronzini, F., Imbesi, P. N. Italian Urban Plans: Diversified Approaches and Methods for Assessing Their Quality[J]. Planning Practice & Research, 2019, 34(3): 346-364.

[18] Serra, S. Urban planning and the market of development rights in Italy: learning from Milan[J]. City, Territory and Architecture, 2021, 8(1): 3.

[19] 胡兰玲. 土地发展权论[J]. 河北法学, 2002, (02): 143-146.

[20] 袁奇峰, 陈嘉悦, 赵杨, 等. 都市区乡村发展权的不均衡及对策研究——以南海区里水镇为例[J]. 现代城市研究, 2022, (03): 21-28.

[21] 汪越, 谭纵波. 英国近现代规划体系发展历程回顾及启示——基于土地开发权视角[J]. 国际城市规划, 2019, 34(02): 94-100, 135.

[22] 吕云涛. 英美法 3 国土地发展权及其移转制度比较研究[J]. 世界农业, 2016, (11): 98-102.

[23] 董海峰, 李萍, 费文婷, 等. 土地发展权制度对中国的启示: 以英国为参照[C]//2015 年政府法制研究. 上海市人民政府法制办公室城建法规处, 2015: 376, 378-406.

[24] 邹艳, 张雅茹, 谢明霞. 城乡融合发展背景下农民土地发展权公平探究[J]. 山西农经, 2021, (09): 30-32.

[25] 张鹏. 规划管制与土地发展权关系研究评述[J]. 中国土地科学, 2010, 24(10): 74-78, 81.

[26] 陈佳骊. 美国新泽西州土地发展权转移银行的运作模式及其启示[J]. 中国土地科学, 2011, 25(05): 85-90.

[27] 赵民, 王理. 中国土地发展权与规划控制的关系初探[J]. 城市规划, 2023, 47(11): 67-76.

[28] 王理. 土地发展权、国土空间治理与社会公平——以上海郊野单元规划为例[C]//中国城市规划学会. 人民城市，规划赋能——2023 中国城市规划年会论文集（11 城乡治理与政策研究）. 同济大学, 2023: 871-879.

[29] 王理, 赵民. “发展权转移”辨析及其在中国的适用性探讨[J]. 城市规划, 2024: 1-11.

[30] 顾汉龙, 冯淑怡, 张志林, 等. 中国城乡建设用地增减挂钩政策与美国土地发展权转移政策的比较研究[J]. 经济地理, 2015, 35(06): 143-148, 183.

[31] 彭敏学, 黄慧明. 论“增减挂钩”在国土空间规划中的扩展适用——以土地发展权转移的视角[J]. 城市规划, 2021, 45(04): 24-32.

[32] 梁小薇, 廖曼华, 袁奇峰. 土地发展权视角下全域土地综合整治工具探索——以佛山

市南海区“三券”为例[J]. 城市观察, 2024, (02): 19-28, 159-160.

[33] 张占录, 张雅婷, 姚艳, 等. 土地发展权配置与转移理论对中国宅基地改革的启示[J]. 学习与实践, 2019, (05): 33-41.

[34] 夏菁, 田莉, 王晨跃, 等. 土地发展权益均等化导向的湖北省“影子指标”预评估[J]. 城市规划学刊, 2024, (02): 41-48.

[35] 汪晖, 陶然. 论土地发展权转移与交易的“浙江模式”——制度起源、操作模式及其重要含义[J]. 管理世界, 2009, (08): 39-52.

[36] 朱从谋, 苑韶峰, 李胜男, 等. 基于发展权与功能损失的农村宅基地流转增值收益分配研究——以义乌市“集地券”为例[J]. 中国土地科学, 2017, 31(07): 37-44.

[37] Mastroniani, L. Pianificazione, diritti edificatori e perequazione urbanistica[D]. Università degli Studi di Firenze, 2011.

[38] Micelli, E. La perequazione urbanistica per l'attuazione innovativa di piani e progetti[J]. Aestimum, 2003.

[39] Fondazione Italiana del Notariato. Il contributo di costruzione tra disciplina edilizia e pianificazione urbanistica [EB/OL]. [2011-06-11]. https://elibrary.fondazionenotariato.it/articolo.asp?art=34/3402&mn=3.

[40] Camagni, R. L’uso improprio della perequazione urbanistica: il caso del PGT di Milano[J]. EyesReg, 2011, 1(1). ISSN: 2239-3110.

[41] Fondazione Italiana del Notariato. Disciplina regionale concorrente in materia di governo del territorio e principio perequativo nella pianificazione urbanistica comunale[EB/OL]. [2011-06-11]. https://elibrary.fondazionenotariato.it/articolo.asp?art=34/3401&mn=3.

