

## SUSTAINABLE URBAN REGENERATION THROUGH “BOUNDARYLESS” UNDERGROUND DEVELOPMENT: INTEGRATION OF UNDERGROUND AND ABOVEGROUND, PUBLIC-PRIVATE PARTNERSHIP, AND CONTINUITY FROM PLANNING TO OPERATION - A CASE STUDY OF SHIBUYA, TOKYO

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**Abstract:** Tokyo has developed a rail-centered transport system above and below ground to support its vast population. Rapid development around railway stations in the late 20th century created complex urban structures and aging infrastructure. Today, Tokyo seeks regeneration strategies, with underground development key to improving livability and connectivity. As a solution to these problems, this study introduces strategies taken around Shibuya Station—one of Japan’s largest terminal stations—to discuss the benefits and challenges of “boundaryless” underground development led by NIKKEN SEKKEI. The strategies are integration of underground and aboveground, public-private partnerships, and continuity from planning to operation. The featured projects are as follows.

1. Planning and operation of vertical public plazas called “the Urban Core” by private entities located in private land. Following the concept of regional design developed under public-private partnership, these facilities ensure smooth pedestrian connections between underground and aboveground and designed to be the city’s new iconic landmark.
2. Planning and operation of underground public plaza by private entities located in public land. Revenue from contents such as cafes and advertisements within the plaza is reinvested into its maintenance and management, achieving both sustainable operation and area revitalization unique to underground spaces.
3. Planning and operation of underground parking network that transcends multiple property boundaries of both public and private lands. This allows us to establish an integrated parking service in the area and ensure smooth aboveground traffic.

“Boundaryless” underground development strategies play a key role in connecting people and driving urban regeneration in complex cities like Shibuya. However, since underground development is time and money consuming, creating a system such as BID will be effective to manage financial burden not only subjected to developers but shared among the entire area that benefits from it.

**Keywords:** Transit-Oriented Development (TOD), Boundaryless, Pedestrian Network, Parking Network, Shibuya Station Redevelopment

## 1. INTRODUCTION

### 1.1. Background

In Tokyo, a transportation system centered on railways has been systematically developed as a mass transit measure in both aboveground and underground to support the world's largest metropolitan population and complex urban structure. In tandem, areas especially around railway stations have quickly developed in late 20th century with numerous high-rise complexes, underground malls and underground networks. However, those rapid urban developments have been faced aging infrastructure and compounded complexities resulting from intermittent

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planning. Therefore, the city of Tokyo is currently under the urgent consideration of efficient strategies to regenerate its urban environments, and underground development playing a crucial role in unraveling the complexities of urban structures and in contributing to the creation of more convenient and livable cities.

## 1.2. Research Objectives

While major cities worldwide also have been actively developing underground infrastructures centered on subway systems, utilizing underground spaces are facing challenges due to their unique spatial characteristics. As redevelopment or demolition of underground spaces after completion is hardly achievable, it is imperative to maximize its connectivity, sustainability and cost-effectiveness with a broad perspective that encompasses both spatial and temporal dimensions. This requires a comprehensive approach regardless of boundaries between underground and aboveground, public land and private land, and moreover, planning phase and operating phase.

In this paper, we define this approach as “Boundaryless” underground development that will fully harness the potential of underground spaces and enabling sustained use amid evolving urban environments. “Boundaryless” underground development is an integration of following 3 strategies: Integration of underground and aboveground, Public-private partnership, and Continuity from planning to operation.

In Japan, with the enactment of the act on special measures concerning urban renaissance in 2002, the Urban Renaissance Urgent Redevelopment Area were established to further accelerate urban regeneration. This initiative has facilitated integrated development of public spaces and architecture, including underground areas. This paper examines Shibuya, one of these priority areas, where large-scale development and regeneration, described as a “once-in-a-century” urban transformation, are taking place [1]. NIKKEN SEKKEI, leading urban development consulting and architectural design for decades in this area, plays a pivotal role in this urban transformation with “Boundaryless” underground development approach. Therefore, this paper examines the benefits and challenges of the 'boundaryless' underground development adopted in Shibuya, with the aim of envisioning a sustainable approach for underground development.

