

ADAPTIVE REUSE OF PALAZZO DEL LAVORO



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Program in
Architecture for the
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ABSTRACT

Embarking on the adaptive reuse of Palazzo del Lavoro, a distinguished modern movement masterpiece by Pier Luigi Nervi and Gino Covre, this exploration addresses the significant challenge presented by its extended state of abandonment. Following the acquisition by Cassa Depositi e Prestiti, the iconic building stands at the threshold of transformative redevelopment. Envisioning Palazzo del Lavoro as a dynamic startup and innovation hub, the proposal seeks seamless integration of diverse functions, including a shopping center, science museum, university, event space, and co-working area.

Navigating the intricate economic landscape played a pivotal role in shaping the core aspects of this thesis. A comprehensive analysis of potential stakeholders and investors served as the guiding compass for the pursuit of an economically viable transformation. From this scrutiny, a bespoke design program emerged, finely tuned to the genuine interests of stakeholders, ensuring a harmonious blend of functionality and financial feasibility.

Respecting Palazzo del Lavoro as a significant modern heritage site became a cornerstone of the approach. Recognizing its enduring value, a thorough assessment was conducted in collaboration with DoCoMoMo—an organization dedicated to the Documentation and Conservation of buildings, sites, and neighborhoods of the Modern Movement. This collaborative effort marked a crucial step in preserving the intrinsic values of Palazzo del Lavoro throughout the adaptive reuse project.

The proposed design stands as a synthesis of meticulous stakeholder analysis, profound respect for the building's heritage values, an unwavering commitment to environmental sustainability, and a deliberate focus on enhancing social sustainability. In the quest to breathe new life into this architectural gem, the goal is not merely to honor its historical significance but also to craft a space that resonates with contemporary needs. By aligning with the aspirations of stakeholders and prioritizing social connectivity, the aim is to lay the foundation for a resilient and vibrant future for Palazzo del Lavoro. This vision encapsulates the essence of a transformative endeavor, where a shopping center, co-working space, universities, innovation hub, and science museum all harmoniously unfold "Under the same roof".

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United under the roof of Palazzo del Lavoro

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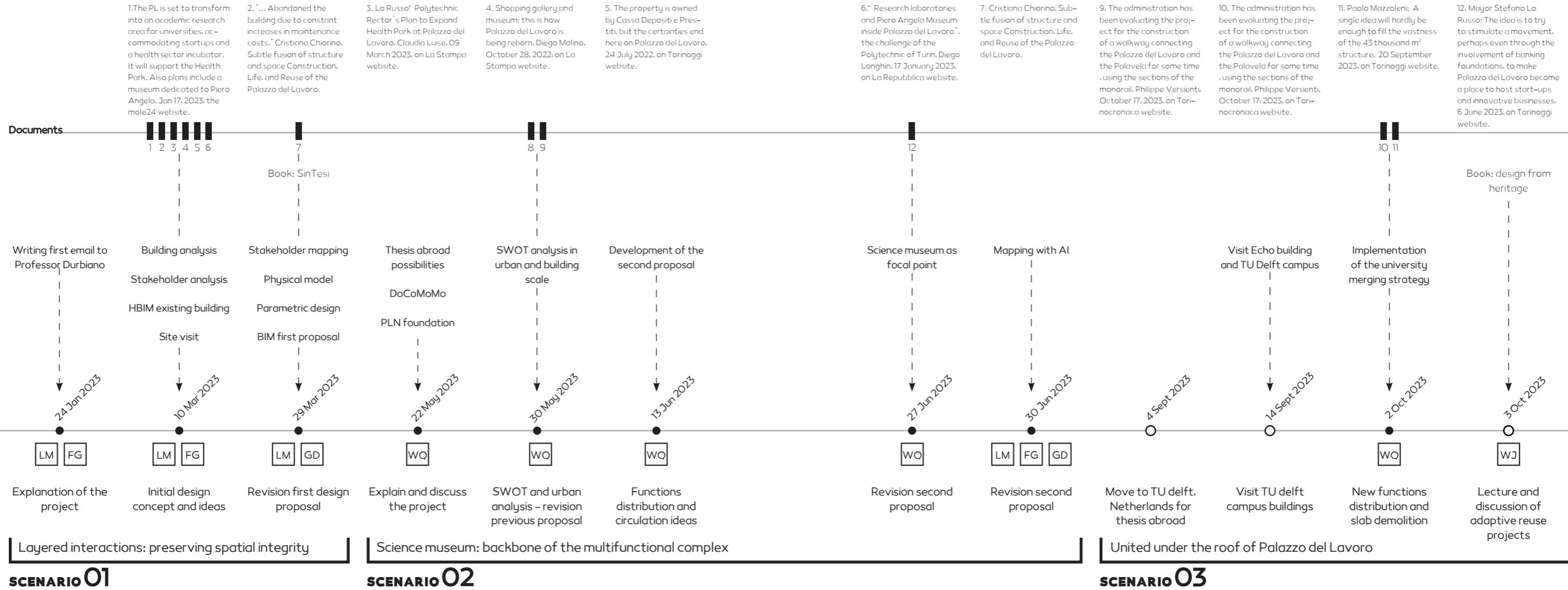
INTRODUCTION

The adaptive reuse of the Palazzo del Lavoro presents a complex and multifaceted challenge, necessitating a thorough analysis of both the building itself and the real stakeholders involved. This thesis meticulously charts the evolution of the project, unfolding a detailed timeline that highlights key scenarios and significant events at each stage. This chronological approach not only narrates the project's development but also underscores the dynamic interplay of factors influencing its progression.

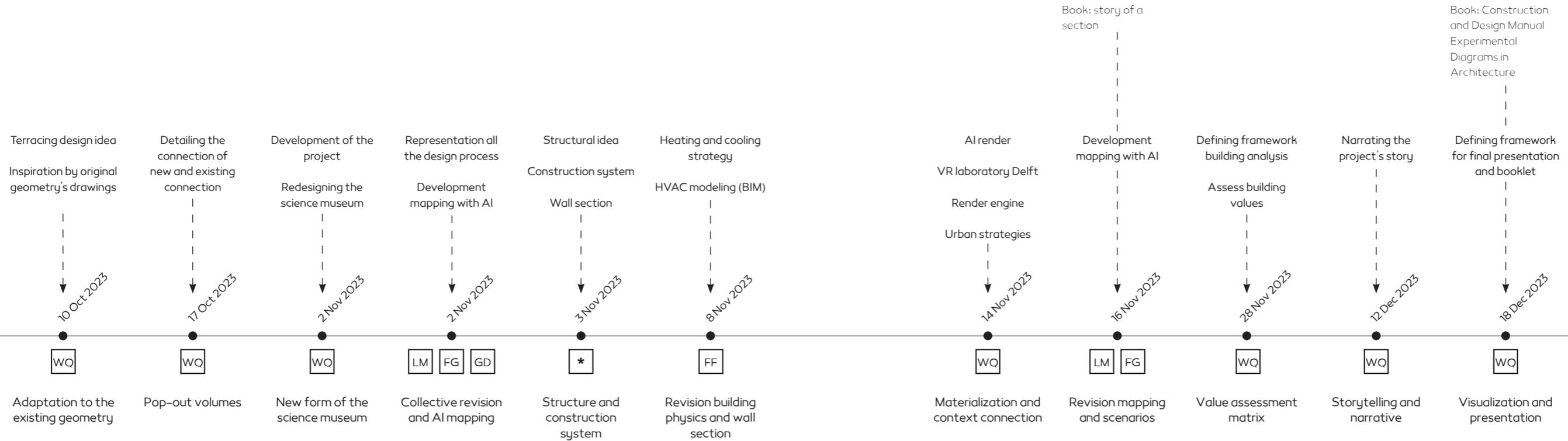
Each chapter of the thesis commences with a specific timeline segment, capturing the essence of that period. These segments document the meetings held, pivotal external documents that emerged, and significant activities undertaken, offering a clear and structured overview of the project's advancement. This methodical approach ensures a comprehensive and transparent record of the project's journey, providing valuable insights into the decision-making process and the various influences at play.

Within each chapter, at the onset of every key time step, there is a synchronic information mapping. This mapping is instrumental in visualizing the evolving landscape of the project, tracking the addition or elimination of actors, documents, and design actions. Notably, in scenario no.2, the pages with dark backgrounds signify the phase of integrating artificial intelligence into the process of information mapping, marking a distinct approach in the project's methodology.

In our thesis, we have intentionally incorporated sections on the blue pages that detail our project's journey, articulated in our own words and organized according to specific time periods. These sections aim to clearly outline the challenges we faced at each stage and the steps we took to overcome them. By doing so, we offer a detailed look into the progression of our work, highlighting the hurdles we encountered and the solutions we implemented. This method provides a comprehensive and transparent overview of our project's evolution, enabling readers to gain a deeper understanding of the thought processes and decisions that shaped our work. Essentially, this narrative approach opens up our project to readers, inviting them to view it from our perspective and understand the complexities and considerations that informed its development.



- Meetings with
- GD Giovanni Durbiano
- FG Federica Joe Gardella
- WJ Wessel de Jong
- * Structural Engineer
- WQ Wido Quist
- LM Luciana Mastrolià
- FF Fabio Favoino



SCENARIO 03

1. The PL is set to transform into an academic research area for universities, accommodating startups and a health sector incubator. It will support the Health Park. Also plans include a museum dedicated to Piero Angela. Jan 17, 2023, the mole24 website.

2. "... Abandoned the building due to constant increases in maintenance costs." Cristiana Chiorino. Subtle fusion of structure and space Construction, Life, and Reuse of the Palazzo del Lavoro.

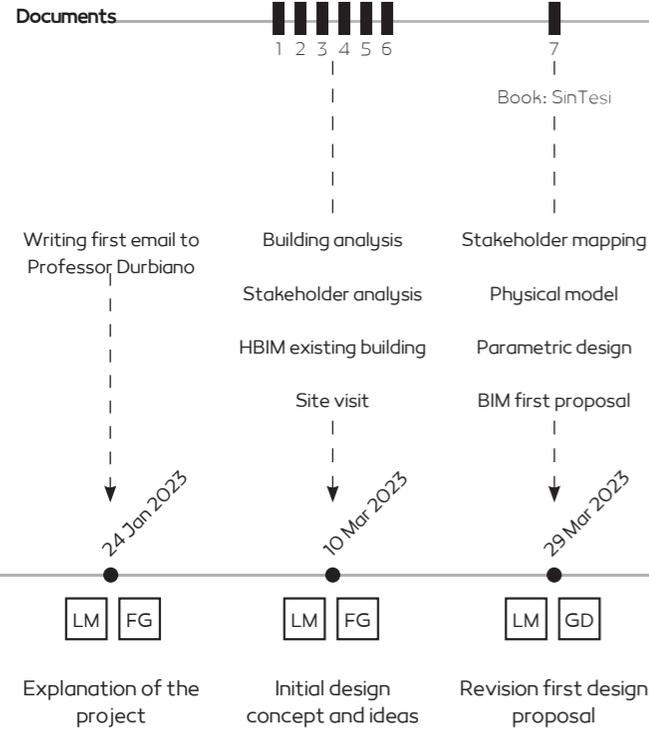
3. Lo Russo' Polytechnic Rector's Plan to Expand Health Park at Palazzo del Lavoro. Claudia Luise. 09 March 2023, on La Stampa website.

4. Shopping gallery and museum: this is how Palazzo del Lavoro is being reborn. Diego Molino. October 28, 2022, on La Stampa website.

5. The property is owned by Cassa Depositi e Prestiti, but the certainties end here on Palazzo del Lavoro. 24 July 2022, on Torinoggi website.

6. " Research laboratories and Piero Angela Museum inside Palazzo del Lavoro". the challenge of the Polytechnic of Turin. Diego Longhin. 17 January 2023, on La Repubblica website.

7. Cristiana Chiorino. Subtle fusion of structure and space Construction, Life, and Reuse of the Palazzo del Lavoro.



Layered interactions: preserving spatial integrity

SCENARIO 01

● Meetings with



This chapter focuses on the commencement of the project, which began with a detailed analysis at two critical levels: the building scale and stakeholder analysis. An essential part of the stakeholder analysis involved a real-time tracking of various news sources related to the actors, providing a deep understanding of the dynamics and interests involved.

Parallel to this, study of the historical context and current condition of the building was conducted. This involved examining a range of historical documents to capture the essence of the original structure and reviewing contemporary sources to

understand its current state. On-site visits played a significant role in gaining firsthand insights into the building's physical and spatial characteristics. To aid the design process, both digital (using HBIM approach) and physical (through 3D printing) models of the building were created, offering visual and tangible insights into its structure.

This foundational work allowed for the identification of key adaptive reuse strategies that consider both the stakeholders' interests and the building's potential. The chapter concludes with the establishment of a primary design program, setting the stage for the design development phases to follow.

HISTORY OF PALAZZO DEL LAVORO

The Palazzo del Lavoro is a remarkable building that combines smart engineering and creative design. It's famous for how it showcases its structure, which has fascinated people for years. This big pavilion was planned to hold a major exhibition about work during Italy's 100th anniversary.

The announcement inviting bids for the construction of the Palazzo del Lavoro, an exhibition pavilion in Turin, created for the 1961 Centenary of Italian Unification celebrations, was released on July 4, 1959. This pavilion was intended to house the significant labor exhibition orchestrated by Giovanni Agnelli and designed by Gio Ponti.¹

This pavilion aimed to offer 47,000 square meters of space for exhibitions and various services. Moreover, it was envisioned to serve as a National Center for Professional Education after the celebrations.

The call for proposals prioritized cost-effectiveness and an innovative utilization of construction techniques and materials, allotting three months for the formulation of a comprehensive plan. This plan encompassed structural assessments, estimated quantities, and financial quotations.¹

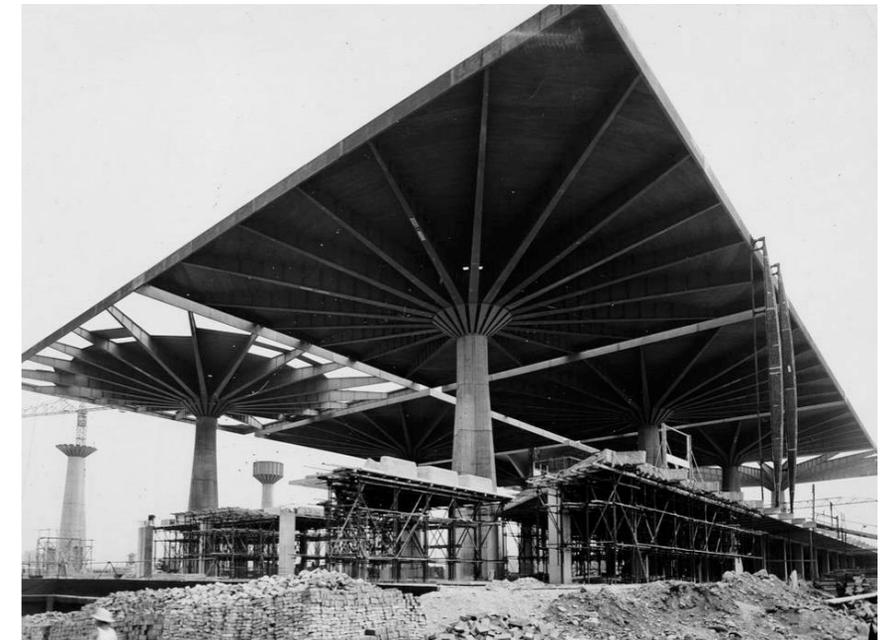


1. National Committee for the Celebration of the First Centenary of Italian Unity. (1961). The Celebration of the First Centenary of Italian Unity. Turin.

Figure 1: Palazzo del Lavoro, 11 June 1961 at Italia' 61. (Source: AtlasFor).

The winning design, secured by Nervi and Bartoli in 1959, led by Pier Luigi Nervi, showcased a distinctive approach. The central idea centered on dividing the expansive square roof into 16 autonomous "umbrellas," each measuring 40 meters per side. These were interspersed with continuous strip skylights, forming a sunburst pattern using steel beams fixed to a central column. This column boasted a variable geometry recurring characteristic evident in Nervi's architectural repertoire.²

The architectural design featured a central element complemented by a perimeter gallery. The proposal stood out for its simplicity, clear structure, and modular design, utilizing various materials to meet the given time frame. Technical specifications included dimensions of 158 meters on each side, a height of 25 meters, and a total volume of 600,000 cubic meters. The construction site organization was innovative, leading to the swift completion of the entire building from February to December 1960.³



2. Drawings are at the Centro Studi Arte Contemporanea, Parma, Fondo Pier Luigi Nervi.

3. Palazzo del Lavoro. (n.d). Museo Torino. Retrieved February 13, 2024, from <https://www.museotorino.it/>

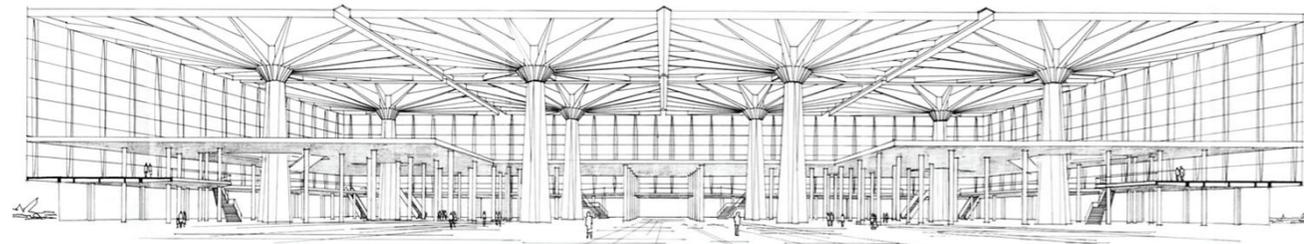
Figure 2: Palazzo del lavoro construction site. (Archivio Storico della Città di Torino).

ORIGINAL DESIGN DOCUMENTS

The project initially planned for the creation of two exhibition levels: one below ground level and another approximately 10 meters above ground, supported by a system of pillars. In May 1960, the Nervi studio finalized the design with modifications suggested by Ponti. These included raising the lower floor to ground level, maintaining the perimeter gallery, using ribbed floors for structural support, and postponing the construction of the upper level. Additionally, a basement floor was incorporated for service facilities and technical needs.⁴

The building features a large square space split into 16 smaller squares, each with a reinforced concrete pillar at its center supporting a steel umbrella roofing structure. These pillars are architecturally unique, transitioning from a cross shape at the base to a circular shape at the top, with umbrella-like steel spokes extending from steel capitals. The integration of structural and architectural elements creates a grandiose interior space reminiscent of Egyptian temples.⁵

The structural design allows for independent construction and static support within each of the 16 squares, with graceful ribbing on the balcony floors responding to the internal distribution of stresses. A glass wall running 19 meters high separates the balcony from the roof, supported by aluminum vertical elements resting on reinforced concrete corbels. The design's inspiration from individual "umbrellas" remained prominent, with the unique configuration of pillars serving both aesthetic and structural purposes. The building's design incorporates horizontal skylights between the pillars, providing excellent natural lighting.⁵



4. Olmo, C., & Chiorino, C. 2010. PIER LUIGI NERVI l'architettura come sfida. SilvanaEditoriale.

5. Chiorino, C. (2014). Problems and strategies for conservation of Pier Luigi Nervi's heritage. Journal of the International Association for Shell and Spatial Structures.