[42] Regione Autonoma Friuli Venezia Giulia Consiglio regionale. Riforma dell'urbanistica e disciplina dell'attività edilizia e del paesaggio (Legge regionale 23 febbraio 2007, n. 5) [EB/OL]. [2007-08-27]. https://lexview-int.regione.fvg.it/FontiNormative/xml/xmllex.aspx?anno=2007&legge=5.

[43] Comune di Padova. Linee guida per l’applicazione della perequazione urbanistica nel Piano degli Interventi (PI)[R]. Padova: Settore Urbanistica, 2021.

[44] Cappabianca, T. Principio di legalità e pianificazione consensuale. I nuovi confini della perequazione urbanistica[D]. Università degli Studi di Napoli Federico II, 2015.

[45] Morano, P. Sostenibilità economica: criteri per favorire la fattibilità degli interventi e attuare la perequazione urbanistica[C]//Calace, F., Bozzo, L., Carella, R., et al. Criteri per la progettazione urbanistica. La sostenibilità alla prova. Firenze: Alinea, 2012: Chapter 5.

[46] Di Somma, A. Lo sviluppo del tessuto urbano del Comune di Roma dal dopoguerra a

oggi[C]//Atti della 15a Conferenza Nazionale ASITA. Reggio di Colorno: ASITA, 2011: 15-18.

[47] Comune di Milano. Documento di piano[EB/OL]. [2020-05-02]. https://www.pgt.comune.milano.it/documento-di-piano.

[48] Comune di Milano. Piano delle regole[EB/OL]. [2020-05-02]. https://www.pgt.comune.milano.it/piano-delle-regole.

[49] Comune di Milano. Piano dei servizi[EB/OL]. [2020-05-02]. https://www.pgt.comune.milano.it/piano-dei-servizi.

[50] Crupi F．Urban regeneration and green and blue infrastructure: The case of the "Acilia–Madonnetta" urban and metropolitan centrality in the Municipality of Rome[J]．Urban Sci, 2022, 6(3): 56.

[51] Ricci L, ed．Piano locale e. Nuove regole, nuovi strumenti, nuovi meccanismi attuativi: Nuove regole, nuovi strumenti, nuovi meccanismi attuativi[M]. FrancoAngeli, 2009.

[52] Crupi F．Roma senza tema. Abusivismo, rigenerazione, progetto[M]．Tricase: Youcanprint, 2017.

[53] Comune di Roma．Deliberazione di CC 18 febbraio 2008 n. 12, Approvazione del Nuovo PRG di Roma. NTA, art. 18 "Ambiti di compensazione"[EB/OL]．Roma: Comune di Roma, Dipartimento VI, 2008: 25–25. http://www.urbanistica.comune.roma.it/images/uo_urban/prg_vigente/prg_nta.pdf .

[54] Comune di Roma．Deliberazione di CC 18 febbraio 2008 n. 12, Approvazione del Nuovo PRG di Roma. NTA, Appendice 2, Schede delle Centralità metropolitane e urbane [EB/OL]．Roma: Comune di Roma, Dipartimento VI, 2008: 113–129. http://www.urbanistica.comune.roma.it/images/uo_urban/prg_vigente/prg_nta.pdf .

[55] Crupi F. Modelli perequativi e meccanismi attuativi. Perequazione e innovazione nel piano locale[M]//Piano locale e... Nuove regole, nuovi strumenti, nuovi meccanismi attuativi. FrancoAngeli, 2009: 265-370.

[56] United Nations．Agenda for Sustainable Development [EB/OL]． https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.

[57] European Commission．Europa 2020. In: A Strategy for Smart, Sustainable and Inclusive Growth, COM (2010) 2020 Final[EB/OL]．Brussels: European Commission, 2010. https://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:52010DC2020&from =IT.

[58] United Nations．Paris Agreement (UNFCCC)[EB/OL]．2015. https://unfccc.int/sites/default/files/english_paris_agreement.pdf .

[59] European Commission．Building a Green Infrastructure for Europe[EB/OL]．2013. https://ec.europa.eu/environment/nature/ecosystems/docs/green_infrastructure_broc.pdf .

[60] Boer F, Jorritsma J, Van Peijpe D, eds．De Urbanisten and the Wondrous Water Square [M]．Rotterdam: Nai Uitgevers Pub, 2013.

[61] Comune di Cittadella, Comune di Galliera Veneta, Comune di Fontaniva, 等. Relazione - Piano di Assetto del Territorio Intercomunale (P.A.T.I.) dell'Area "Alta Padovana"[R]. Padova: Unione dei Comuni del P.A.T.I., 2006.