## 1.3. Research Structure

This paper is structured as follows; Chapter 2 organizes the characteristics of urban development and city regeneration in Tokyo, as well as the historical background and features of underground development that evolved in tandem with these efforts. Chapter 3 provides an overview of Shibuya's unique traits as the target area, followed



**Figure 1.** Projected Image of Shibuya Station Surrounding Area (Planned in 2013)

by an analysis of three representative underground developments in Shibuya from three cross-field perspectives: Integration of underground and aboveground, Public-private partnership, and Continuity from planning to operation, to discuss the benefits and challenges of “boundaryless” underground development in Chapter 4. Finally, Chapter 5 concludes the paper with a summary and outlook.

## **2. OVERVIEW OF URBAN DEVELOPMENT AND REGENERATION IN TOKYO**

### **2.1. History and Features of Urban Development and Urban Regeneration**

#### **2.1.1. From Government to Private Sector: The Rise of “Privatization-Oriented Urban Development”**

The key characteristic of urban development in Tokyo is the “privatization-oriented urban development” introduced in the 1980s. This policy aims to delegate traditionally public sector tasks to private entities to leverage private sector capabilities to provide high-quality and efficient services. It comprises two main components: the distribution of publicly owned resources to the private sector, such as selling off public land and privatizing public projects, and the relaxation of legal restrictions, including easing floor-area ratio regulations. This system facilitated integrated urban development by enabling private enterprises to utilize previously public land, such as railway facilities and port areas, and to carry out large-scale developments in exchange for public contributions like infrastructure improvements and residential creation. Supported by ample private capital, it promoted richer architectural designs, infrastructure, and public spaces in a cohesive framework for urban progress.

#### **2.1.2. Transition to Private-Led Urban Regeneration: the Act on Special Measures Concerning Urban Renaissance and Special Urban Regeneration Districts**

Since the introduction of privatization-oriented urban development in the 1980s, development of former public land has progressed nationwide. Meanwhile, urban areas in city centers, which had undergone development since the rapid economic growth in the 1960s, faced challenges from increasingly complex urban structures.

Furthermore, entering the 2000s, the rapid growth of cities in Asia led to a continued decline in the relative international competitiveness of Japanese cities. In response to this, the Act on Special Measures Concerning Urban Renaissance was enacted in 2002 to leverage private capital once again and “regenerate” complex city centers into internationally competitive urban hubs. Under this legislation, the government designated Urban Renaissance Urgent Redevelopment Area in major cities nationwide, aiming to create international urban hubs through public-private collaboration. These areas became subject to special measures such as deregulation, financial support, and tax incentives for private projects. Within these designated areas, private enterprises propose urban plans, and government establishes a designated areas called Special Urban Regeneration Districts based on these proposals. Using these designated areas and mutual agreements, urban regeneration projects are promoted through public-private cooperation.

Shibuya Station area, targeted in this paper, is one of the Urban Renaissance Urgent Redevelopment Areas where unprecedented large-scale urban development is underway.

#### **2.1.3. Promotion of Transit-Oriented Development (TOD) through Private Railway Businesses**

One of the driving forces behind the acceleration of privatization-oriented urban development is the role played by private railway companies. Most railways in Japan are operated by private enterprises, and in the Tokyo metropolitan area, multiple private companies manage railway networks that efficiently connect central business districts (CBDs) with suburban residential areas. Moreover, to maximize revenue, these companies have ventured into land development and real estate businesses around railway stations, promoting Transit-Oriented Development (TOD) that integrates stations with surrounding neighborhoods to enhance user convenience. The competition among these companies has expanded beyond building construction to encompass large-scale projects linked with public spaces, including roads, plazas, and underground spaces. Shibuya, the subject of this paper, represents one of Tokyo's most notable and largest TOD projects.