Figure 3: The project presented by Pier Luigi Nervi, 1959. (Source: AtlasFor). Retrieved December 2, 2023, <https://atlas.landscapefor.eu/category/secxx/poi/6497-palazzo-del-lavoro/5405-a-space-stressed-by-a-titanic-structure/>

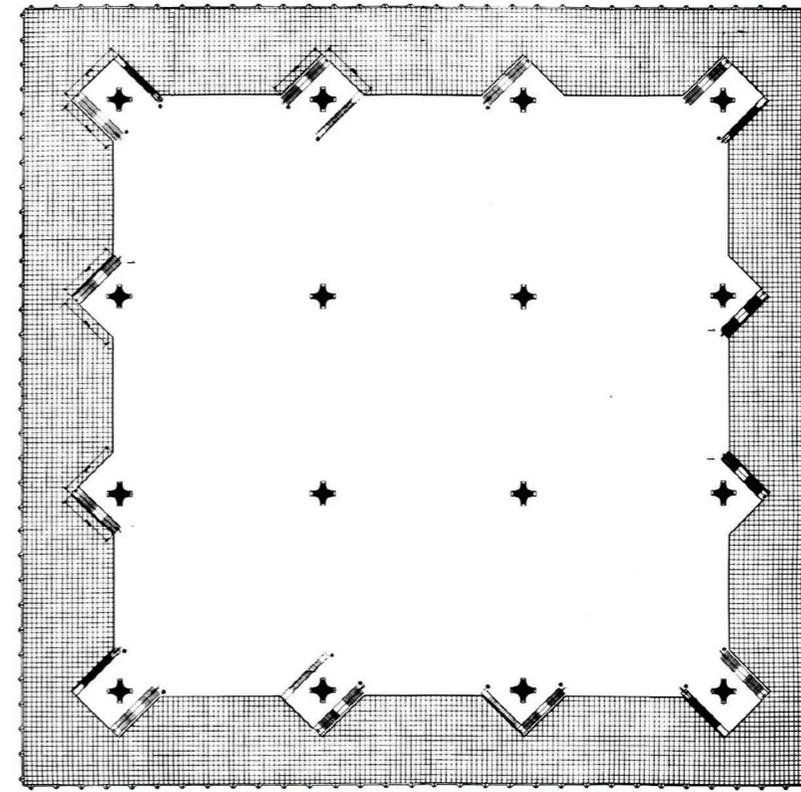
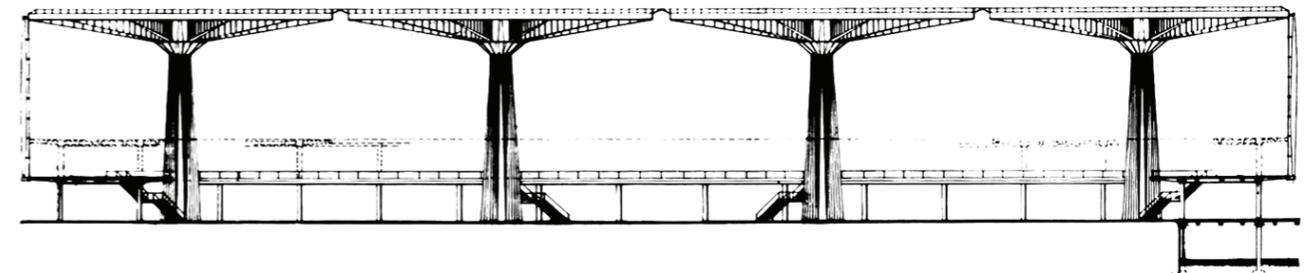


Figure 4: Plan of Palazzo del Lavoro designed by Pier Luigi Nervi. (Source: Atlasofplaces). Retrieved December 2, 2023, from <https://www.atlasofplaces.com/architecture/palazzo-del-lavoro/>

Figure 5: Section of Palazzo del Lavoro designed by Pier Luigi Nervi, 1960. (Source: Atlasofplaces). Retrieved December 2, 2023, from <https://www.atlasofplaces.com/architecture/palazzo-del-lavoro/>



TRANSFORMATION

Historical Evolution and transformation journey

The journey of the Palazzo del Lavoro, from its initial conception to its completion, stands as a testament to the visionary prowess of Pier Luigi Nervi, reflecting his multidimensional approach to architecture. Nervi's unique blend of design acumen and entrepreneurial spirit enabled him to navigate seamlessly through the complexities of the project, from the drawing board to the construction site.⁶ This holistic approach ensured a tight integration of conceptualization, meticulous planning, and precise execution, allowing Nervi to maintain control over both the economic and qualitative dimensions of the endeavor. As a result, the Palazzo del Lavoro emerged not just as a building but as a symbol of structural and architectural excellence, capturing the attention of both national and international audiences through prominent publications. However, despite its initial acclaim and architectural significance, the Palazzo del Lavoro has encountered challenges in adapting to changing needs and functions over time. Its transition between various uses has posed difficulties, leading to questions about its continued relevance and usability.⁶



Figure 6: Palazzo del Lavoro during the 'Italia '61' celebrations. (Source: PLN Project Association)

This thesis aims to delve into the historical significance of the Palazzo del Lavoro, seeking inspiration for a balanced and well-suited design for its adaptive reuse. By understanding the past dynamics and avoiding previous mistakes, the goal is to inform a thoughtful and proportionate transformation that respects the building's history while addressing contemporary needs. The focus is on creating a design that harmonizes the building's heritage with a forward-thinking approach, ensuring a meaningful and adaptive future use.

1. Nervi's Proposals and 1960s Transformations (1959 – 1965):

In 1959, architect Nervi proposed various reuse solutions⁷ in a public tender, including sports facilities. However, challenges in re-purposing emerged immediately after the exhibition's closure. Initial considerations for transforming Italia' 61 structures into centers for professional training in 1962 proved economically unfeasible. In 1963, the municipality took ownership with plans to turn it into the United Nations International Labor Organization headquarters, leading to extensive renovations.⁸

2. Unsuccessful Attempts (1970s – 1980s):

In the early 1970s, there was an unsuccessful attempt to convert part of the building into a public sports complex. By the mid-1980s, the high maintenance costs and building issues led the United Nations International Labor Organization to vacate.⁹

Several ideas surfaced for the building's future. Yet, no project adequately addressed the fundamental challenge: how to reintegrate such a massive structure into the cityscape for collective use. This lack of a cohesive strategy persisted even as the building changed hands between entities and was used partially by academic and administrative offices over the years. The sheer size of the structure posed a formidable obstacle in envisioning its adaptive reuse.

6. Adapted from the essay "Subtle Fusion of Structure and Space: Construction, Life, and Reuse of the Palazzo del Lavoro, Turin" by Cristiana Chiorino (2020), EPFL Press.

7. A sketch stored at the CSAC depicts a potential educational facility layout featuring classrooms, along with several proposed concepts for a sports center.

8. "Palazzo del Lavoro was equipped with technical labs, machines, and equipment for the delivery of vocational and technical training programs". (ILO website). Retrieved from <https://www.itcilo.org/about/history>

9. The United Nations ILO abandoned the building in After increases in maintenance costs. Adapted from the essay "Subtle Fusion of Structure and Space: Construction, Life, and Reuse of the Palazzo del Lavoro, Turin" by Cristiana Chiorino (2020), EPFL Press.

3. Changing Ownership and Varied Proposals (2004 – 2011):

In 2004, recognizing the significance of Palazzo del Lavoro, the Turin Municipality resolved to acquire the building. However, the ensuing acquisition process proved protracted and complex, and despite this decision, the Palazzo continued to function sporadically as an exhibition hall. The year 2005 witnessed a pivotal alteration to the zoning use clause, expanding the building's classification beyond its initial role as an exhibition space to encompass tourism, culture, conferences, and research. This shift raised concerns about the broad spectrum of permitted activities. In 2007, a development that paved the way for commercial use approvals after the Palazzo del Lavoro was acquired by Cassa Depositi e Prestiti. These events between 2004 and 2011 marked a transformative period for Palazzo del Lavoro, influencing its potential uses and sparking concerns about the compatibility of proposed activities with the building's historical and architectural significance.¹⁰



Figure 7: palazzo del lavoro as exhibition space. (Courtesy of PLN Project Association).

Figure 8: Palazzo del Lavoro adorned in the three colors of the Italian flag for winter Olympic games, 2011. (AtlasFor).



4. Heritage Code Constraints (2010 – 2011):

In 2010, the Dutch group Corio, proposing a project in 2011 with substantial internal volumes. In July 2011, on the 50th anniversary, the Palazzo fell under the cultural heritage code. Constraints focused more on the event's significance than safeguarding its architectural value in the regulatory report, omitting specific details and limiting potential restrictions by the Soprintendenza.¹⁰

10. Adapted from the essay "Subtle Fusion of Structure and Space: Construction, Life, and Reuse of the Palazzo del Lavoro, Turin" by Cristiano Chiorino (2020). EPFL Press.

5. Turin Committee, Lingotto Complaint, and Fire (2012 – 2015):

In 2012, a committee aimed at revamping Palazzo del Lavoro was formed. However, concerns arose about its focus on preserving the building's architecture, leading to uncertainties about its ability to navigate the complexities of adaptive reuse. Legal issues halted the project in 2012, and a fire in August 2015 further complicated matters. Despite planning agreements being approved in December 2015 with hopes of transforming the Palazzo by fall 2018, progress faced delays due to regulatory and financial challenges¹¹. Notably, a complaint from the company managing nearby Lingotto mall, possibly concerned about competition and urban planning goals, contributed to the project's slowdown, highlighting the intricate challenges in transforming Palazzo del Lavoro into a commercial center.



Figure 9: Fire consumes Palazzo del lavoro, 2015. (Torino Today).

6. Recent Developments and Adaptive Reuse Proposals (2019 – 2022):

As of early 2019, Palazzo del Lavoro remained unchanged, underscoring persistent challenges in aligning policies with the city's actual needs. In 2021, acknowledging the need for transformation, security measures were initiated to safeguard the building. Subsequently, in 2022, proposals for revitalization gained momentum with the emergence of ideas such as the Museum Hub and University Hub.¹² The year also saw the commencement of redevelopment

works in August 2022, signifying a renewed effort to address the building's adaptive reuse. In October 2022, a significant regulatory change opened the possibility of reintroducing Palazzo del Lavoro into a new commercial settlement. This marks a crucial development in redefining the building's role and importance within the city, potentially integrating it with the Bengasi area and the Health Park.

11. "The failure to fully utilize the Palazzo due to its high maintenance costs is a reminder of how policies relating to major events may fail if they are not connected to the real economic and social requirements of the city" (Chiorino, 2020, p. XX). Palazzo del Lavoro, Turin. EPFL Press.

12. "From Shopping Gallery and Museum: This is how Palazzo del Lavoro is being reborn" by D. Molino. La Stampa, October 28, 2022.



TERRITORIAL FRAMEWORK

The project site is nestled near the southern edge of Turin, which places it a distance away from the city center. Primarily, it finds its location near Lingotto, a renowned landmark of the city. Additionally, it resides within the Italia' 61 Park, featuring Lake Italia as one of its distinctive attributes. Furthermore, the site is in close proximity to the Po River, further enhancing its geographical significance.

Situated within the Italia' 61 Urban Park in the Nizza Millefonti-Lingotto district, within Circonscrizione VIII, the project site is strategically placed near the southern gateway of Turin, adjacent to the Metropolitan City of Moncalieri.

The Palazzo del Lavoro serves as a pivotal point within a well-conceived urban plan, harking back to the 1961 exhibition. Its placement amid green spaces along a broad, linear path signifies its importance as an architectural and landscape feature marking the city's southern entrance.

Reflecting the influence of the original Master plan (1959) for the centennial celebration of Italian Unification, the Italia' 61 area bears a historical legacy, with Turin's major expositions often leading to enduring developments and changes in the urban fabric.

Created on reclaimed marshland adjacent to the Po River, the 1961 Expo introduced a new neighborhood on Turin's southern outskirts, symbolizing urban modernity. With a park to the north and parking facilities to the south, its accessibility is further enhanced by its proximity to Lingotto, one of the city's largest shopping complexes, and the Lingotto train station.¹²

13. Olmo, C., & Chiarino, C. (2010). PIER LUIGI NERVI l'architettura come sfida.

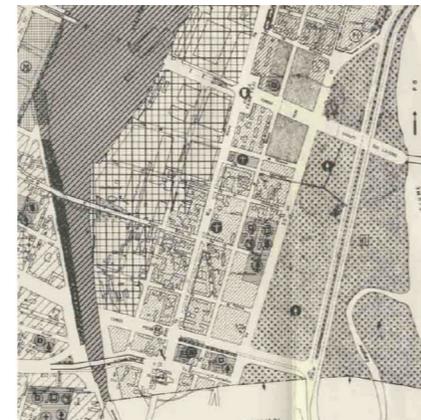
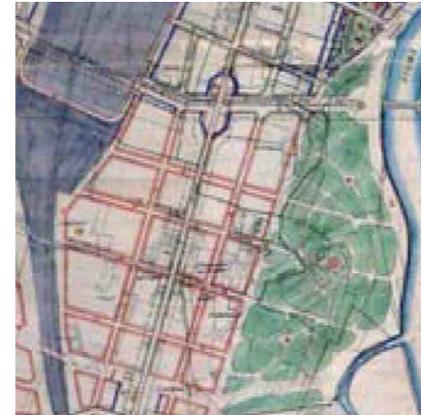


Figure 11, 12: The 1913 Development Plan envisions a substantial urban park for the region, while the 1959 PRG designates the area as a "green wedge" situated between productive and residential zones.

Both the 1913 and 1959 development plans share the common objective of designating the spaces utilized for Italia' 61 as park areas.



0 500 1000 2500

- 1 Area of the Project
- 2 Lingotto commercial center
- 3 Torino Lingotto Railway Station
- 4 City Center
- 5 Po River
- 6 Porta Nuova Train station
- 7 Porta Susa Train station
- 8 Turin Health, Research and Innovation Park

Figure 13: Map of Turin highlighting key landmarks and project location.

Embodying a blend of historical significance and contemporary urban dynamics, the project area showcases the evolution of Turin's landscape over time. From remnants of past exhibition structures to modern infrastructural adaptations, it encapsulates the city's journey from its industrial past to its present-day identity.

Key architectural landmarks such as the Palavela and the monorail contribute to the area's distinct character, while recent redevelopment efforts aim to revitalize its cultural and socio-economic significance. Despite facing challenges of neglect, the Palazzo del Lavoro remains a testament to Turin's industrial heritage and its aspirations for urban regeneration.

Adjacent to the Palazzo del Lavoro, the Palavela stands as a reference point for sports and entertainment events, thanks to its transformation into an ice rink stadium in 2005. The monorail, now a skeletal structure, once spanned 1800 meters, crossing an artificial lake that served as support and an innovative public transportation mean.

In summary, the project site's territorial context showcases the interplay between historical preservation, modern development, and the enduring legacy of significant cultural events, all within the vibrant urban fabric of Turin.



Figure 14: Torino Palavela. Facebook.



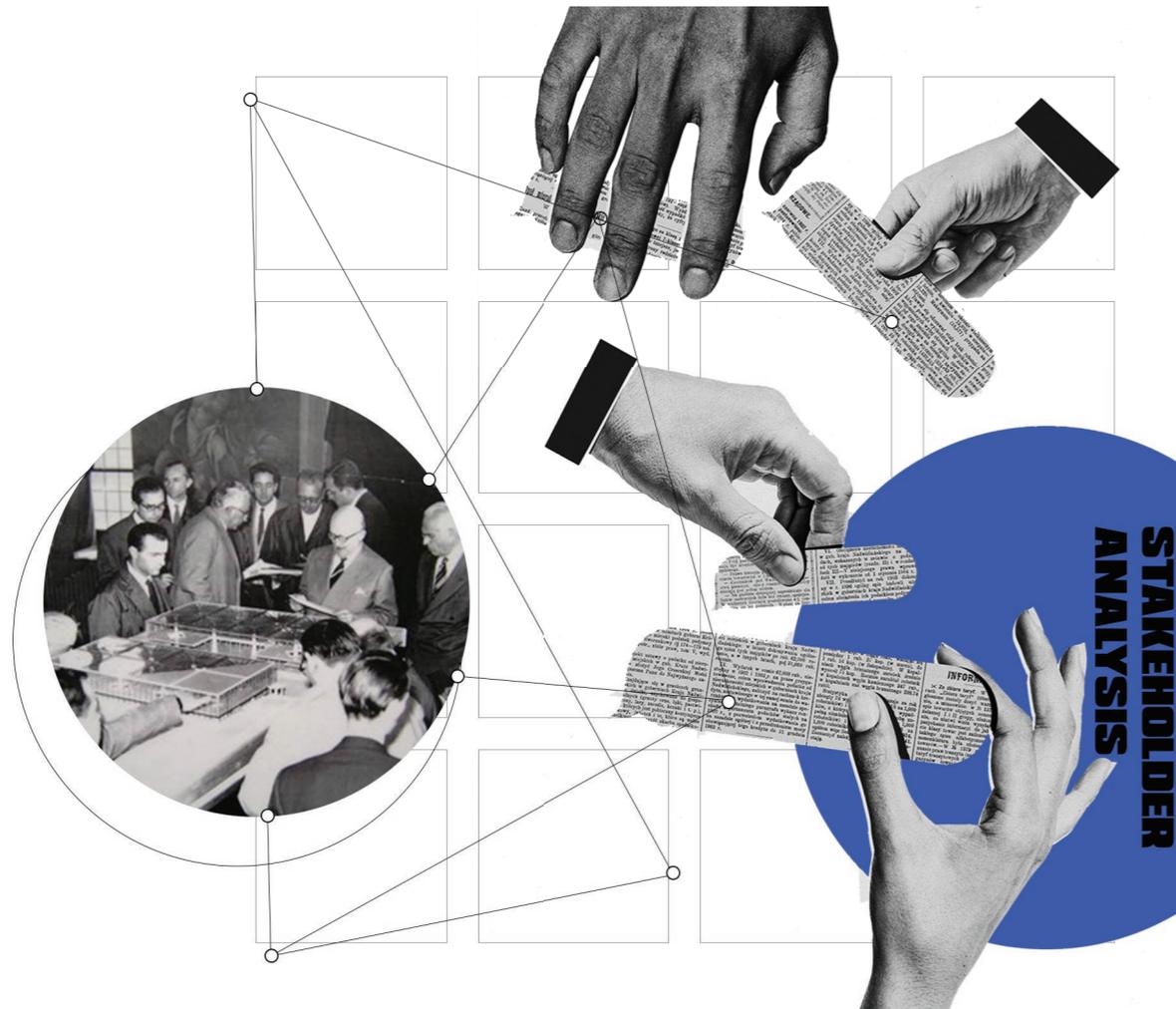
Figure 15: Monorail. Facebook.