[62] Comune di Nanto. Criteri perequativi[EB/OL]. [2019]. https://ww2.gazzettaamministrativa.it/opencms/export/sites/default/_gazzetta_amministrativa/amministrazione_trasparente/_veneto/_nanto/190_pia_gov_ter/2019/2015_Documenti_1553761596447/1553761600862_p000000034_001000_nanto_criteriperequativi.pdf.

[63] Comune di Arcugnano. Piano degli interventi: Perequazione urbanistica - linee guida preliminari[EB/OL]. [2025-04-03]. http://old.comune.arcugnano.vi.it

[64] Duany A, Plater-Zyberk E, Speck J．Suburban nation: The rise of sprawl and the decline of the American dream[M]．New York: North Point Press, 2000.

[65] Meerow S, Newell J P, Stults M．Defining urban resilience: A review[J]．Landscape and Urban Planning, 2016, 147: 38–49.

[66] Brand S．How buildings learn: What happens after they're built[M]．New York: Penguin Books, 1994.

[67] Durmisevic E．Circular economy in construction design strategies for reversible buildings [R/OL]．Netherlands: BAMB, 2019[2025-05-18]. https://www.bamb2020.eu/wp-content/uploads/2019/05/Reversible-Building-Design-Strateges.pdf.

[68] Lefebvre H．The production of space[M]．Oxford: Blackwell, 1991.

[69] Gehl J．Cities for people[M]．Washington, DC: Island Press, 2010.

[70] Jacobs J．The death and life of great American cities[M]．New York: Random House, 1961.

[71] 刘贤腾．空间可达性研究综述[J]．城市交通, 2007, 5(6): 36–43.

[72] Comune di Torino. Relazione Illustrativa: Area ex-Manifattura Tabacchi e ex-Fimit [EB/OL]. Torino: Città di Torino, 2024 [2025-04-03].

[73] Comune di Torino. Norme Urbanistiche Edilizie di Attuazione: Estratto (Art. 19 – Aree per

servizi: generalità)[EB/OL]. Torino: Comune di Torino, 2022 [2025-04-03].

[74] 傅倩, 牧骑. 工业遗产助推城市转型发展——都灵的经验及启示[C]//中国城市规划学会, 杭州市人民政府. 共享与品质——2018 中国城市规划年会论文集（02 城市更新）. 武汉市规划编制研究和展示中心, 2018: 840-849.

[75] Regione Piemonte. GeoPortale Piemonte: Sistema Informativo Territoriale Regionale[EB/OL]. [2025-04-03]. https://www.geoportale.piemonte.it/.

[76] Comune di Torino. Piano Infrastruttura Verde: Il verde a Torino[EB/OL]. [2025-04-03]. http://www.comune.torino.it/verdepubblico/il-verde-a-torino/piano-infrastruttura-verde/.

[77] Repubblica Italiana. Codice dei beni culturali e del paesaggio. Decreto Legislativo 22 gennaio 2004, n. 42[EB/OL]. [2025-04-03]. https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:decreto.legislativo:2004-01-22;42.

[78] Abbate, M. La rigenerazione urbana nell'area ex industriale di Torino: ex Manifattura Tabacchi ed ex area FIMIT[EB/OL]. Torino: Politecnico di Torino, 2014 [2025-04-03]. https://webthesis.biblio.polito.it/3174/.

[79] City Population. Regio Parco–Barca–Bertolla (Quarter) in Turin (Torino)[EB/OL]. [2025-04-03].

[80] Comune di Torino. Piano Regolatore Generale: Governo del Territorio[EB/OL]. [2025-04-03]. http://geoportale.comune.torino.it/web/governo-del-territorio/piano-regolatore-generale.

[81] Agenzia delle Entrate．Portale OMI - Quotazioni immobiliari [EB/OL]．https://www1.agenziaentrate.gov.it/servizi/geopoi_omi/index.php .

[82] 李学文, 张蔚文, 陈帅. 耕地非农化严格管控下的地方合作、共谋与制度创新——源自浙江省土地发展权折抵指标交易政策的证据[J]. 经济学(季刊), 2020, 19(03): 797-824.

[83] 王霞萍, 赵谦. 土地发展权三十年: 功能进路与实践面向[J]. 中国土地科学, 2019, 33(06): 37-43, 52.

[84] 刘威, 刘申敏. 城市建设中的土地增值回收融资手段[J]. 国际城市规划, 2023, 38(01): 35-43.

[85] 岳文泽, 钟鹏宇, 王田雨, 等. 国土空间规划视域下土地发展权配置的理论思考[J]. 中国土地科学, 2021, 35(04): 1-8.