### **2.2. Underground Development Supporting Tokyo's Urban Transformation**

#### **2.2.1. Underground Development in Tokyo Beginning with Subway Operations**

The history of underground development and utilization in Tokyo began in 1927 with the opening of the Asakusa–Ueno section of the Tokyo Underground Railway Company (currently Tokyo Metro), marking the first subway project in East Asia. As modernization progressed and the demand for transportation among citizens



rapidly increased, urban planning in Tokyo evolved around railway transport, capable of efficiently handling mass transit. By 1939, the Ginza Line extended to its present-day route between Asakusa and Shibuya, becoming a vital means of transportation that traverses Tokyo from east to west and connects major areas.

#### 2.2.2. Crossing Boundaries between Public and Private Land: Formation of an Integrated Underground Network Between Subways and Surrounding Buildings

The development of subway networks has significantly enhanced the convenience for citizens while incurring substantial construction costs. For this reason, the Ginza Line incorporated contributions from major department stores near stations alongside Tokyo Underground Railway Company, in exchange for underground connections between subway stations and their facilities. This initiative broke the boundaries between public and private lands, creating an integrated pedestrian network that connects subways and department stores underground.

#### 2.2.3. Integration of Underground and Aboveground: The Rise of Underground Spaces through Parking Facilities and Underground Malls

Following the rapid economic growth of the 1960s, the development of underground railways in Tokyo has progressed, leading to the formation of the current metropolitan subway network. Similarly, the expansion of underground parking facilities and commercial spaces also gained momentum. In response to rapid urban development projects and the increasing demand for automobile transportation, the government promoted the establishment of underground parking facilities. These facilities were categorized into two types: those managed by public authorities and those developed by private entities through licensed projects. Particularly in the latter case, private developers utilized underground malls, to generate the necessary revenue for constructing and maintaining parking facilities. By relocating parking lots and commercial facilities underground, traffic congestion on the surface was alleviated, while encouraging the public to make greater use of underground spaces.

#### 2.2.4. Continuity from Planning to Operation: Shifting from the “Era of Construction” to the “Era of Continued Use”

With more than half a century having passed since the period of rapid economic growth, Tokyo has undergone multiple phases of redevelopment, including secondary redevelopment efforts aimed at revitalizing previously