Figure 16: Lake Italia 61 and Monorail. Facebook.
Retrieved from: <https://www.facebook.com/media/set/?set=a.1542224856062298&type=3>



Figure 17: Po River beside Palazzo del lavoro. Facebook.
Retrieved from: <https://www.facebook.com/media/set/?set=a.1542224856062298&type=3>



Influential Actors and Redevelopment Efforts at Palazzo del Lavoro

In order to understand the actors who have influenced this building, it is essential to examine the events of the past decade and the various attempts to enact change. The fire incident of 2015 refocused attention on the Palazzo del Lavoro, shedding light on its vulnerability to intrusions and lack of security measures. In response, the DoCoMoMo association¹³ penned a letter denouncing the neglect of this culturally significant site, emphasizing the need for a conservation and reuse strategy to preserve national memory.¹⁴ This sparked a new debate initiated by Turin's Mayor Piero Fassino and the Mayor of Moncalieri, leading to the signing of a program agreement for the redevelopment of Nervi's masterpiece. However, challenges such as unresolved issues regarding green areas and traffic persisted. Efforts were made to integrate green spaces with the building and address traffic concerns through various solutions.

In 2017, a redevelopment plan was proposed, envisioning a shopping center and Museum of Science and Technology¹⁵, but faced resistance and bureaucratic hurdles. Balancing the needs of stakeholders with economic viability proved challenging, hindering effective redevelopment. Eventually, in 2021, negotiations concluded with CdP Immobiliare acquiring sole ownership, marking a turning point for the Palazzo's recovery.¹⁷ Subsequent initiatives focused on restoring skylights and the damaged facade, while discussions with the Municipality explored collaborative use of the space. Various proposals emerged, including a shopping center, events hub, and Science Center, with suggestions to transform it into a "Science Museum"¹⁸ or integrate it into a "Health Park"¹⁹ project. The latest proposal, presented in 2023, envisages an "innovation citadel" within the Nervi Palace, highlighting ongoing efforts to revitalize this iconic landmark.²⁰

14. DoCoMoMo International is a non-profit organization whose full title is: International Committee for Documentation and Conservation of Buildings, Sites and Neighborhoods of the Modern Movement.

15. DoCoMoMo Italia, together with the Pier Luigi Nervi project, wrote to the Mayor of Turin asking to study a strategy for the transformation of the Palazzo del Lavoro. (2016). PLN Project Website. Retrieved from <https://pierluiginervi.org/palazzodelavoro/>

16. "palazzo del lavoro will host a shopping center with underground parking and a series of exhibitions on science and technology born in Turin." Pizzigallo, C. (June 10, 2017). Torino Today website.

17. "The property is owned by Cassa Depositi e Prestiti." (July 24, 2023). Torinoggi website.

18. The proposal of the rector of the Polytechnic: "Let's name a Museum of Innovation after Piero Angela". (August 14, 2022). La Stampa Website.

19. "Lo Russo: Polytechnic Rector's Plan to Expand Health Park at Palazzo del Lavoro" (Luise, 2023, La Stampa). "According to this new plan, the Palazzo del Lavoro could host an academic research area for the two universities but not only. Its spaces could host startups and an incubator for companies in the technical health sector. There will be no real health services, only services useful to the Health Park. Furthermore, still within the structure, the new museum dedicated to Piero Angela could be built" (Jan 17, 2023). mole24 website.

20. Mayor Stefano Lo Russo stated, "The idea - explained the mayor - is to try to stimulate a movement, perhaps even through the involvement of banking foundations, to make Palazzo del Lavoro become a place to host startups and innovative businesses" (June 6, 2023). Torinoggi website.

Recent developments indicate growing interest from CdP and Turin universities in transforming the Palazzo into a multifunctional complex, potentially serving as an innovation hub. This transformation holds promise for revitalizing the Palazzo and positioning it as a dynamic center for cultural, commercial, and technological exchange.

Moving forward from past failures, efforts are underway to establish the foundations of a new scenario. Focusing on building a network of actors is key to expanding design choices collectively. Dealing with a complex collective involves navigating intersecting and conflicting forces. Entities involved in the process wield per formative power, influencing actions and outcomes.

The design phase outlines potential actions as project documents, reflecting the network of involved actors. Building a proposal for action based on documentary exchange becomes crucial, where documents record the intentions of the actors. Thus, the design strategy aims to produce and exchange documents to guide the project from agreements to outcomes.

The intervention is currently undergoing negotiation among various actors, including the University of Turin, and the Polytechnic of Turin, all actively engaged in experimentation and research on space.

1. The PL is set to transform into an academic research area for universities, accommodating startups and a health sector incubator. It will support the Health Park. Also plans include a museum dedicated to Piero Angela. Jan 17, 2023, the mole24 website.
2. "... Abandoned the building due to constant increases in maintenance costs." Cristiana Chiorino, Subtle fusion of structure and space Construction, Life, and Reuse of the Palazzo del Lavoro. 24 July 2022, on Torinoggi website.
3. Lo Russo "Polytechnic Rector's Plan to Expand Health Park at Palazzo del Lavoro. Claudia Luise, 09 March 2023, on La Stampa website.
4. Shopping gallery and museum: this is how Palazzo del Lavoro is being reborn. Diego Molino, October 28, 2022, on La Stampa website.
5. The property is owned by Cassa Depositi e Prestiti, but the certainties end here on Palazzo del Lavoro. 24 July 2022, on Torinoggi website.
6. "Research laboratories and Piero Angela Museum inside Palazzo del Lavoro", the challenge of the Polytechnic of Turin, Diego Longhin, 17 January 2023, on La Repubblica website.

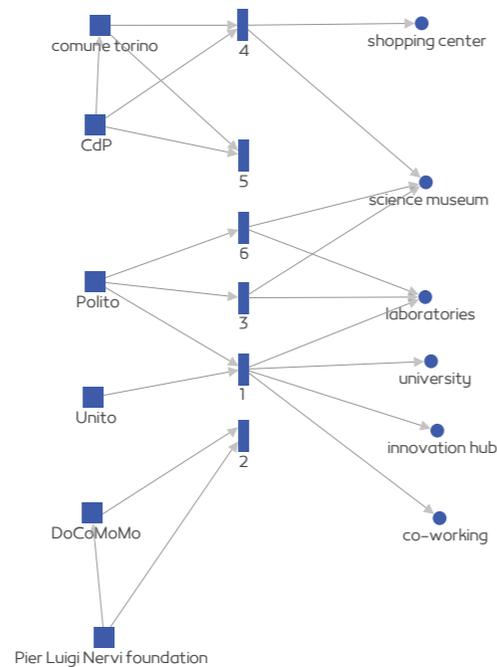


Figure 18: Project process mapping, 10 March 2023.

Legend

- Human Actors
- Non human Actors
- Documents
- Design Actions

10 March 2023

In our thesis project, we conducted an in-depth analysis of stakeholders, delving into numerous newspapers to gain a comprehensive understanding of the involved parties and their potential impact on our project. Therefore, we could decide about the main strategies and design program according to the mentioned analysis. Concurrently, we embarked on a meticulous exploration of the building's history, seeking out original documents to piece together the narrative of each structural component. This endeavor allowed us to connect with the historical essence of the building, appreciating the stories embedded within its columns and beams.

Moreover, at this stage utilizing the Historic Building Information Modeling (HBIM) approach, we digitally reconstructed the building, complemented by the creation of a 3D printed model. This tangible representation provided us with a unique perspective, enhancing our understanding of the building's spatial dynamics. Additionally, an on-site visit further deepened our connection to the space, offering invaluable insights that could not be captured through digital models alone.

BUILDING COMPONENTS

Following the extensive research into actors, the building's location, and its historical background, a critical aspect of the study involved familiarizing with the key components of Palazzo del Lavoro. The objective was to discern the most significant elements and understand their characteristics, particularly in distinguishing between original designs by Pier Luigi Nervi for the Expo and subsequent additions.

Main umbrella-shaped Columns

The Palazzo del Lavoro is characterized by 16 umbrella-shaped columns, each standing at a height of 25 meters with a 40-meter spacing from adjacent columns. The columns, as depicted in the original drawings, feature a cross-shaped foundation on top of piles, with each column being independent and their foundations remaining unconnected. Pier Luigi Nervi ingeniously designed each column in seven different parts, transitioning gradually from a cross-shaped base to a circular top. This method expedited construction and simplified implementation. Atop the concrete section of each column, 20 asymmetric metal beams are bolted to the designed metal core, which, in turn, connects to the concrete column. These beams play a crucial role in supporting the weight of the metal sheet panels comprising the roof.

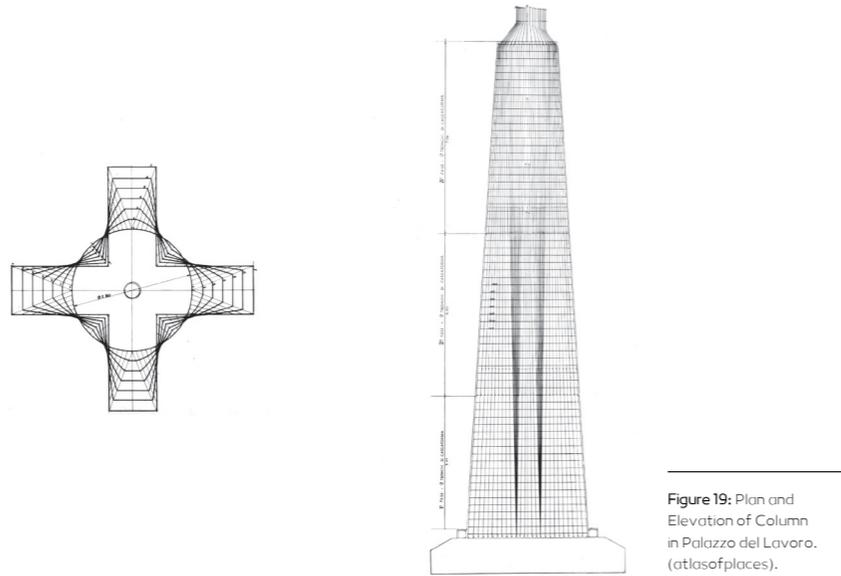


Figure 19: Plan and Elevation of Column in Palazzo del Lavoro. (atlasofplaces).

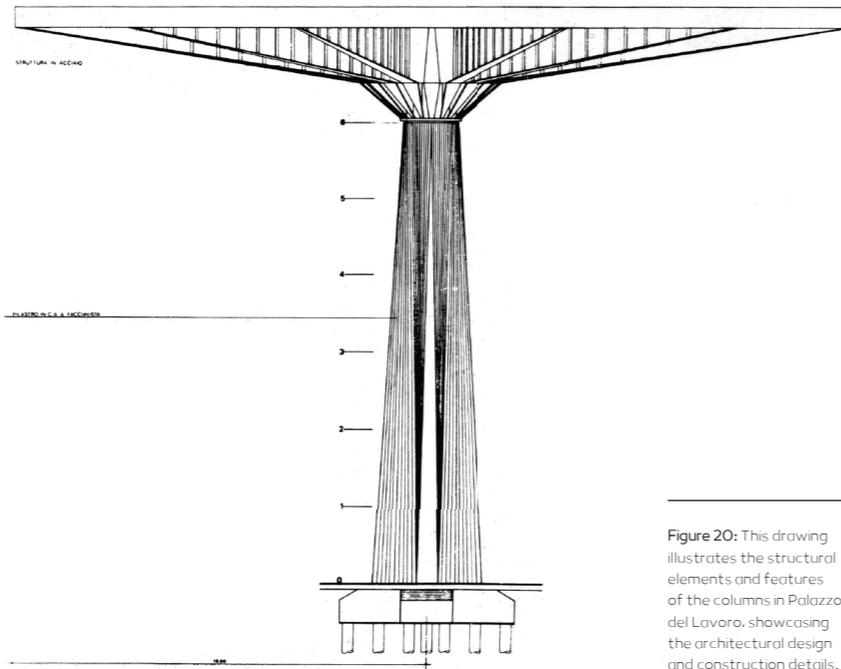


Figure 20: This drawing illustrates the structural elements and features of the columns in Palazzo del Lavoro, showcasing the architectural design and construction details. (atlasofplaces).

Isostatic Ribs Slabs

The mezzanine along the building's perimeter features reinforced concrete slabs with isostatic ribs, a distinctive original structural feature designed by Pier Luigi Nervi. These slabs, measuring 10 x 10 meters, are supported by four concrete columns at the corners and were formed using a modular construction process. The mezzanine not only serves a structural purpose but also possesses aesthetic value, contributing to the unique identity of Palazzo del Lavoro.

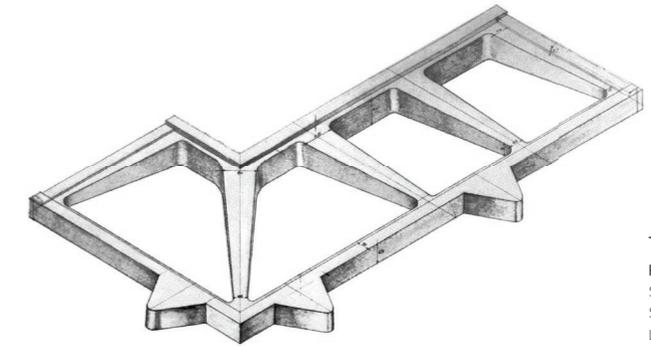
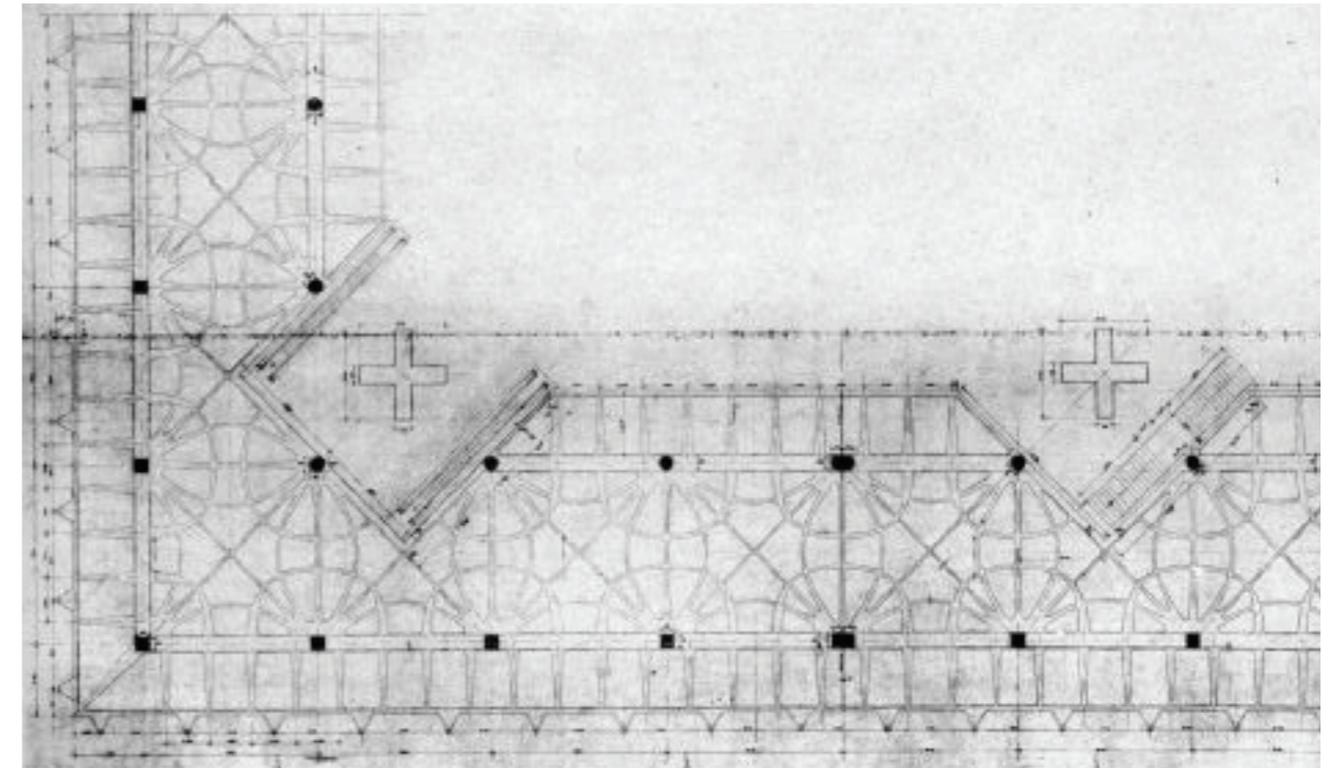


Figure 21: Detail of Isostatic Slab Engineered to Support Shading Devices Load. (atlasofplaces).

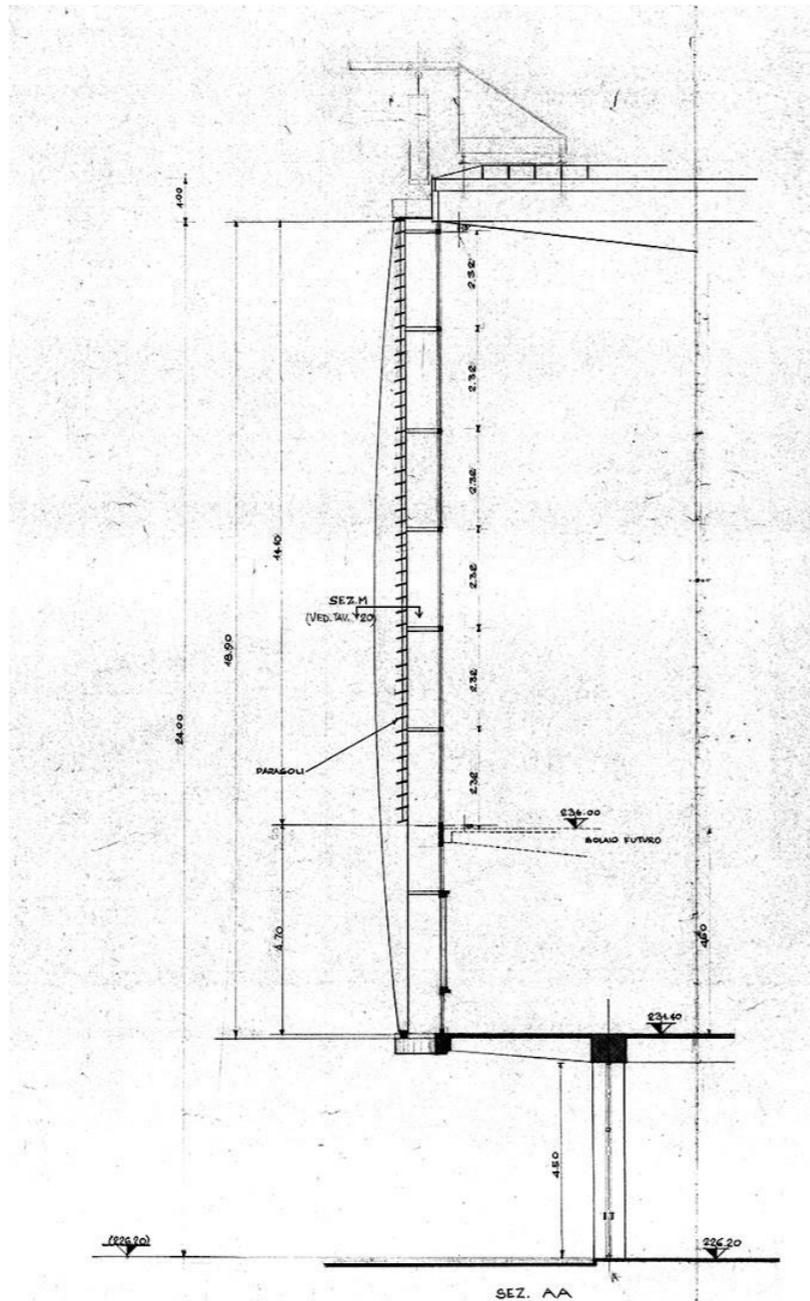
Figure 22: Drawing of Isostatic Slabs in Palazzo del Lavoro. (atlasofplaces).