Acknowledgments

I would like to express my sincere gratitude to Professors Mauro Berta and Angelo Sampieri from Politecnico di Torino for their guidance throughout this thesis journey. Thank you to all the teachers whose passionate teaching helped me grow through new class formats and unfamiliar content. Studying in Italy was a precious and beautiful memory—the sunshine in Turin, the air, and the view of the Alps at the end of the road always brought peace to my heart.

I'm deeply grateful to my advisors at South China University of Technology: Professors Wang Shifu, Chen Changyong, Liu Zheng, and Wei Zongcai. Your academic wisdom has always been a great inspiration, and every piece of guidance has been incredibly valuable to me. I sincerely wish you continued success in your academic endeavors. A special thanks to Professor Liu Zheng—this research was a real challenge for me, especially with the unfamiliarity of Italian studies and the overwhelming foreign materials I couldn't understand. At every stage, you offered timely and dedicated support, helping me grasp core issues and guiding me through. Beyond academics, you often checked in on my well-being, and though I may not always seem strong or mature, you have always shown understanding and genuine care. Your dedication to teaching and your passion for life are things I truly admire and aspire to. I've learned not just academically, but also in how to think, how to approach problems, and how to do research. I'm truly lucky to have been guided by such teachers.

To the anonymous reviewers—thank you for your thoughtful and constructive feedback. You helped me step out of my narrow focus and see the bigger picture in my writing. Your suggestions taught me how to prioritize, sharpen the main message, and structure my logic. Even though we've never met, your guidance helped me grow quickly, and I truly appreciate your support for a young researcher.

Thank you to Ms. Li Chun from the Academic Affairs Office. Even though you were newly assigned to student affairs, you've handled everything with great care and commitment. You've always been there for us, working late to provide timely support. Your encouragement during my anxious moments gave me comfort. I wish you good health and all the best in your work.

To my parents—becoming your daughter, the one thing I didn't choose in life, has been my greatest fortune. Thank you for always supporting every decision I've made. Even if you don't fully understand what I do, you always listen carefully and respond thoughtfully before giving your unconditional support. I wouldn't be here without you, and I wouldn't dare to dream of the future either. I hope to become independent soon, and one day be your source of strength. Thanks also to my eldest sister and her family—she's not just a family member but a best friend. Her wisdom and deep understanding of me always give me the best advice. I might always act like the stubborn, headstrong little sister around her, but I hope one day I can become as capable and admirable as she is. Thanks to her cat, Zhaozhao—such a lazy little thing, yet somehow makes life feel warmer and more meaningful. Without my family, I wouldn't be who I am today. I wish all of you health, happiness, and peace.

To my dearest friends—Xiong Chen, Fu Yizhou, Huang Zishan, Lin Yifeng, Guo Wenjing, Bian Xiao, Zhao Jia, and Henry—I'm incredibly lucky to have so many kindred spirits by my side. We've faced hardships together, shared joy and sorrow, and the eight years I’ ve spent with some of you, from undergrad to graduate school, are truly precious. You each have your own unique personalities and perspectives, and I've learned so much from all of you. These were the most formative years of my life, and I'm thankful we grew through them together. Thank you for pulling me out of my own little world and into reality. With you around, I've never felt alone.

Thank you to my fellow graduate classmates He Peijia, Zhang Shuning, Guan Zifei, He Yining, Zhao Yinglun, Nie Ziyi, and Liu Ziyi for teaming up on assignments and supporting each other through the journey. Thanks also to my thesis group—Chen Yang, Zhang Yang, Huang Luohuai, and Zhang Jiwei—for your collaboration and companionship. And a big thank you to everyone in the lively and friendly class. The days spent studying in China, living in Turin, and traveling across Europe will always be precious memories to me. Wishing you all a bright and beautiful future ahead.

To Leof—your presence has given me the courage to face everything and the determination to keep moving forward. I never really understood what it meant to have a significant other; I always thought life was just about finding my own answers. But with you, I think I get it now. No matter how long the road ahead, I know we'll get through it together.

How do we even begin to carry the weight of others' help in our lives? Maybe the people who help us are, in some way, a part of ourselves. Every outward observation eventually leads back to inward reflection—and being grateful for others is, in a way, a form of self-affirmation. I hope that at every important stage of life, I can look back and say: though I didn't know how hard it would be until I lived it, the mountains are behind me now, and I've made it through the storm.At 26, I've finally come to understand what my life truly means. May I carry forward with unwavering determination and the courage to burn the ships behind me.

The past is what shaped me—no need to dwell on it. From now on, I'll reap what I sow.