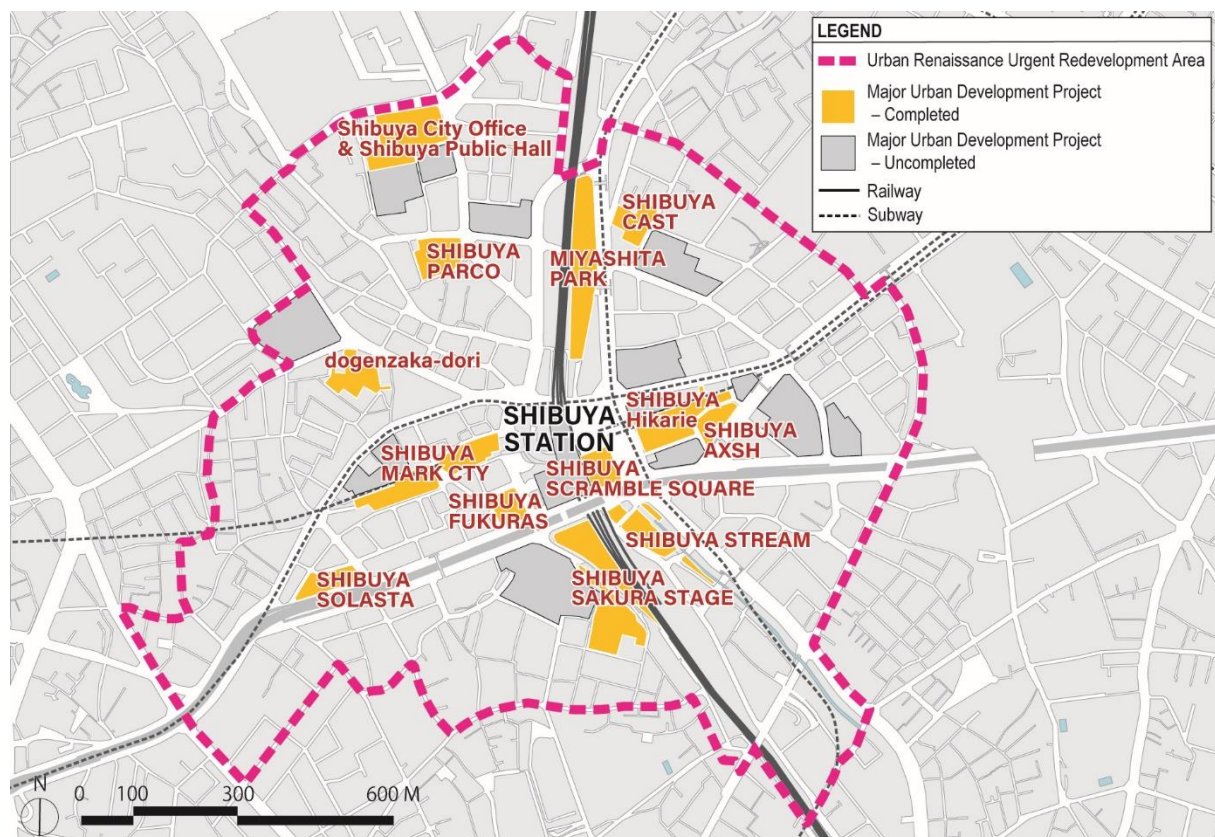


Figure 2. Major Urban Development Projects in Shibuya

redeveloped areas. In major districts, these second-round redevelopment projects are nearing completion. On the other hand, aiming to reduce the costs associated with new urban development and to lower environmental impact, sustainable development projects have recently been in demand. Accordingly, future urban development, including underground spaces requires a paradigm shift from “scrap and build” toward prolonged use and management. This approach encompasses the entire lifecycle of development, fostering a continuation from planning to operation with the aim of sustaining usability over the long term.

### 3. METHODOLOGY + RESULTS

#### 3.1. Target Site Overview

##### 3.1.1. Positioning of Shibuya in Tokyo

Shibuya has long developed as Tokyo's “hub of the content industry”. During the 1970s, Shibuya emerged as a cultural beacon for youth, broadcasting diverse trends in fashion, music, art, and dance across the nation. Subsequently, spurred by the IT bubble of the 1990s, Shibuya attracted headquarters of companies involved in cutting-edge IT, video, music, and gaming industries. Today, it stands as a significant content hub, hosting numerous global tech corporations' offices and branches.

At the same time, one of the longstanding challenges for Shibuya's further development lies in its unique “bowl-shaped” valley terrain. Shibuya forms an enormous valley centered on Shibuya Station, spanning a diameter of approximately 1 kilometer with a height difference of around 20 meters, surrounded by various slopes connecting the valley bottom to its outer edges. In comparison to other major cities with grid-like urban layouts—such as Marunouchi which is a core CBD in Tokyo, or Manhattan in New York—Shibuya's distinctive valley terrain and intricate road patterns are both a hallmark of its regional character and a significant barrier to improving accessibility in the area.

##### 3.1.2. Urban Development Trends in Shibuya

Figure 2 illustrates the trends in urban development within Shibuya. Designated as the Urban Renaissance Urgent Redevelopment Area in 2005, Shibuya represents one of Japan's major Transit-Oriented Development (TOD) projects, with significant involvement from NIKKEN SEKKEI. Addressing the challenges posed by Shibuya's valley terrain, the development has adopted a comprehensive approach encompassing “point” (stations and mixed-use facilities), “line” (underground passages and elevated decks), and “area” (multi-block development spanning 30 years, connecting points and lines). Dubbed a “once-in-a-century” large-scale project, the initiative not only revitalizes the central district but also stimulates the development and investment momentum in surrounding areas connected via ground and underground routes. The surroundings of Shibuya Station, which are major mixed-use facilities and the infrastructure connecting them, including underground passages and elevated decks, have already been operated for several years. The remaining projects include Shibuya Station updating repairs and plaza developments, as well as the completion of SHIBUYA SCRAMBLE west and central wing, scheduled for completion by 2034.