Shading Devices

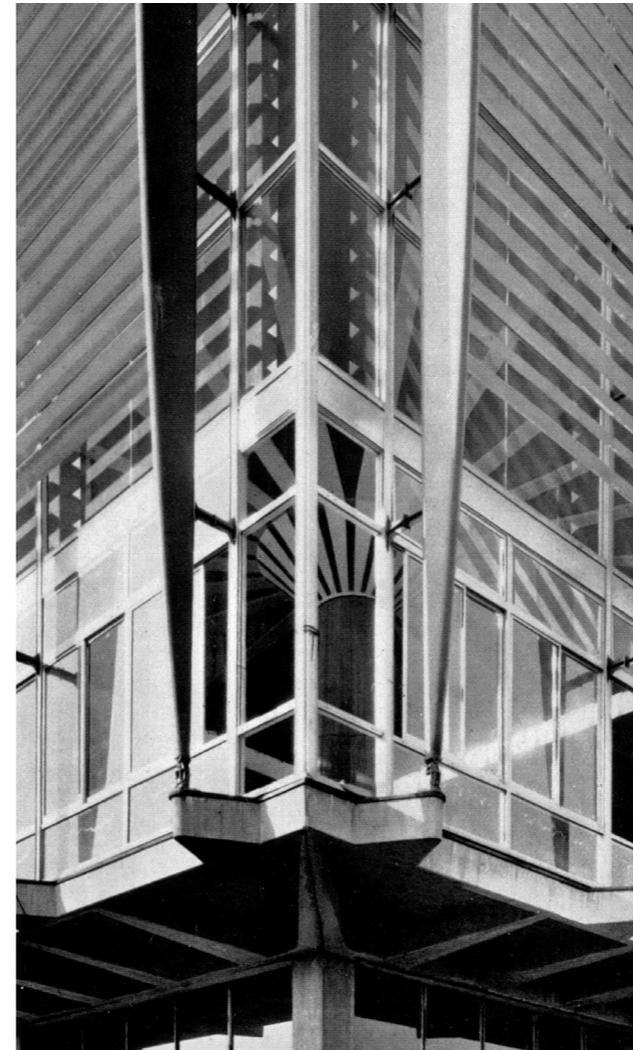
An innovative solution by Nervi, external shading devices embellish all facades of the building. These elements, consisting of repeated vertical aluminum components, support the expansive curtain wall of the facade. Connected to the concrete slabs at the bottom and the metal perimeter beam of the roof at the top, these elements are spaced at five-meter intervals. Sunshade slats are strategically positioned, being absent on the North facade and exhibiting varying angles on the South, East, and West facades. These slats contribute not only to the aesthetic appeal but also play a crucial role in modulating sunlight and enhancing the building's environmental performance.

Figure 23: Wall Section Detailing Shading Devices Connection to Palazzo del Lavoro. (AtlasFor).



Facade's Glazing

The four facades of Palazzo del Lavoro feature extensive curtain walls, starting from the first floor (elevation 5.25 meters) to the main roof (elevation 25 meters). The glazing comprises single-pane windows with metal framing, where the 2.5 x 5-meter frames are connected and supported by external vertical aluminum elements.



Roof

Originally constructed with metal sheet insulated waterproofed cladding panels, the roof underwent a significant transformation after the Expo. In 1965, when re-purposed as the headquarters of the United Nations International Labor Organization (ILO), the unstable and insufficiently insulated sheet metal roof was replaced with prefabricated ferro-cement panels, ensuring stability and improved insulation.²¹

21. Adapted from the essay "Subtle Fusion of Structure and Space: Construction, Life, and Reuse of the Palazzo del Lavoro, Turin" by Cristiana Chiorino (2020). EPFL Press.

Figure 24: Connection Detail - Frames of Glazing to Shading, Transferring Load to Isostatic Slabs. (atlasofplaces).

Figure 25: Construction Detail with Metal Sheet, Insulated Waterproofed Cladding Panels. (atlasofplaces).



HISTORICAL BUILDING INFORMATION MODELING (HBIM)

In consideration of the preference for Revit software as the primary tool for 3D modeling, the adoption of a Building Information Modeling (BIM) methodology in representing Palazzo del Lavoro was undertaken. The historic significance of the structure prompted adherence to the principles of Historic Building Information Modeling (HBIM). The existing edifice was meticulously reconstructed through an accurate examination of historical documents. To ensure the accuracy and fidelity of the model, the initial phase underwent cross-verification with DWG files obtained from the Pier Luigi Nervi Project Foundation.

The dynamic history of Palazzo del Lavoro, characterized by various adaptations and changes over its life cycle, necessitated the application of the HBIM approach²². This approach facilitated the delineation of distinct phases, corresponding to pivotal modifications over time. Consequently, the original structure erected in 1961 was meticulously modeled as one phase. Subsequent alterations that occurred following its transformation into the headquarters of the United Nations International Labor Organization (ILO) in 1965 were incorporated as another phase. The phased modeling strategy not only preserved the chronological evolution of the building but also proved essential in integrating proposed alterations as a discrete phase within the modeling framework. This detailed phasing ensured a comprehensive portrayal of Palazzo del Lavoro in its various historical and adapted states, establishing a robust foundation for the integration of proposed adaptive reuse interventions.

22. Curra, Edoardo & D'Amico, Alessandro & Angelosanti, Marco. (2021). Representation and knowledge of historic construction: HBIM for structural use in the case of Villa Palma-Guazzaroni in Terni. 7. 2021. 10.30682/tema0701b.



Figure 26: Palazzo del lavoro on 8 March 2023. The image shows the columns and ceiling.



Figure 28: Palazzo del lavoro on 8 March 2023. The image shows the ground floor ceiling.



Figure 30: Palazzo del lavoro on 8 March 2023. The image shows external shadings.

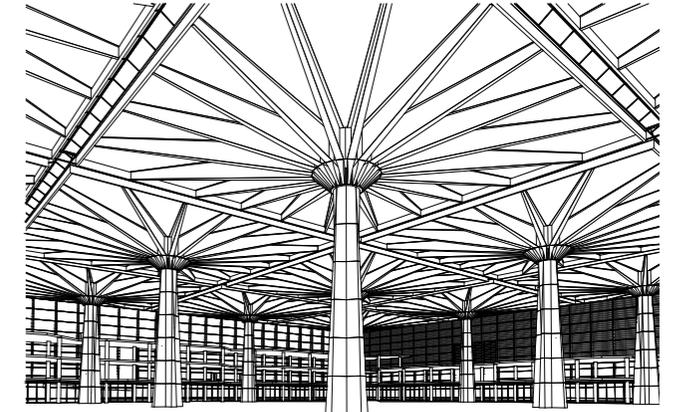


Figure 27: Palazzo del lavoro BIM model.

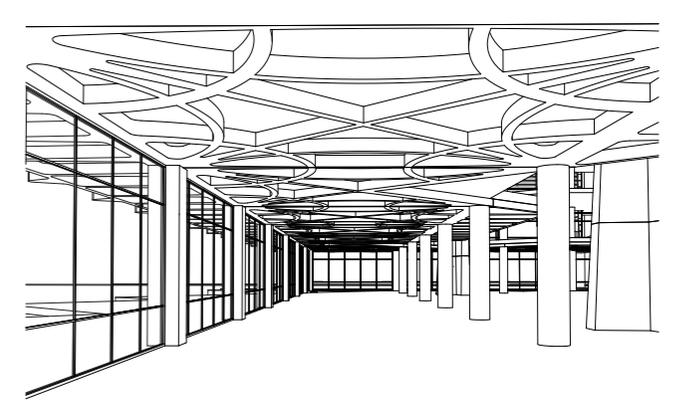


Figure 29: Palazzo del lavoro BIM model.

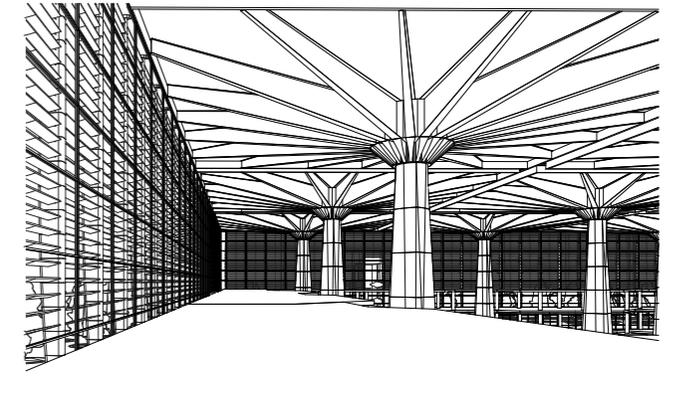


Figure 31: Palazzo del lavoro BIM model.

PHYSICAL MODEL

In the design process, a critical tool employed was a physical model, facilitating a hands-on understanding of the project. The initial consideration involved determining the appropriate scale for the entire Palazzo del Lavoro, measuring 156 x 156 meters. Opting for a 1:200 scale, the resulting model size was approximately 80 x 80 centimeters.

The first step in crafting the model involved addressing the main 16 columns of Palazzo del Lavoro. Two methods were explored: casting concrete and 3D printing.

For the casting concrete method, the creation of a mold was imperative. Various materials were considered for the mold, with a focus on re-usability for the 16 modular columns. While one potential solution involved using a 3D-printed base to create a reusable silicon mold, due to cost and implementation challenges, an alternative method was chosen: 3D printing.

Embracing 3D printing for its efficiency, leveraged by the precisely modeled columns in Revit. To enhance the visibility of proposed changes, each column was divided into two parts, facilitating the removal and placement of the model's roof. This division not only expedited the 3D printing process but also allowed for easy manipulation of the model.

The S5 Ultimaker 3D printer and white polylactic acid (PLA) were utilized as the primary materials. To augment the model's functionality, mini magnets were incorporated in both the upper part (the roof) and the lower part (the column), enabling seamless placement and removal of the roof. This approach not only provided a tangible representation of the design but also offered a practical and interactive tool for effectively communicating ideas.

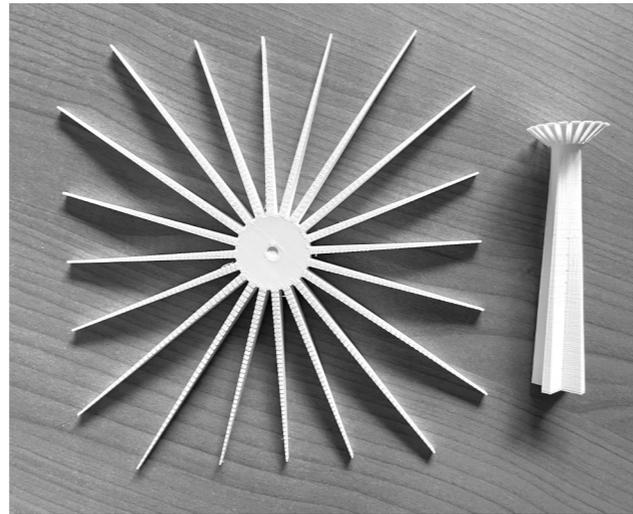


Figure 32: Elements of physical model of Columns and Roof



Figure 33: Elements of physical model of Columns and Roof

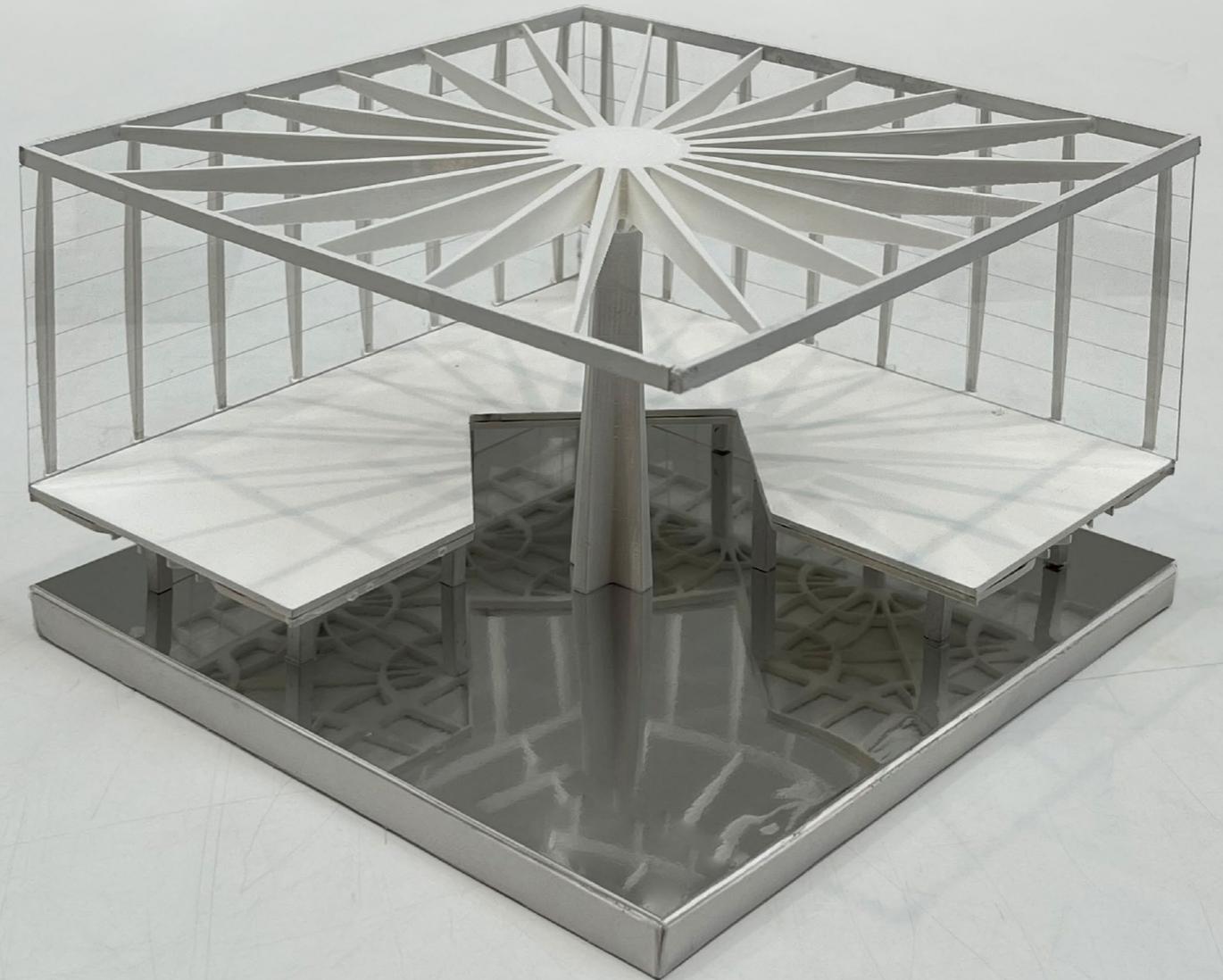


Figure 34: Physical model

SITE VISIT

During this pivotal phase of the project, an on-site visit to the Palazzo del Lavoro was conducted, marking a crucial step in the analysis of the building components and the application of the HBIM (Historical Building Information Modeling) approach for modeling efforts. This visit was instrumental in uncovering intricacies that remained elusive in drawings and images.

External observations revealed noteworthy aspects, particularly regarding the building's facade. A striking feature was that all external facades possessed identical designs, engendering a sense of repetition and a lack of uniqueness. The structure's scalelessness posed another challenge; the absence of architectural elements on the external facades made it difficult to gauge the enormity of the 160-meter-long structure. Moreover, the absence of a distinct and inviting entrance was noted, a consequence of the facades' uniformity that failed to establish a focal point or draw attention.

Figure 35: Capturing a moment from the site visit on 8 March 2023





Figure 36: Capturing a moment from the site visit on 8 March 2023

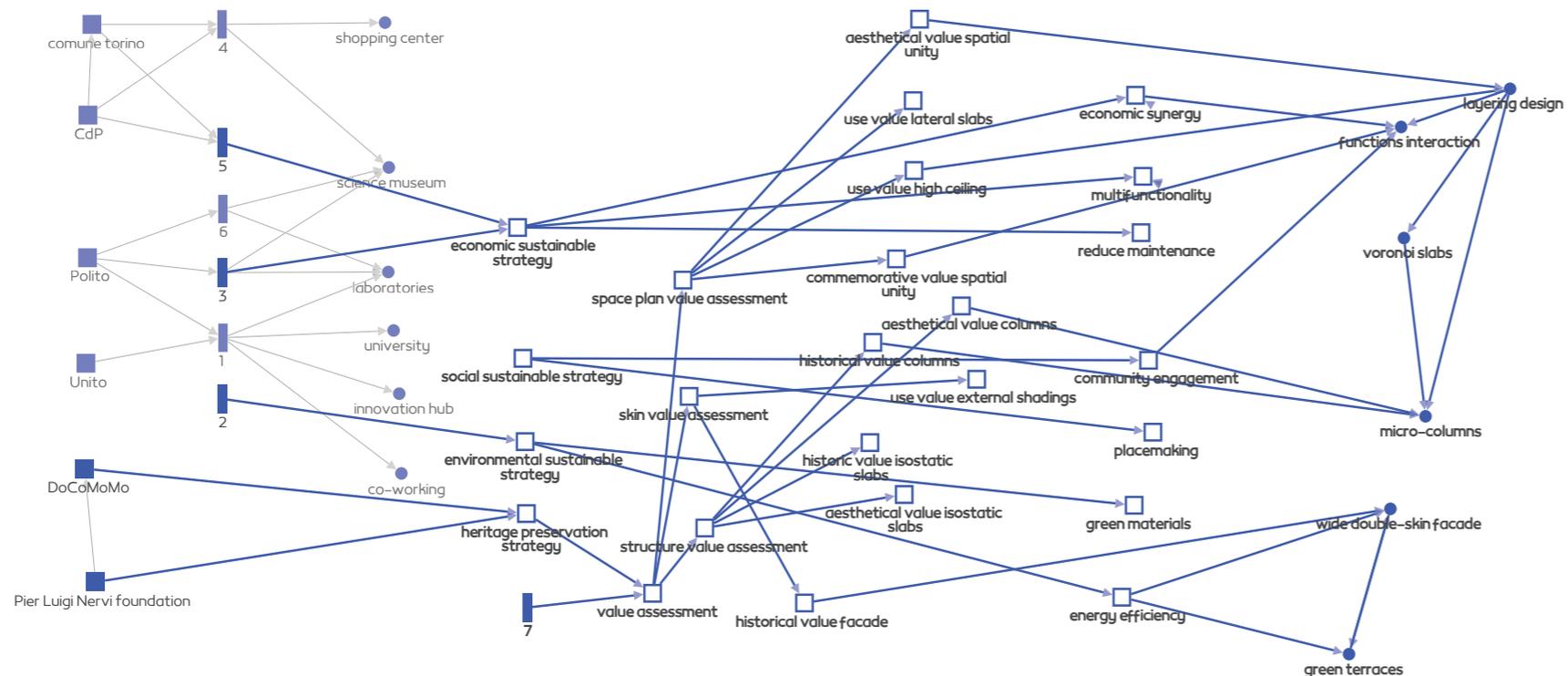


From a broader perspective, the historical closure of the building became evident through surrounding fencing, overgrown vegetation, and signs of vandalism; a testament to years of neglect and disuse.