#### 3.2. Methodology

The study focused on representative examples of “boundaryless” underground development in Shibuya, including:

- (1) **The Urban Core:** A multi-level public plaza planned and operated by private entities on private lands.
- (2) **Shibuya Station East Entrance Underground Plaza:** A public space operated by private entities on public lands.
- (3) **The Parking Network:** A network of parking facilities traversing both public and private lands in both underground and aboveground and operated by private entities.

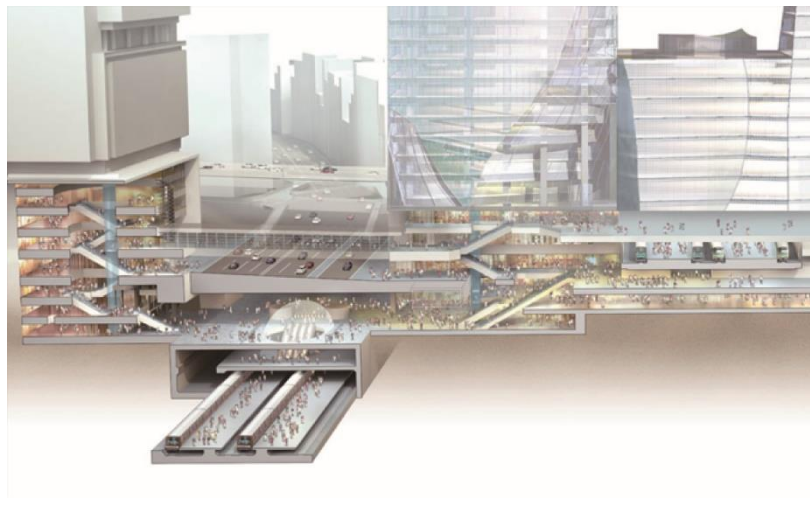
These cases were analyzed through three perspectives:

- A) **Integration of Underground and Aboveground:** Examining the integration of underground and aboveground spaces.
- B) **Public-Private Partnership:** Investigating the collaboration and utilization of both public and private lands.
- C) **Continuity from Planning to Operation:** Evaluating seamless management and future utilization of spaces.

Based on this analysis, Chapter 4 discusses the benefits and challenges of “boundaryless” underground development for sustainable urban development and regeneration.



**Figure 3.** The Urban Core of SHIBUYA Hikarie



**Figure 4.** Projected Image of the East Exit Urban Cores

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### 3.3. Results

#### 3.3.1. The Urban Core

##### A) Integration of Underground and Aboveground

The Urban Core aims to overcome the valley terrain of Shibuya, highlight the presence of underground spaces to visitors, and establish distinct identities for the east, west, south, and north areas of the city. As Figure 3 shows the Urban Core of SHIBUYA Hikarie, this interconnected vertical circulation space between the surface and underground is designed to enhance accessibility while simultaneously serving as a visual icon within the urban landscape.

##### B) Public-Private Partnership

Space creation and utilization are centered around private land owned by developers but also include integrated use of public land such as roads and rivers, planned without dividing zones. As illustrated in Figure 4, which is a projected image of the East Entrance Urban Core district, This kind of such cross-sectoral space creation and utilization is refined and decided through “Design Conferences”, a platform composed of municipalities, residents, and academics, including developers, working collaboratively.

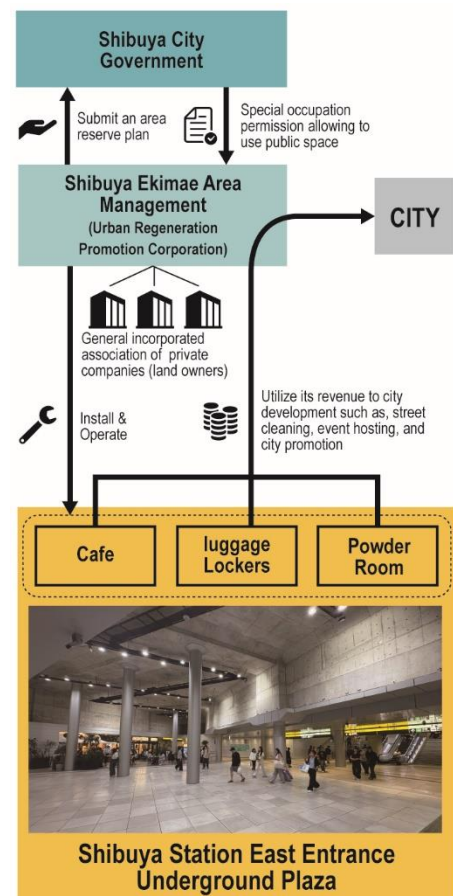
##### C) Continuity from Planning to Operation

Design, development, and operation are consistently carried out under the leadership of the development entities. Future utilization is anticipated, enabling efficient investment by determining plans, designs, and specifications for development. Furthermore, the “public nature” of the space is ensured by designating it as a Privately Owned Public Space (POPS) within urban planning.

#### 3.3.2. Shibuya Station East Entrance Underground Plaza

##### A) Integration of Underground and Aboveground

Through the construction of new subway stations, redevelopment of ground-level station plazas, redirection of existing river courses, and the installation of underground water storage tanks, new niche spaces have been created underground. Vehicle and pedestrian flow functions are assigned to the ground-level plazas, while the underground plazas are designed with a focus on pedestrian retention and all-weather activity hubs.



**Figure 5.** Development and Management Scheme of Shibuya Station East Entrance Plaza



B) Public-Private Partnership

The planning and development are carried out as public facilities (underground plaza designated as “public road”) under the jurisdiction of the municipality. At the same time, as the space directly connects to private railway facilities and private development buildings, close coordination with each private entity has been undertaken since the planning stage. Furthermore, the management and operation are planned to be handled by the local community development organization, which is called Area Management Organization).

C) Continuity from Planning to Operation

Figure 5 illustrates the development and management scheme of the plaza. From planning to operation, the process is consistently carried out under the leadership of municipalities. Regarding specific management and operational responsibilities, the municipality conducts public recruitment and selects Area Management Organizations. In the plaza facility plan, future utilization and operational projects are anticipated, including various revenue-generating facilities such as dining establishments, coin lockers, powder rooms, event spaces, and advertisement facilities. The income generated is reinvested into community-building activities for regional benefit.

### 3.3.3. The Parking Network

A) Integration of Underground and Aboveground

To ensure smooth vehicle and pedestrian traffic on the surface and achieve a well-formed landscape, parking spaces across the entire area are consolidated underground. The parking plan aims to facilitate mutual utilization, centralize and appropriately allocate entrances and exits across the area, and network both public and private Public to Private.

B) Public-Private Partnership

As illustrated in Figure 6, to ensure integrated parking functionality across public and private spaces, specific sections of parking spaces and entrances/exits are developed within the boundaries of private development sites, while parts of the networked vehicle pathways and entrances/exits are established within public roads. Furthermore, comprehensive management of parking operations extends to utilizing existing parking facilities in