Entering the vacant Palazzo del Lavoro provided profound insights into the sheer magnitude of the structure. The towering columns and expansive central space underscored the monumental scale of the structure. However, the building's modularity and square shape inadvertently led to a non-directional spatial quality, presenting a challenge in terms of design versatility. Another crucial observation was the abundance of natural light permeating the building, leading to issues of glare.

Exploring the upper levels revealed an inspiring transformation in perspectives. Ascending through the structure, the views towards the main space of the Palazzo del Lavoro and the surrounding area improved progressively. This revelation underscored the intriguing potential of elevated vantage points in shaping diverse and captivating views within the structure.

Figure 37: Capturing a moment from the site visit on 8 March 2023



29 Mar 2023

According to the analysis of the building and its actors, we obtained our main strategies and assessed different values of the Palazzo del Lavoro. Which served as the foundational framework for our design actions, guiding the development of our initial design concepts.

After thorough consideration and refinement of these concepts, we presented our first proposal for the adaptive reuse of the building.

Legend

- Human Actors
- Non human Actors
- Documents
- Design Actions
- New instances

- 2. "... Abandoned the building due to constant increases in maintenance costs." Cristiana Chiorino, Subtle fusion of structure and space Construction, Life, and Reuse of the Palazzo del Lavoro.
- 3. Lo Russo "Polytechnic Rector's Plan to Expand Health Park at Palazzo del Lavoro, Claudia Luise, 09 March 2023, on La Stampa website.
- 5. The property is owned by Cassa Depositi e Prestiti, but the certainties end here on Palazzo del Lavoro, 24 July 2022, on Torinoggi website.
- 7. Cristiana Chiorino, Subtle fusion of structure and space Construction, Life, and Reuse of the Palazzo del Lavoro.

Figure 38: Project process mapping. 29 March 2023..

MAIN STRATEGIES

In examining the multitude of proposals spanning Palazzo del Lavoro's architectural history, a fundamental realization guided the approach to the adaptive reuse project: a steadfast commitment to sustainability across economic, environmental, and social dimensions. This commitment stemmed from recognizing the evolving narrative of the building, reflecting the multifaceted challenges it faced over time. The diverse array of proposals underscored the need for a comprehensive strategy addressing both the immediate needs of Palazzo del Lavoro and providing a resilient framework capable of adapting to the dynamic demands of the future. In navigating this intricate landscape, sustainability emerged as the linchpin for success; an overarching principle harmonizing economic viability, environmental responsibility, and social relevance. This realization prompted a meticulous examination of each aspect, ensuring that the proposal not only breathed new life into the Palazzo but also positioned it as a sustainable and integral part of Torino's cultural and architectural heritage.

Economic Sustainability

A significant economic hurdle lay in the endeavor to attract stakeholders, compounded by the considerable disparity between the building's square meter and cubic meter metrics. Boasting approximately 45,000 square meters but exceeding 600,000 cubic meters, Palazzo del Lavoro presented a distinctive challenge. While earlier suggestions leaned towards transforming it into a large-scale shopping center, the proximity of the Lingotto shopping center and a dearth of investors hindered such endeavors. To navigate these economic complexities, the proposal advocated for a multifunctional complex. This innovative approach harmonized the notion of a shopping center, serving as the initial economic catalyst, with an educational center, co-working spaces, and a science museum. By diversifying the functions, the aim was to create a sustainable economic model resilient to the challenges faced by single-use complexes.

Social Sustainability

The Expo 1961 complex, once a hub of vibrant memories for the people of Torino, faced challenges stemming from years of abandonment and the discontinuation of integral elements like the cable car and monorail. The focus on social sustainability aimed at revitalizing Palazzo del Lavoro's connection with the public. This comprehensive approach involved removing physical barriers, establishing a seamless link between Park Italia61 and the building, and integrating public activities into the proposed design. The revival of this architectural gem not only sought to reopen its doors but also aimed to reintegrate it into the fabric of Torino, fostering a renewed sense of community engagement and collective memory. This strategy acknowledged the social significance of the building and aimed to position it as a vibrant and relevant part of the city's narrative.

Environmental Sustainability

Palazzo del Lavoro's distinctive architectural features, characterized by a high ceiling, expansive glazing facades, and a substantial volume, presented persistent challenges in terms of energy efficiency and maintenance. In tackling these environmental hurdles, the adaptive reuse proposal adopted a comprehensive sustainability approach. From thoughtful construction systems to efficient heating/cooling mechanisms, strategic daylight utilization, and the selection of eco-friendly materials, every aspect was meticulously considered. This holistic strategy underscored the commitment to environmental sustainability, ensuring a resilient and eco-conscious foundation for the entire project.

ECONOMIC
CHALLENGES

SOCIAL
CHALLENGES



ENVIRONMENTAL
CHALLENGES

Figure 39: Capturing a moment from the site visit on 8 March 2023.

01 LAYERED INTERACTIONS: PRESERVING SPATIAL INTEGRITY

The analytical examination of actors and stakeholders within the context of the Palazzo del Lavoro's adaptive reuse project has led to a design program that caters to the diverse interests of these groups, with a particular focus on economic vitality and multi-functionality. The inclusion of a shopping center is strategically envisioned as the primary economic driver of the project, augmented by the integration of educational institutions to introduce additional layers of utility and interaction. Central to this ecosystem is the science museum, positioned as a dynamic nexus that engages both the academic community and the general public. Furthermore, co-working spaces are conceptualized as connective tissues that not only facilitate collaboration across different domains but also bridge the gap between the museum and the academic entities, thereby creating a synergistic environment within the re-imagined Palazzo del Lavoro.

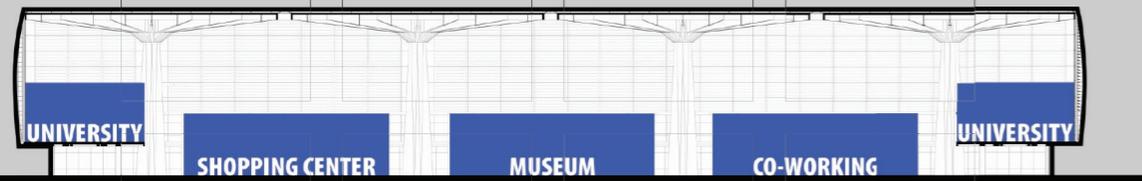


Figure 40: Design program Diagram



Figure 41: Scenario 1 - Axonometric View.

PRELIMINARY VISIONS

This comprehensive design program is underpinned by an initial concept that pays homage to the architectural essence and spatial unity of the Palazzo del Lavoro, guided by an intention to preserve the building's distinctive character. Inspired by the architectural philosophy of Gio Ponti, particularly his emphasis on visibility and spatial coherence during Expo61, the project aims to uphold the structural integrity of the building. This entails ensuring the continued visibility of the building's core elements from multiple perspectives within the project, thus maintaining a dialogue with Ponti's design principles.

Central to the design philosophy is the notion of layering functions within the existing architectural fabric rather than segregating activities into isolated compartments. This approach involves leveraging and enhancing the building's lateral slabs by introducing suspended-like extensions that facilitate diverse circulation paths tailored to the unique requirements of various user groups. The proposal envisions the ground floor as a vibrant shopping center, with the subsequent levels dedicated to housing the science museum, co-working spaces, and academic facilities.



Figure 42: Layering Diagram.

A significant consideration within the project is the challenge of ensuring energy efficiency, particularly given the building's extensive use of glazing. To address this, the design incorporates an innovative double-skin facade system along the lateral slabs. This feature not only functions as a transitional passageway linking different areas of the building but also plays a crucial role in enhancing the overall energy performance of the structure. Through this multifaceted approach, the project seeks to forge a sustainable, vibrant, and community-oriented future for the Palazzo del Lavoro.

Second Floor

- Co-working
- Unito
- Polito

First Floor

- Museum path
- Relaxing area
- Unito
- Polito

Ground floor

- Shopping mall
- Unito

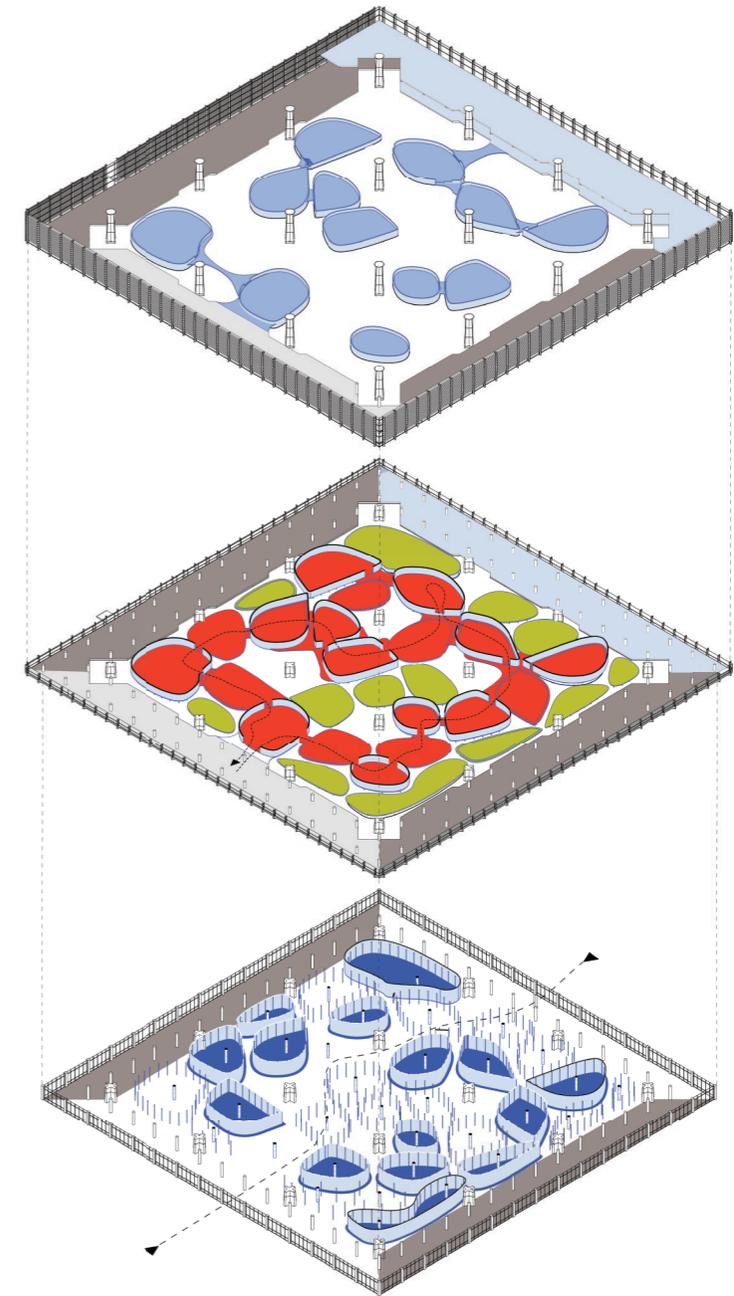


Figure 43: Scenario 1 - Exploded diagram.

To preserve the inherent essence and unity of Palazzo del Lavoro, the approach focused on employing slabs instead of imposing large volumes in the primary space. Specifically, lateral slabs were allocated for university-related activities requiring ample natural light. These slabs were intentionally crafted to create semi-open spaces for co-working and distinct volumes for the science museum. Establishing a thoughtful connection between the science museum, co-working areas, and universities played a pivotal role in the overall design. The museum's layout, orchestrated as a path rather than a fixed position, was a deliberate choice to evoke diverse perspectives and interactions among its users. Meanwhile, the visual connections between co-working spaces, dispersed across various slabs, fostered a sense of unity despite their physical separation.

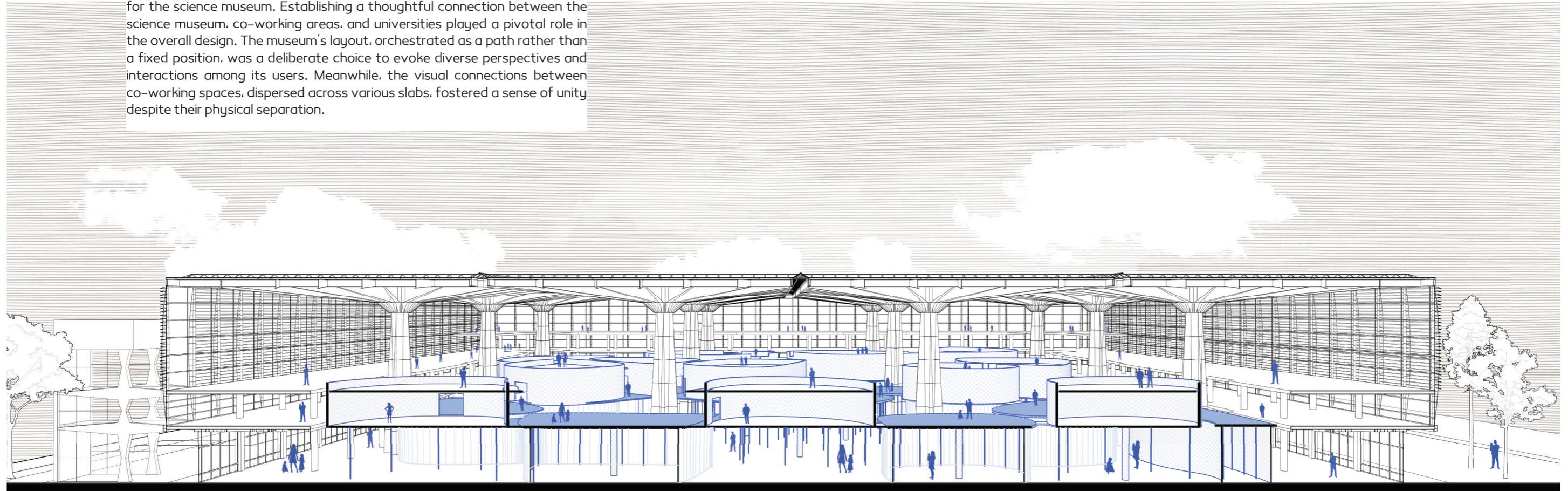
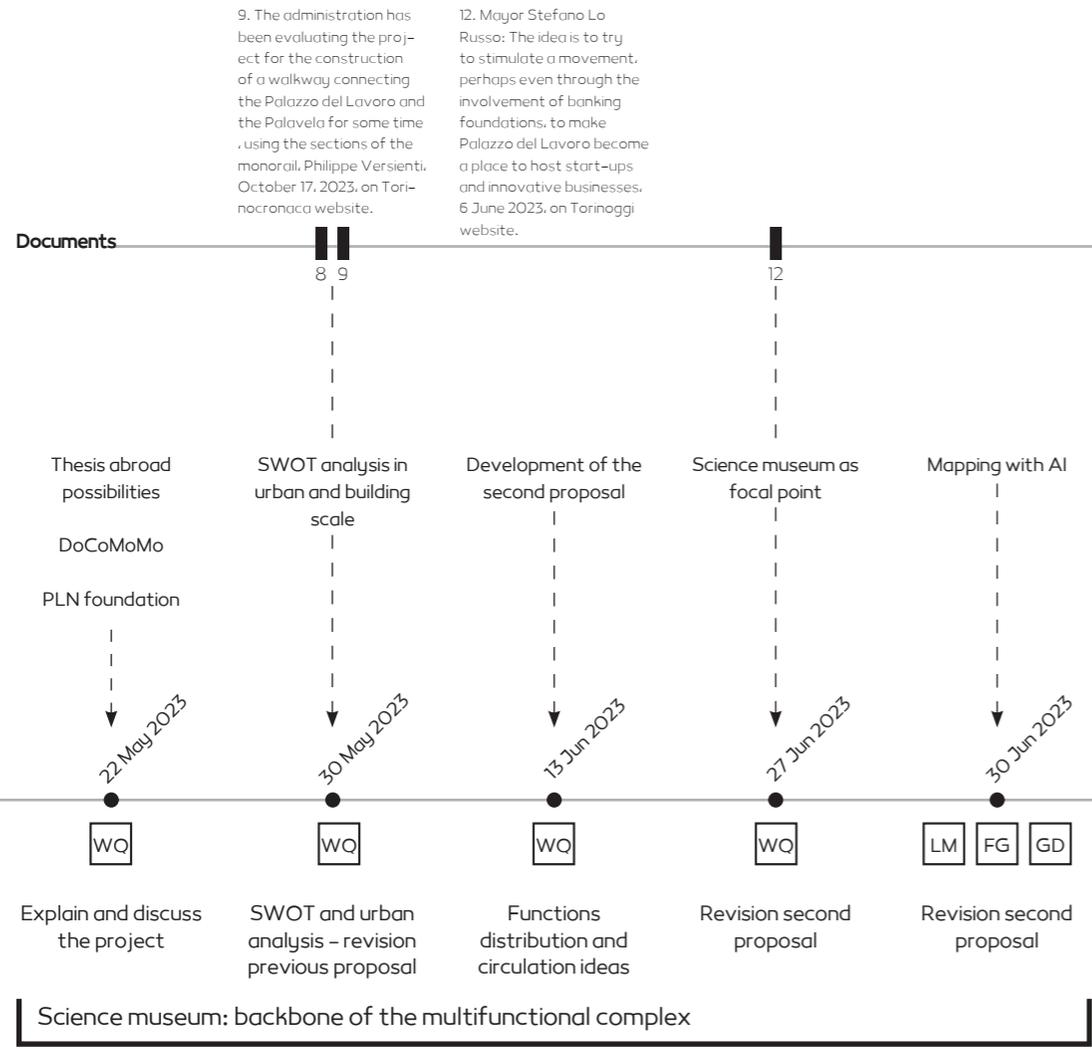


Figure 44: Scenario 1 - Section.



SCENARIO 02

- Meetings with
- GD Giovanni Durbiano
- FG Federica Joe Gardella
- WJ Wessel de Jong
- * Structural Engineer
- WQ Wido Quist
- LM Luciana Mastrolia
- FF Fabio Favoino

The second chapter pivots towards a conservation-centric approach, emphasizing the integration of heritage perspectives. This phase was marked by a collaborative endeavor with the heritage sector of TU Delft and DoCoMoMo, focusing on preserving the architectural integrity of the Palazzo del Lavoro while accommodating new functions. In this stage, a nuanced analysis of the urban context was undertaken, enriching the project's situational understanding. Building upon the foundational ideas from the initial scenario, a second proposal was developed. The conceptual foundation laid by the initial proposal was

preserved, specifically the idea of layering different functions within the building. However, significant modifications were introduced in terms of the spatial configuration and functional distribution to foster a deeper alignment with the building's historical essence and architectural significance. Moreover, the functions within the building were reassessed and reorganized to better reflect the Palazzo del Lavoro's heritage. This involved a careful consideration of how each proposed function could contribute to the building's revival without compromising its architectural integrity.

Integrating Heritage Perspectives

In the progression of the project, after the initial analyses involving the building and its stakeholders, a critical decision was made to delve deeper into the heritage significance of the Palazzo del Lavoro, acknowledging its stature as a piece of modern heritage. This phase marked the initiation of a collaboration with the heritage sector of TU Delft University, specifically through the inclusion of Professor Wido Quist as a supervisor to the thesis project. This strategic partnership was not merely a procedural addition but a vital step towards integrating a comprehensive heritage perspective into the adaptive reuse process of the Palazzo. It facilitated a balanced consideration of both the building's current contextual challenges, including stakeholder interests and economic considerations, and its historical value.

The collaboration gained additional significance due to the Palazzo del Lavoro's listing in DoCoMoMo, an international organization dedicated to the documentation and conservation of buildings, sites, and neighborhoods of the Modern Movement. With Professor Quist acting as the Secretary-General of DoCoMoMo International, his involvement brought a depth of knowledge and an expansive network to the project²³. Notably, the Palazzo del Lavoro's inclusion in DoCoMoMo Italia's SOS list as an at-risk piece of modern movement heritage underscored the project's urgency and importance.²⁴ This relationship between the project and DoCoMoMo highlighted the critical balance required to navigate the adaptive reuse of the Palazzo, ensuring that its historical significance is preserved while making it relevant and functional in a contemporary context.

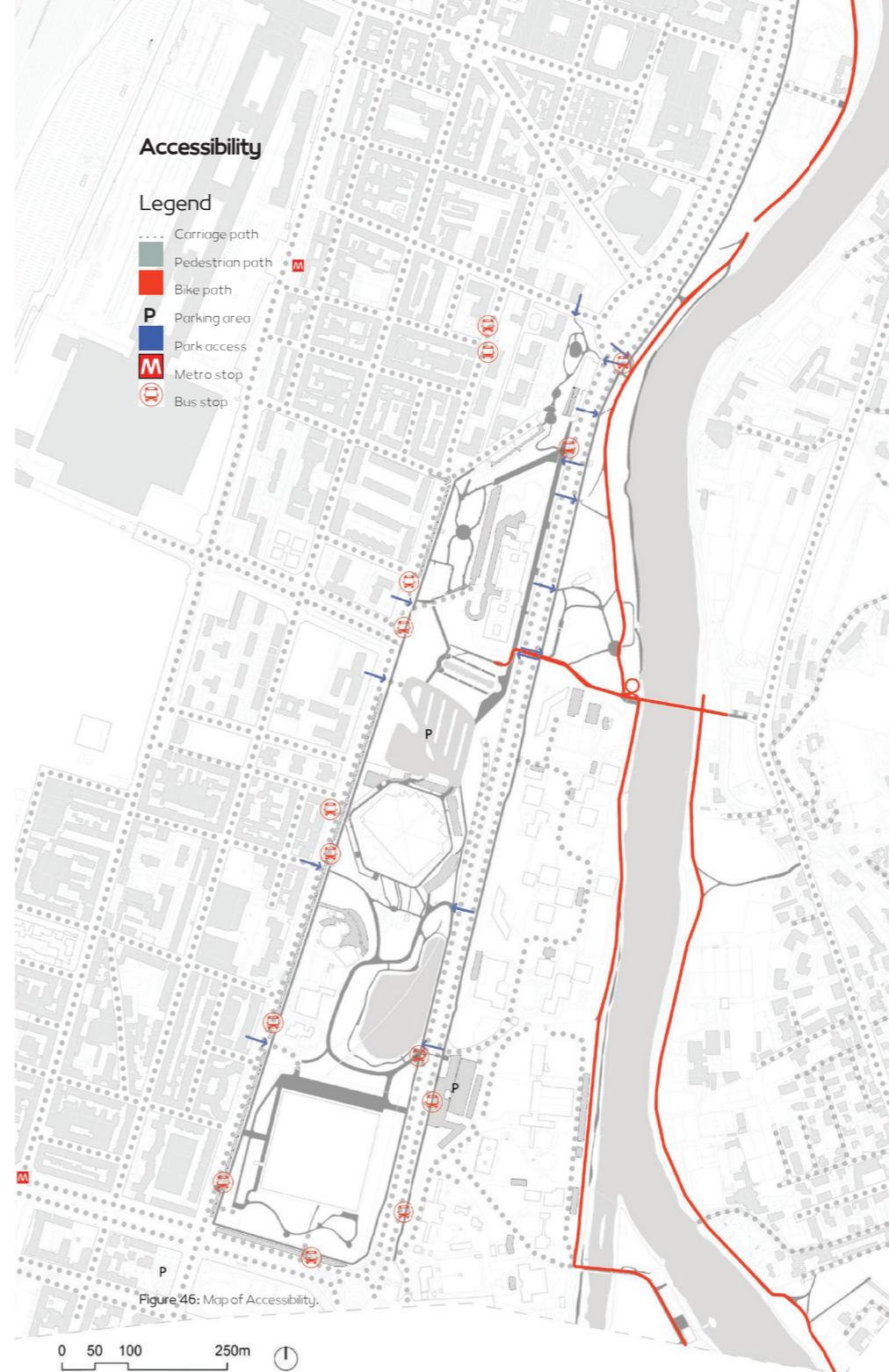
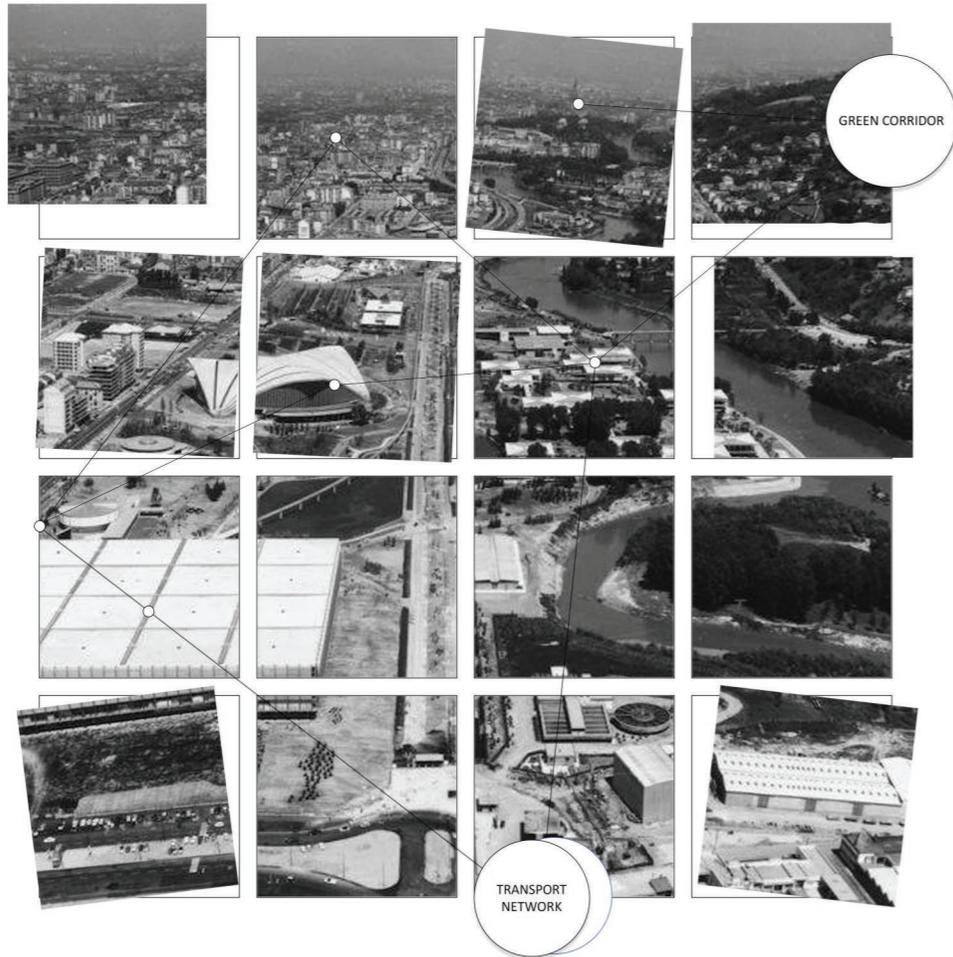
23. DoCoMoMo International. (n.d.). Organization. In DoCoMoMo. Retrieved March 12, 2023, from <https://docomomo.com/organization/>

24. "2016 Palazzo del Lavoro Torino." (n.d.). DoCoMoMo Italia. Retrieved May 9, 2023, from <https://www.docomomoitalia.it/2016-palazzo-del-lavoro-torino/>

22 May 2023

We explored the possibility of conducting our thesis project abroad, inspired by our engagement with DoCoMoMo. This led to a collaboration with Professor Wido Quist, section leader "heritage and architecture" of TU Delft and the Secretary-General of DoCoMoMo International. Professor Quist's expertise in heritage conservation, combined with Professor Durbiano's insights into project feasibility, significantly enriched our project.

URBAN ANALYSIS



Public Transport:

Situated between two metro stations, the Palazzo del Lavoro benefits from convenient access to public transportation, ensuring easy connectivity to the city center. Additionally, the presence of bus stations along three main streets surrounding the site further enhances accessibility for commuters relying on bus services. For broader regional access, the proximity to the Lingotto train station provides an additional transportation option.

Road Infrastructure:

The east side of the site, serving as the city entrance, is linked to a highway, providing a direct route for vehicular traffic. However, it is worth noting that this highway on the east side experiences high traffic volumes during peak hours, impacting the overall movement to and from the site.

Cycling Infrastructure:

While the site boasts pedestrian paths, it is important to highlight that the bike lane from the city center does not extend to the site. This limitation in the cycling infrastructure should be considered for future planning to encourage sustainable modes of transportation.²⁵

25. According to the maps provided by "Muoversi a Torino" (2024)

Functions in 1961

- A International Labor Exhibition
- B Circarama
- C Exhibition of the Italian Regions
- D Ministry of Labor Pavilion and Social Security institutions
- E Show Fashion–Style–Costume
- F Self Service (restaurant)
- G General Services
- H Restaurant, Offices, shops, Chapel
- I Fountain
- L Lakes
- L Resale kiosks
- M Cable Car Station
- N Luna Park
- O Monorail
- P Parking
- O Showrooms
- R Entrances
- T Automobile Museum

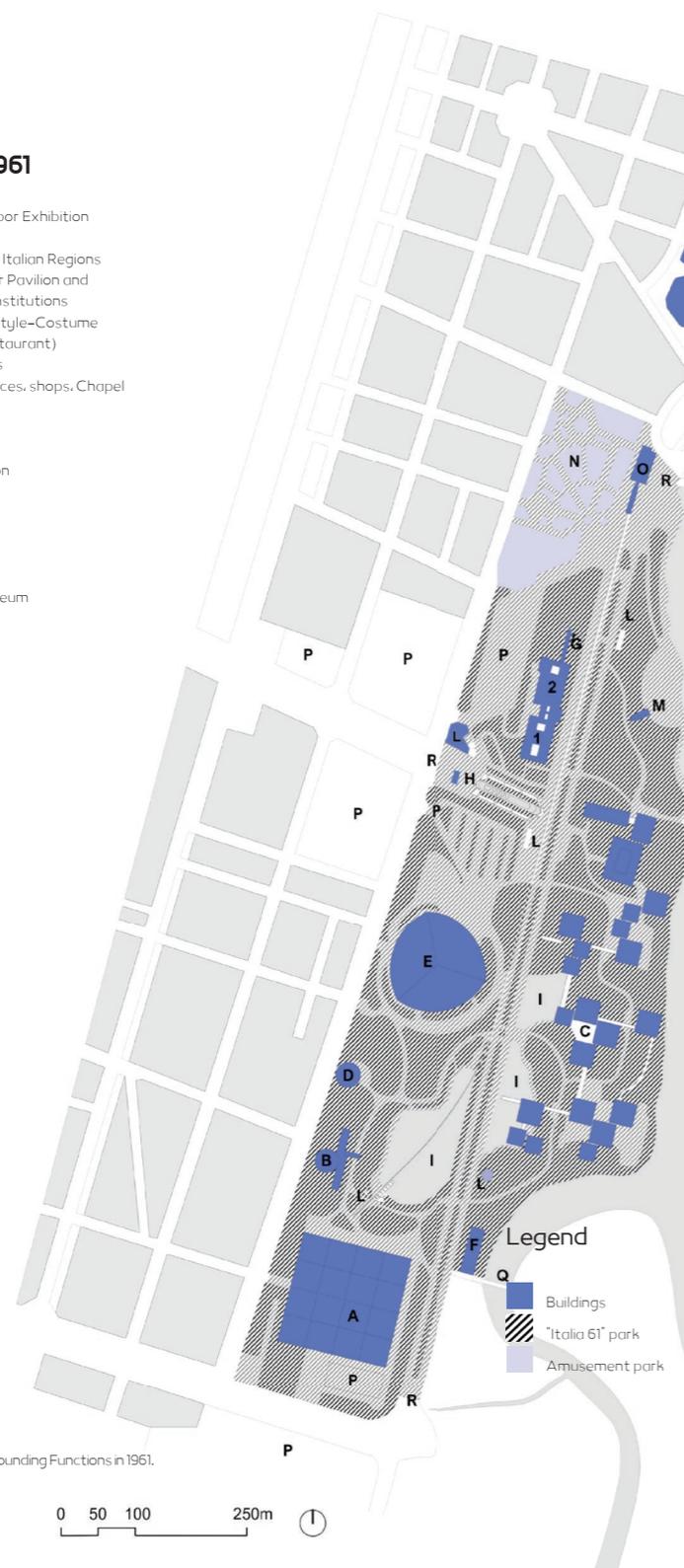


Figure 47: Map of Surrounding Functions in 1961.

The adaptive reuse of Palazzo del Lavoro benefits from the strengths of its surroundings, including Park Italia' 61, the monorail, and the nearby Palavela. These elements contribute to the project's viability and historical significance, forming a robust foundation for a vibrant, multi-functional space.

Adjacent to the Palazzo, Italia '61 Park is a historic site from Expo 1961, enriching the landscape and providing recreational value. The park's commemorative significance enhances the adaptive reuse by drawing on its historical context, creating an authentic and unique setting.²⁶

The monorail, serving as a symbolic and landscape-connected element, adds a distinctive feature with the potential for iconic representation. Beyond its functional purpose, it contributes to the visual identity of the site, offering design opportunities that integrate with the adaptive reuse plan.

The Palavela's proximity, as another Expo 1961 structure, adds historical depth to the adaptive reuse. Leveraging the Palavela's significance enhances the overall narrative, fostering a sense of connectivity with the past.

26. The celebration of the first centenary of the Unification of Italy. (1961). National Committee for the celebration of the first centenary of the Unification of Italy, Turin

In the heart of the Italia '61 event area, the Palazzo stands as a resilient symbol, marking the city entrance for more than fifty years. However, despite its enduring significance, the Palazzo has fallen into a state of decay due to unsuccessful attempts at redevelopment.

The landscape of the Italia '61 event area remains largely unchanged, characterized by the scenic riverbank, the picturesque hills in the background, and the arrangement of expansive exhibition structures. Notably, the only noticeable changes occurred in the western sector, which underwent urbanization in the two decades following the centennial celebration.

Moving eastward, the housing density gradually disperses as one approaches the river. The presence of public green spaces becomes more prominent, providing a scenic backdrop for landmarks such as Palazzo Vela and Palazzo del Lavoro. Smaller buildings within these green areas house various public entities and activities, contributing to the area's dynamic character.

Continuing beyond Corso Unita d'Italia, these structures now serve as the residences for the UNESCO Center of Turin and the International Training Center of the ILO. It's noteworthy that these buildings, once the Pavilions of the Regions during the 1961 event.

Functions in 2023



Figure 48: Map of Surrounding Functions in 2023.

Existing Greenery

The Palazzo is situated in the southern part of Italia' 61 Park, and the site, left abandoned for numerous years, boasts mature greenery, encompassing around 200 trees. These trees hold significant ecological and aesthetic value for the property. Considering their age and size, preserving them becomes crucial for maintaining the site's character in any redevelopment or adaptive reuse plan.

The lush green surroundings and the proximity to the Po River²⁷ bank not only elevate the visual appeal but also deliver substantial environmental benefits by supporting biodiversity and cultivating a sustainable atmosphere. Their integration into the adaptive reuse project is pivotal, providing spaces for recreation and enhancing the overall user experience. This strategic approach harmonizes with the historical importance of Italia' 61 Park, emphasizing the delicate balance between urban development and the preservation of nature. The green surroundings and the Po River bank stand out as indispensable elements, offering both aesthetic allure and functional possibilities for the Palazzo del Lavoro's adaptive reuse.