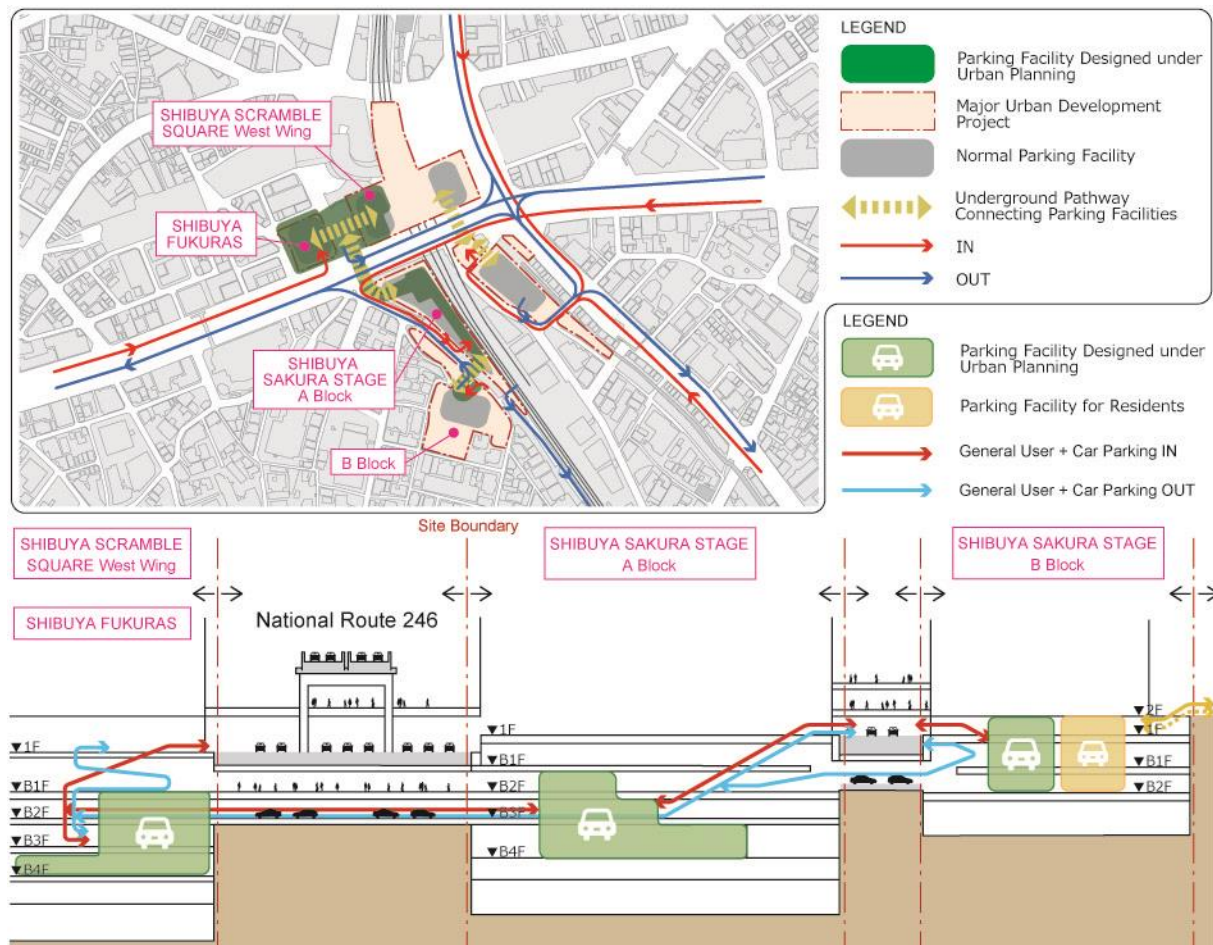


Figure 6. The Parking Network Developed in Shibuya

surrounding areas. These operations are controlled by municipal authorities through guidelines such as the “Regional Parking Rules” and the “Parking Countermeasure Council”.

#### C) Continuity from Planning to Operation

The planning stage envisioned an integrated management approach through the underground network system, with operational methodologies specifically coordinated by the local community development organization (area management organization). Currently, unified management and operational systems for each networked parking facility have been established, achieving integrated operations across the network.