27. Parco Italia' 61. (n.d.), Museo Torino.

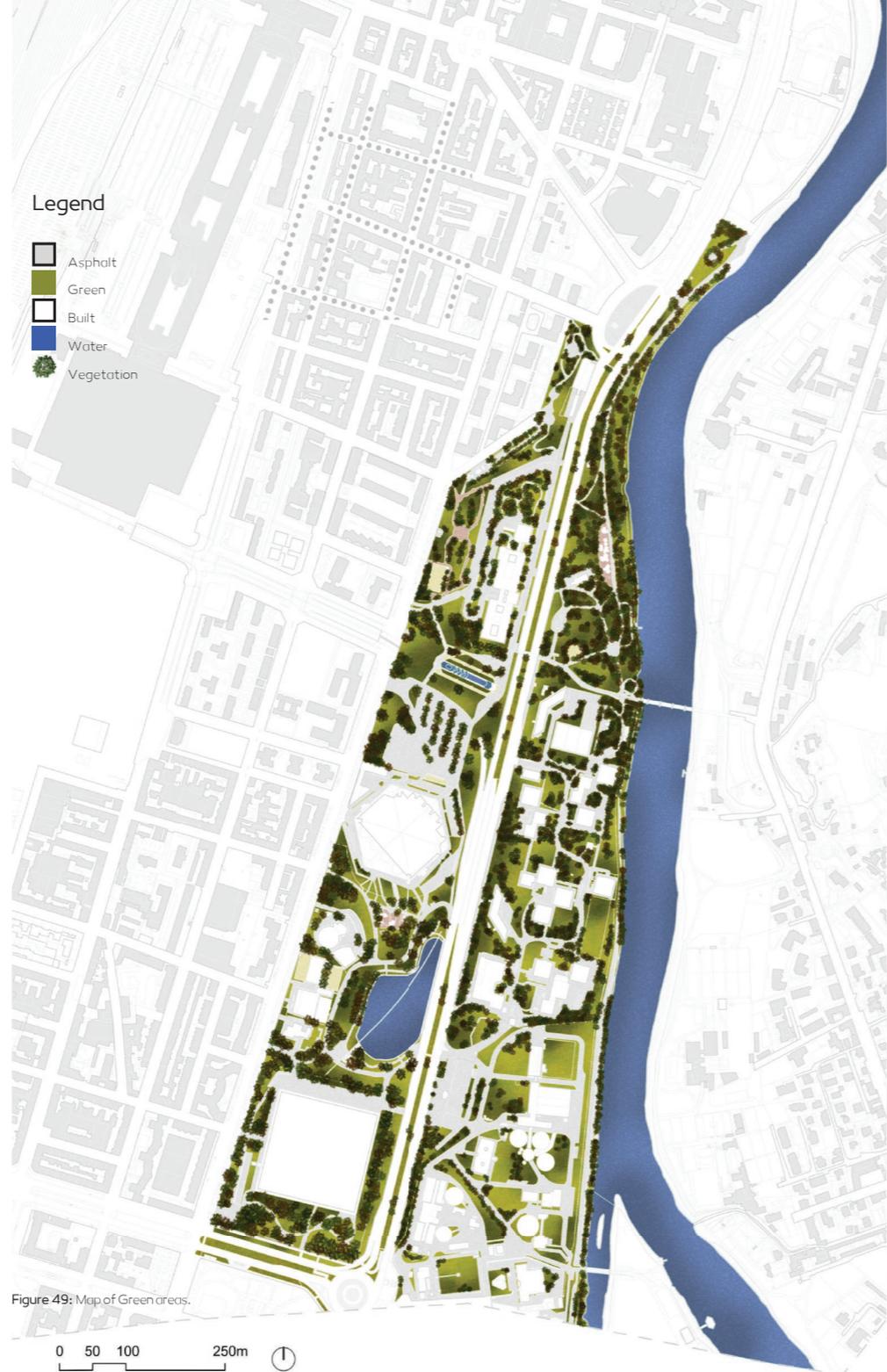


Figure 49: Map of Green areas.

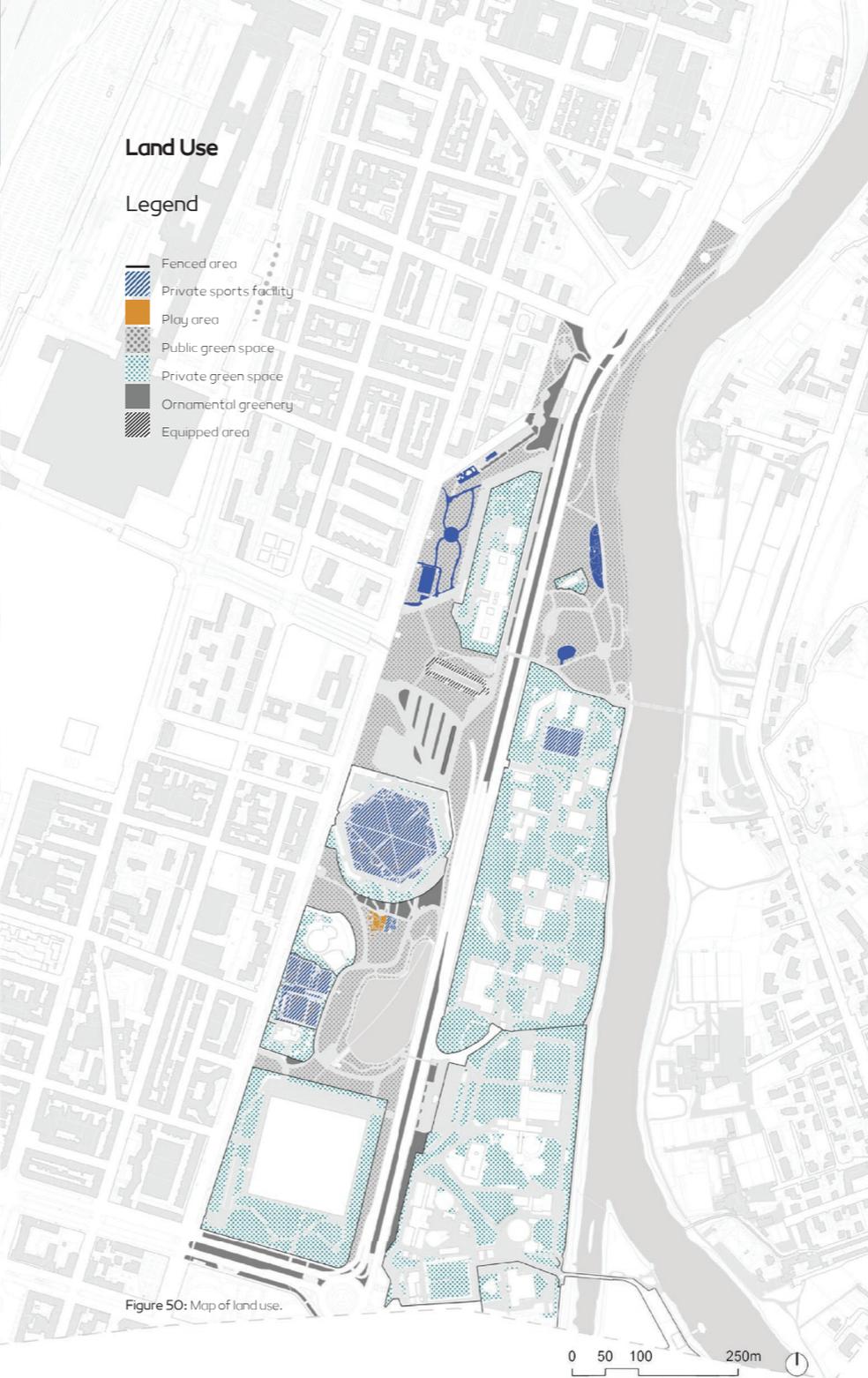


Figure 50: Map of land use.

In essence, the Palazzo's site has transitioned from a public to a private domain, and the surrounding green area has lost its synergy with the city over time. Similarly, various sections of the Italia' 61 complex have undergone transformations. Notably, the key observation is that this green pathway aligns predominantly with a residential zone featuring both public and private functions, rendering it a unique opportunity to seamlessly integrate into the cityscape. This strategic positioning not only enhances its utility for local residents but also contributes significantly to the broader city context. The Palazzo stands as a vital landmark, symbolizing the city's heritage and further emphasizing its potential to serve both local communities and the city at large.

STRENGTH

1. Masterpiece building
2. Memory of the city
3. Building's construction quality
4. Barrier-free structure design
5. Building's underground
6. Importance of the project
7. Extensive studies and information
8. Significant attention from stakeholders.
9. Involvement of main Torino's universities as stakeholders
10. Vicinity to Po river
11. Vicinity to the park
12. Being part of Italia 61 complex
13. Near metro stations
14. Rich public transport
15. Main motorways accessibility.

WEAKNESS

1. High maintenance costs
2. The deterioration due to long-term abandonment
3. Negative perception due to long abandonment
4. Lack of natural light in the underground
5. Lack of proper entrance for the underground
6. Lack of inviting entrances due to symmetrical design
7. Accommodating the diverse interests of the stakeholders
8. Requirement for significant financial investment
9. Increased time and costs for restoring original elements.
10. Insufficient parking
11. Noise and environmental pollution
12. Locating far from city center
13. Disconnected bicycle infrastructure.
14. High perception of insecurity
15. Few public services in the area

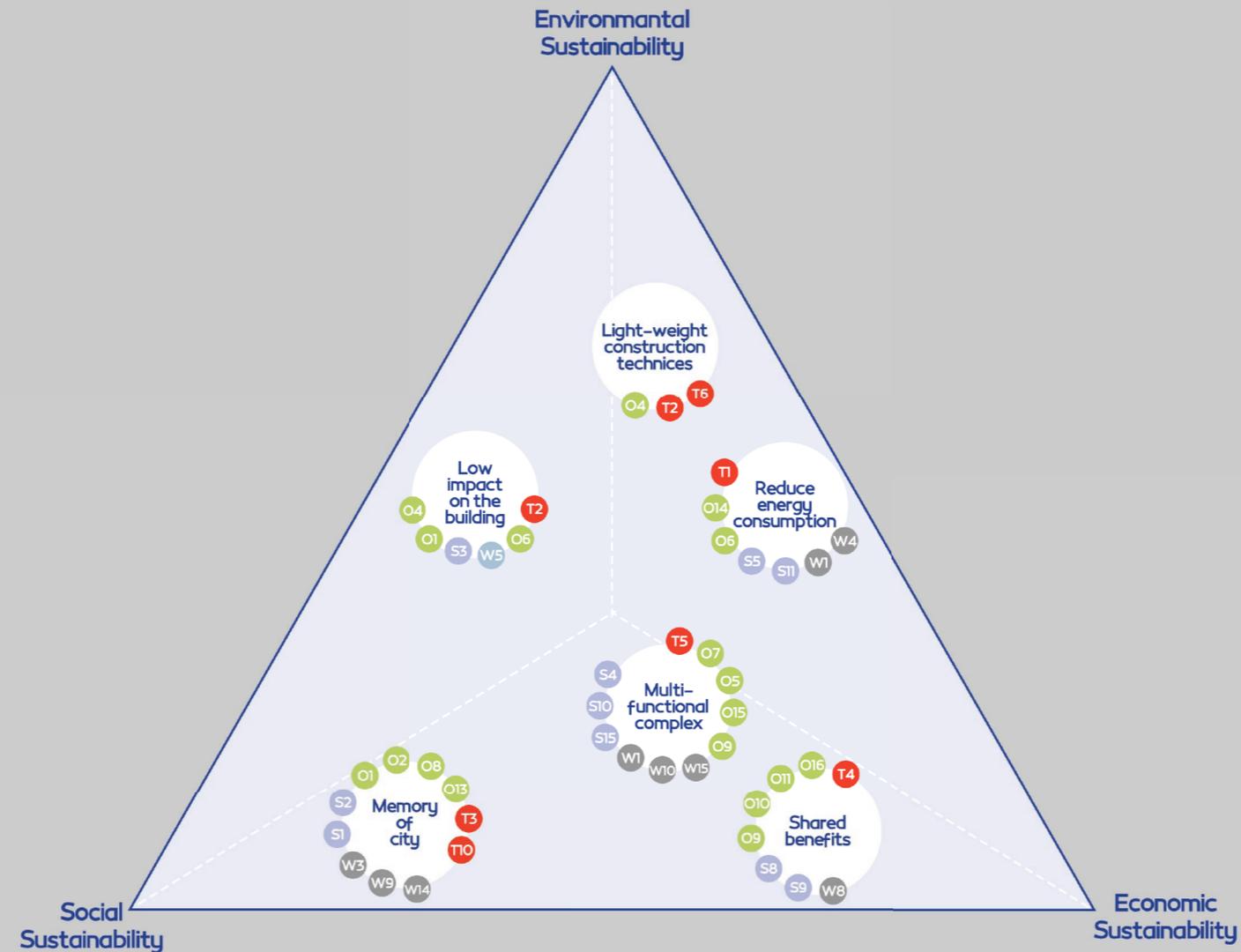


Figure 51: SWOT Diagram.

OPPORTUNITY

1. Being a heritage building
2. Being a masterpiece of architectural and engineering
3. The buildings' studies and information
4. A unified space allowing for flexibility
5. Possibility to design entrances on 2 sides of the building
6. Use of existing underground for different uses
7. Presence of natural light on all sides
8. Easy understandable due to the modularity of the building
9. Stakeholders' suggestions facilitate design process
10. Initial starting point for the Parco della Salute project
11. High intervention requests
12. Easy access thanks to the highway
13. Availability of public transportation
14. Integration to the park
15. Tourist attraction as city's entrance
16. Vicinity of Parco della Salute

THREAT

1. Challenges of using underground without natural light
2. Prioritizing the presence of 8 free columns
3. Negative impact of long building's abandonment
4. Challenge of accommodating different stakeholders' interests
5. Substantial financial investment required
6. Restoration expenses and prolonged duration.
7. Adjacency to the industrial area
8. Far distance from the city center
9. Insufficient parking availability
10. Sense of insecurity due to the vicinity to the highway and industrial area

MASTER PLAN DESIGN

Train access from the other Italian and Euro-pean cities to the Porta Nuova station

Train and bus access from the other Italian cities to the Lingotto train station



The proposal enhances the accessibility of the Palazzo del Lavoro by capitalizing on its proximity to the Lingotto transportation hub and two metro stations, while addressing its distance from Turin's city center through sustainable transportation solutions. New bike lanes from Lingotto and Bengasi metro stations to the site, coupled with bike-sharing stations, facilitate green connectivity. Additionally, the strategic use of Lingotto and Porta Nuova train stations enables seamless access for visitors from other cities, promoting cycling as an eco-friendly option.

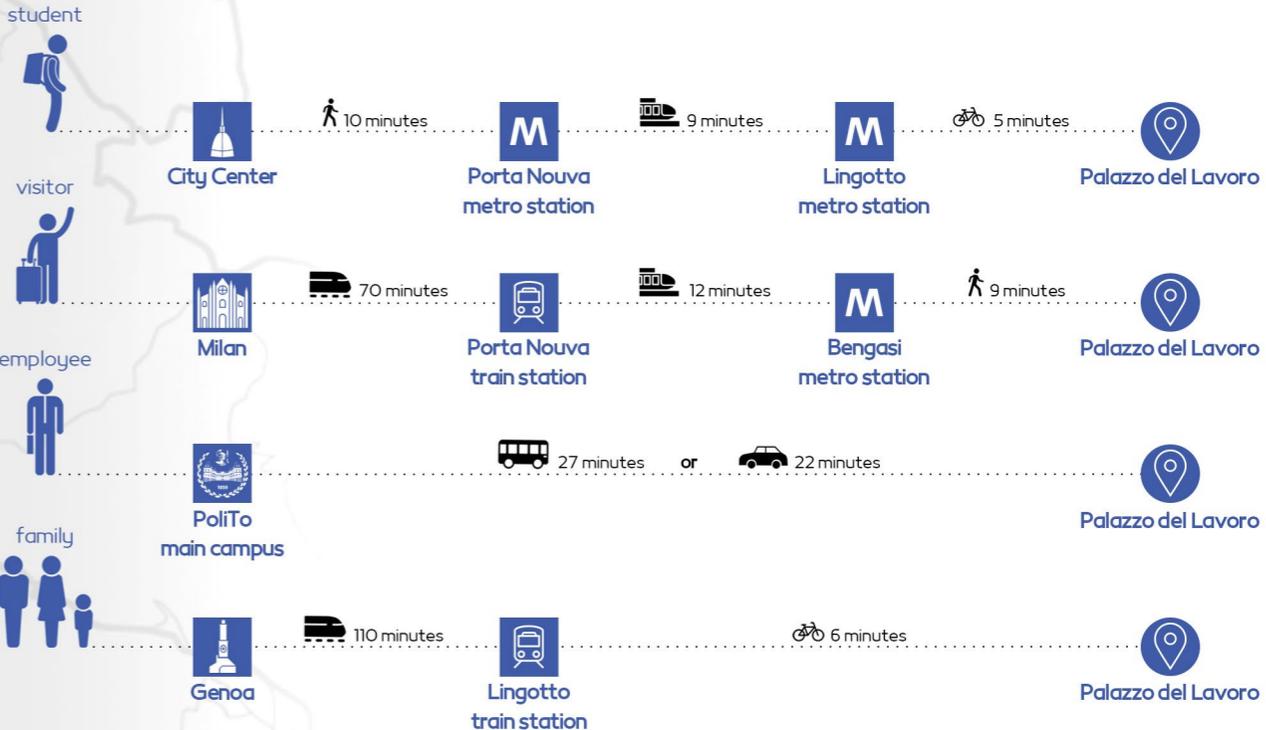


Figure 52: Accessibility strategy.

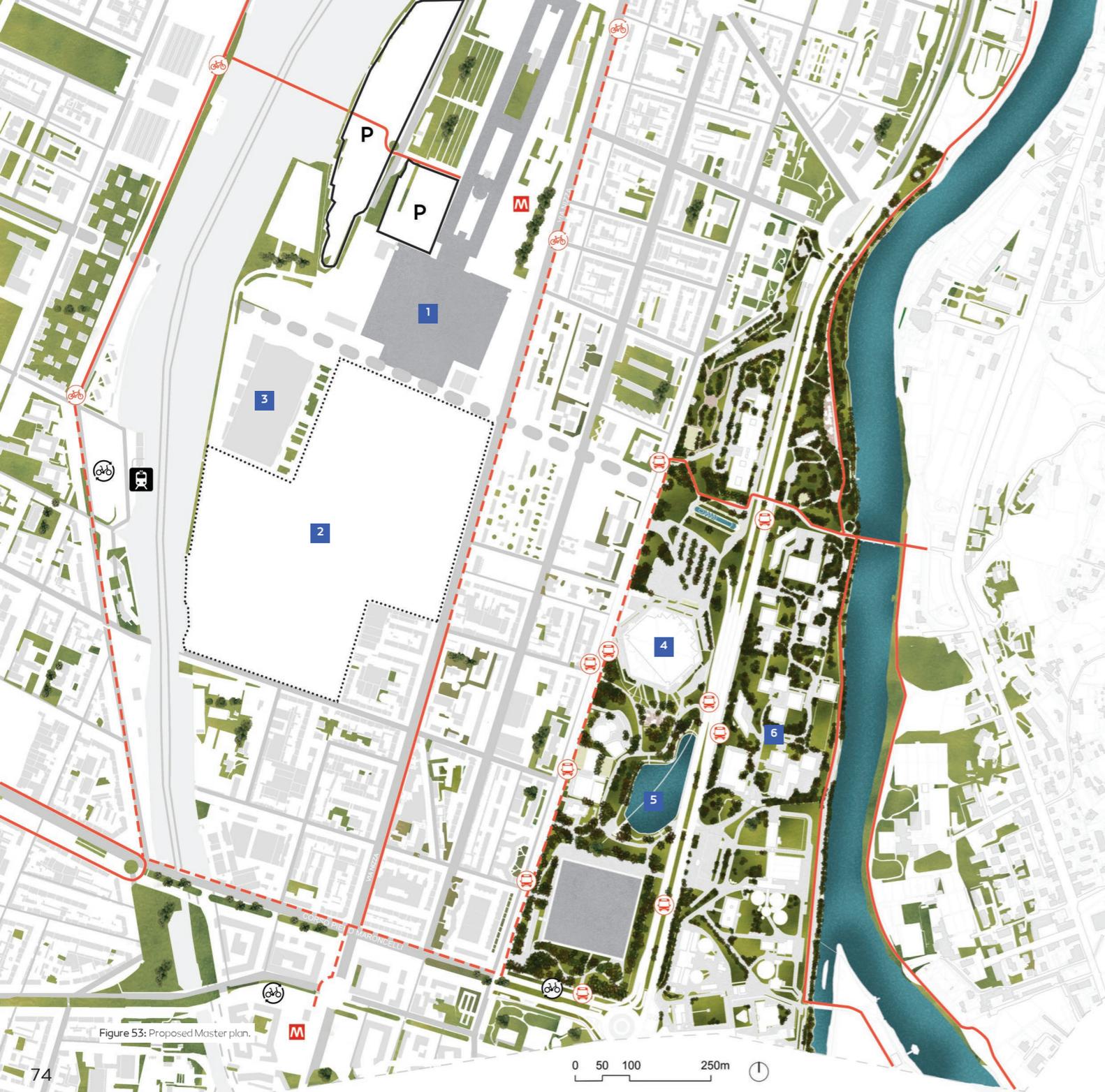


Figure 53: Proposed Master plan.