## 4. DISCUSSION

### 4.1. Benefits of “Boundaryless” Underground Development

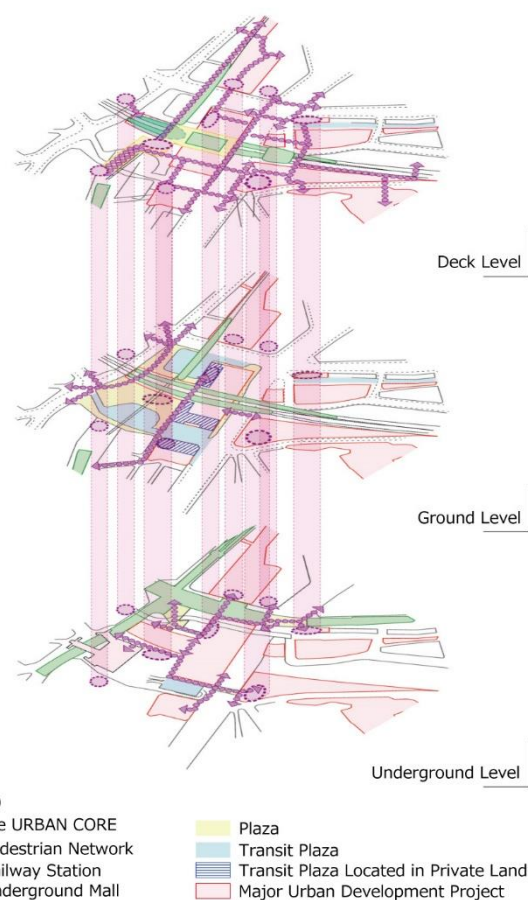
Shibuya's series of underground developments aims to revitalize the city by connecting stations and hub complex facilities through underground pathways. As illustrated in Figure 4, the expansive underground space created by linking the East Exit underground plaza, the ticket gates area of the Shibuya Subway Station, and the adjacent hub complex facility's urban core demonstrates this concept. This space accommodates both transit passengers, who move continuously throughout the day, and stationary visitors who remain within the station area.

Over the past 20 years, Shibuya has expanded such point-and-line-structured spaces through successive developments. As illustrated in Figure 7, integrated underground pedestrian network connecting the station to surrounding buildings supported by the Urban Cores linking underground and aboveground areas, Shibuya provides a comfortable environment for pedestrians unaffected by automobile traffic or weather conditions.

### 4.2. Challenges of “Boundaryless” Underground Development

While the benefits of “boundaryless” underground development have been highlighted, several challenges have been discovered. The first issue is the extension of construction timelines due to the scale of such large-scale projects. Specifically, the Shibuya Station district project, which serves as the core of the Shibuya Station central area has seen its completion delayed significantly—from the initial plan of 2027 to a projected completion in 2034 [2]. The complex vertical and horizontal interferences between infrastructure and buildings necessitate detailed and extensive construction planning, with the outlook for the project only taking shape this year. During the extended construction period, efforts are required to ensure safe and comfortable usage, such as enhancing the temporary transit spaces and disseminating information on future development visions and current construction progress.

The second issue is the heavy reliance on private developers and landowners in large-scale urban development projects, such as those in Shibuya. Within the existing urban development system in Japan, undertaking the development of public spaces, including underground ones, through private projects requires planning high-density buildings capable of generating sufficient revenue to cover construction costs. However, these large-scale projects demand substantial resources -people, money, and time- and are further burdened by challenges such as severe labor shortages in Japan's construction industry, rising material costs, increasing wages, and the costly complexity of infrastructure-linked development projects that extend construction timelines. These adverse conditions have led to numerous cases of redevelopment plans being canceled due to unprofitability. Given the significant public



**Figure 7.** The Pedestrian Network Supported by the Urban Cores in Shibuya



contributions included in private urban development, it might be essential to gather all stakeholders benefiting from the development to advance urban development initiatives collectively at a community-wide level.

## 5. CONCLUSIONS

“Boundaryless” underground development serves as an essential element in efficiently connecting people and advancing urban development and regeneration in cities with complex structures like Shibuya. This approach expands the possibilities of underground utilization by demonstrating how effectively integrating underground spaces can promote urban development and regeneration in other global cities.

However, to ensure sustainable urban development and regeneration, it is necessary to consider a system where the financial burden of utilizing underground spaces is shared not only by private developers responsible for building projects directly above the underground spaces but across the entire area benefiting from these underground developments. A framework such as BID (Business Improvement District), which involves the broader area, could contribute toward achieving a more enduring development model.

NIKKEN SEKKEI will continue to promote the realization of “Boundaryless” underground development to achieve sustainable urban regeneration.

## 6. ACKNOWLEDGEMENT

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