MASTER PLAN DESIGN

The proposal for enhanced connectivity and sustainable mobility serves as a pivotal component in reinvigorating the Palazzo del Lavoro and integrating it seamlessly into the cityscape. This initiative aims to address traffic challenges, promote eco-friendly modes of transportation, and align with the 2030 sustainability goals. The focal point revolves around establishing a robust connection between Palazzo del Lavoro and the Lingotto transportation exchange node, leveraging existing infrastructure and introducing strategic enhancements. Lingotto, strategically located in the southern part of the city, operates as a key transportation exchange

node. Housing both a train station and metro station, Lingotto serves as an ideal starting point for an efficient and sustainable transportation network. The proposal seeks to capitalize on this hub by optimizing its connectivity to Palazzo del Lavoro. A key element of the proposal involves the creation of a continuous bike lane linking Lingotto to Palazzo del Lavoro. This dedicated cycling infrastructure not only promotes sustainable mobility but also provides an alternative mode of transportation for short-distance commuting. The proposed bike lane is designed to enhance the overall accessibility and appeal of the route. To further facilitate green mobility, the proposal identifies and integrates existing bike lanes into the network. Additionally, new bike stations, strategically placed to cater to the needs of commuters, these stations not only serve as convenient points for bike rentals but also contribute to the overall accessibility and attractiveness of the sustainable transportation network. The Proposal for Enhanced Connectivity and Sustainable Mobility represents a strategic initiative to transform Palazzo del Lavoro into

a well-connected and eco-friendly urban space. By capitalizing on the transportation hub at Lingotto, integrating multi-modal connectivity, and emphasizing a continuous bike lane, the proposal aligns with current sustainability goals and enhances the site's accessibility for both local communities and visitors. This holistic approach not only addresses existing traffic challenges but also positions Palazzo del Lavoro as a model for sustainable urban development within the broader city context. On the other hand, in the vicinity of Palazzo del Lavoro, a concurrent project is underway in Parco della Salute. This ongoing initiative not only shares geographical proximity but also exhibits reciprocal influence between the two urban developments. The proposals for both projects indicate a symbiotic relationship, and there are strategic considerations to integrate certain functions of the Parco della Salute project into the adaptive reuse plan for Palazzo del Lavoro. The significance of this connection is highlighted through the emphasis on creating a green corridor and an enhanced bike lane, facilitating seamless integration between these two transformative endeavors.

Legend

- 1 Lingotto
- 2 Grattacielo Regione Piemonte
- 3 Oval Lingotto
- 4 Palavela
- 5 Park Italia'61
- 6 International Training Centre of the ILO
- Lingotto Train Station
- Bus Stop
- Metro Station
- Shared bike station
- Proposed Shared bike station
- Proposed Bike lane
- Existing Bike lane

02 SCIENCE MUSEUM: BACKBONE OF THE MULTIFUNCTIONAL COMPLEX

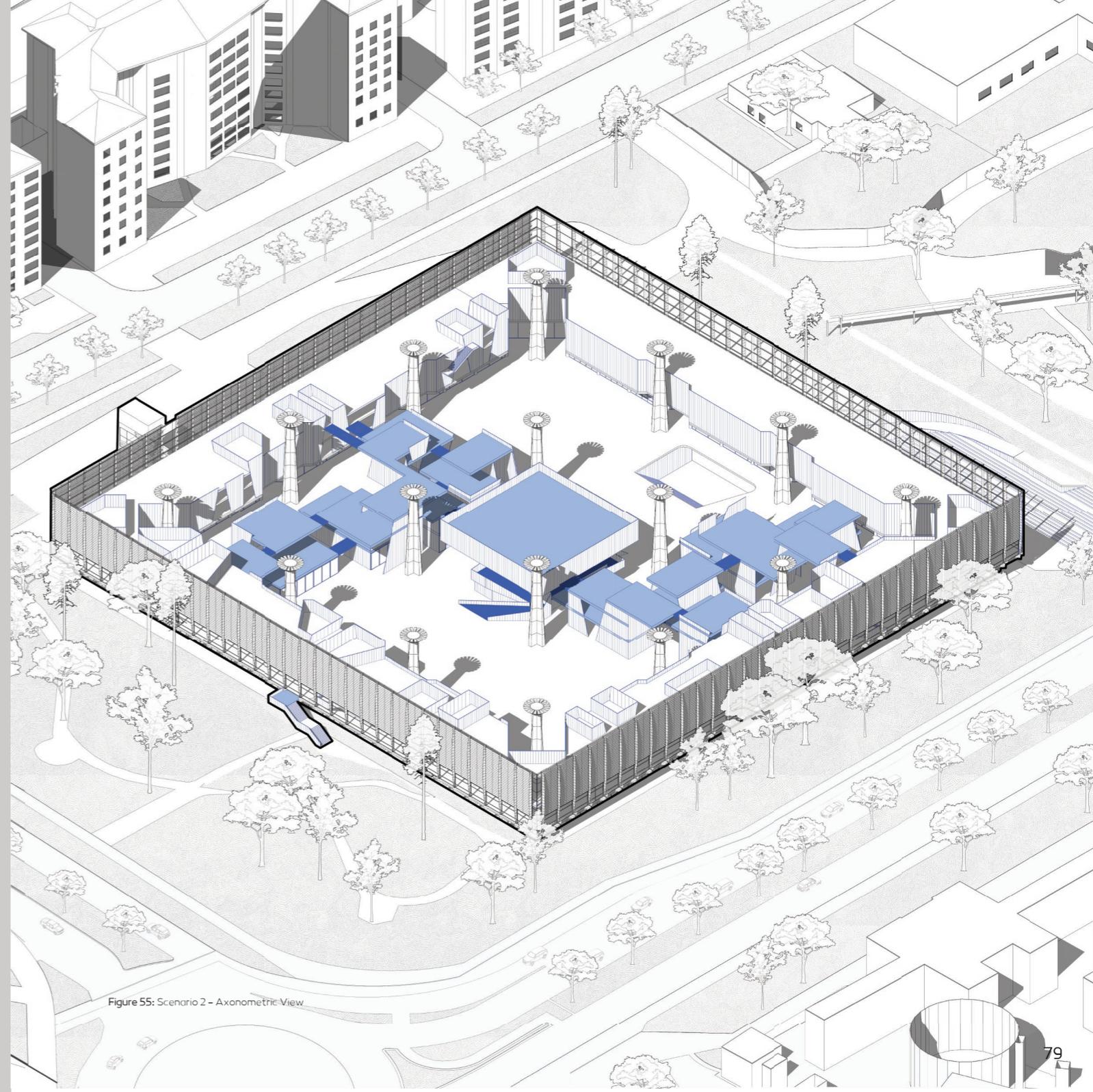
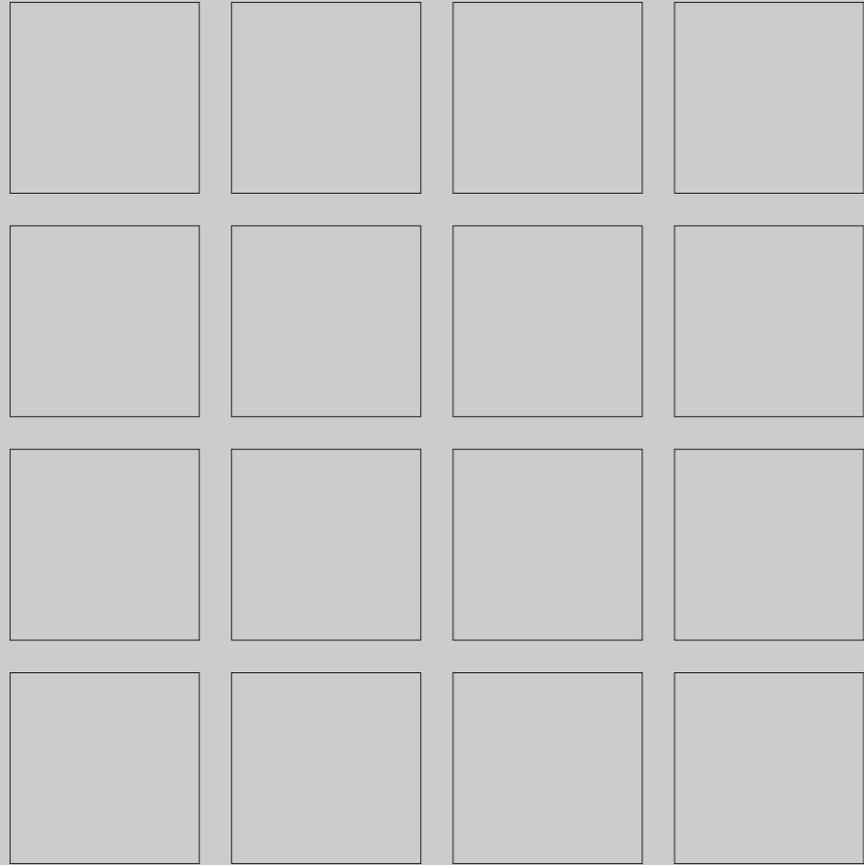


Figure 55: Scenario 2 - Axonometric View

EXTENSION OF EXISTING SLABS

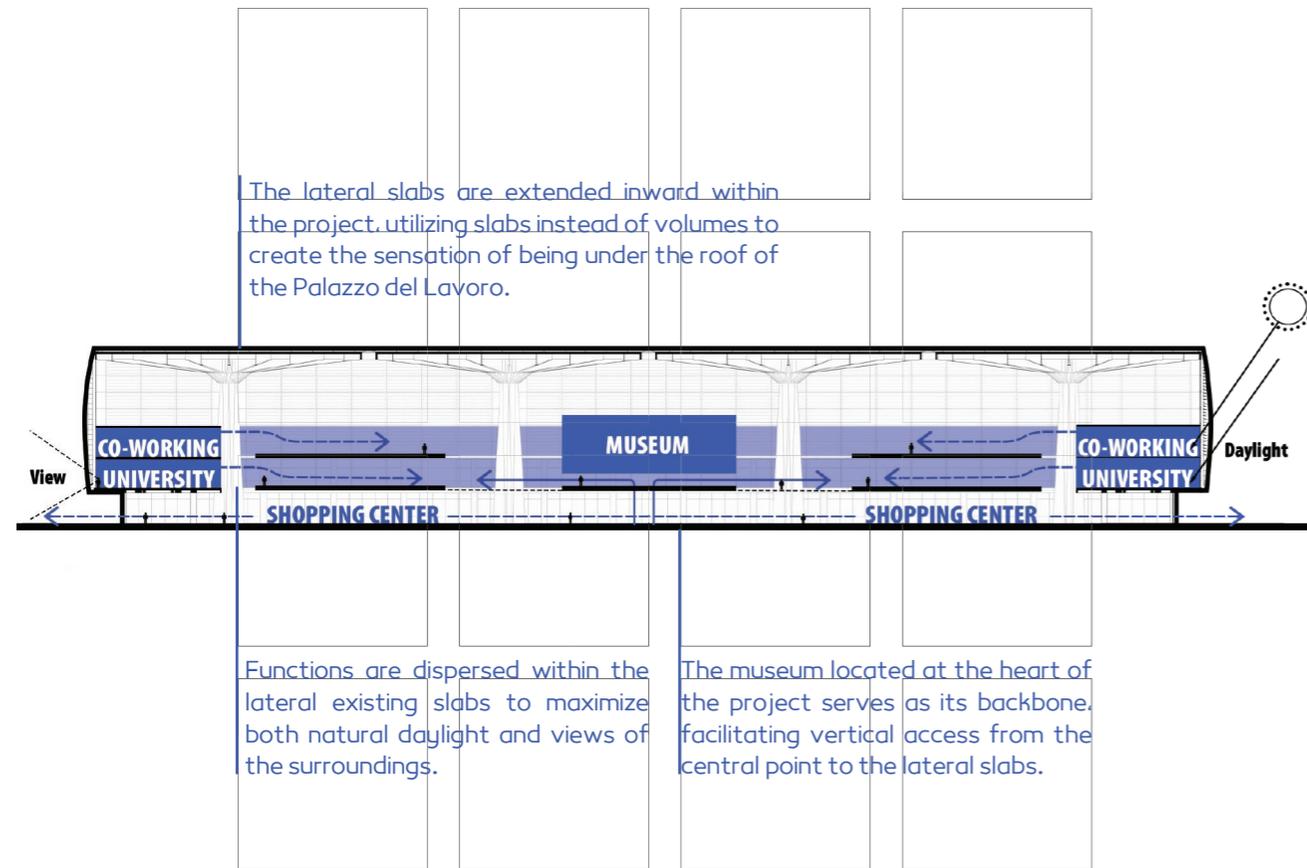


Figure 56 :Diagram for existing slab extension Idea.

Upon revisiting the initial proposal, a crucial constraint emerged: the imperative to maintain a sufficient distance from at least eight of the existing columns within the Palazzo del Lavoro.²⁸ This discovery necessitated a thoughtful revision of the design, particularly the concept of layering, which was preserved yet adapted to accommodate this new limitation. In response, the revised design strategically reduced the number of added slabs and positioned them closer to the building's corners, allowing the central area to be dedicated to the science museum, which serves as the project's core.

This modification engenders two significant internal plazas within the structure, offering a gesture of respect towards the spatial unity of the Palazzo's interior. Unlike previous designs where added slabs might obstruct views, this approach ensures a more cohesive visual experience within the building. The ground floor continues to host the shopping center, preserving the commercial vitality of the original proposal. Moreover, primary functions are still situated on the upper levels along the lateral slabs to harness ample natural light, with the new slabs acting as extensions of these areas, thereby supporting the main functions.

Crucially, the new slabs are designed to converge towards the center of the project, leading to the centrally located science museum. This museum emerges not only as a focal point but also as the structural and conceptual backbone of the entire project. It engages with the public realm on the ground floor, drawing visitors towards its exhibitions and activities. Furthermore, it seamlessly integrates with the university and co-working spaces through the newly extended slabs, fostering a dynamic interplay between educational, professional, and public domains.

28. Superintendency, (2011, August 10). On August 10, 2011, the Superintendency established a protection constraint pursuant to articles 13-14 of Legislative Decree 42/04 prot. 18707 CL. 34.07.07/1068.450.

Science Museum

The Science Museum, dedicated to the memory of Piero Angela¹ and situated at the heart of the project, serves as its structural and conceptual backbone. Thoughtfully designed across multiple levels, it provides direct ground floor access to the public while facilitating connections to the university and co-working spaces through the distribution across added slabs. The museum's first level is configured to function as a central distribution hub, catering to a diverse user group that includes students, visitors, and shoppers. This positioning not only enhance the museum's accessibility but also reinforce its role as a pivotal element within the project, seamlessly integrating various functions and fostering a dynamic interaction among the building's inhabitants.

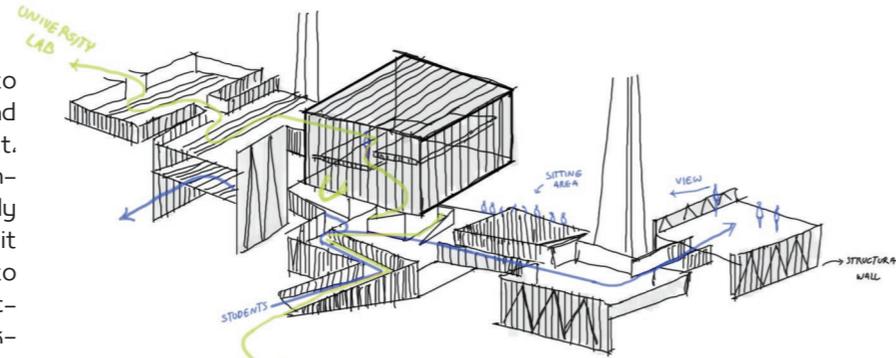


Figure 57: Scenario 2 - Hand Sketch.
1. Angela, Piero D. (1928-2022). Renowned Italian science communicator, journalist, and television host, celebrated for his contributions to public understanding of science.

Northern Plaza

In light of the analysis aimed at enhancing contextual connectivity, the proposition of constructing a plaza on the northern side of the building emerges as a strategic intervention. This plaza, conceived through the excavation of ground outside the building's perimeter, seeks to anchor the structure within its surrounding landscape. Such an architectural gesture not only bridges the gap between the park and the building but also revitalizes the underground level by introducing natural light. Accordingly, this illuminated underground space is envisioned to host an event center, designed to be accessible from both inside and outside the building.

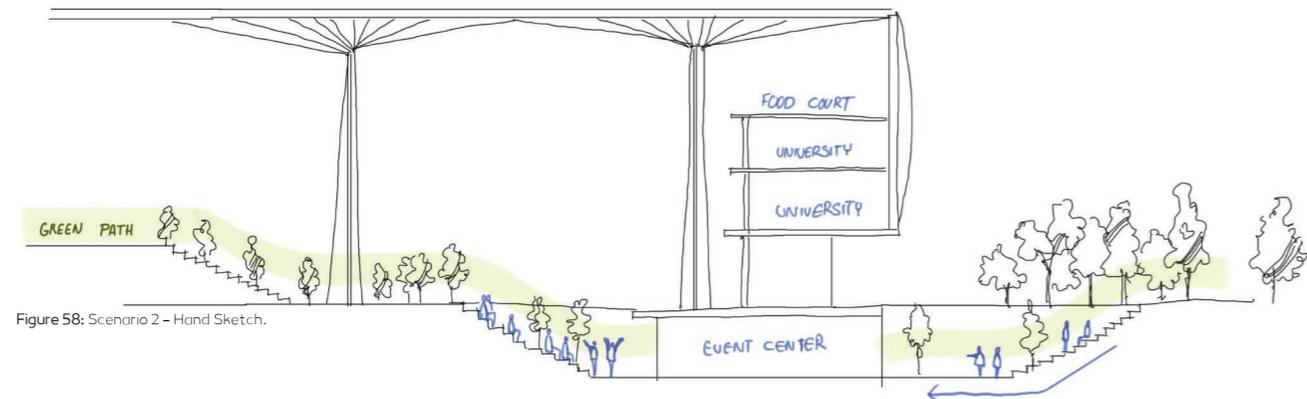


Figure 58: Scenario 2 - Hand Sketch.

Structural Idea

The proposal adopts structural walls over columns to minimize foundation impact. Oriented to guide movement, these walls are combined with translucent materials, ensuring structural visibility while enhancing spatial

aesthetics with natural light interplay. This approach integrates functional and aesthetic considerations, showcasing a harmonious blend of structural innovation and design sensitivity.

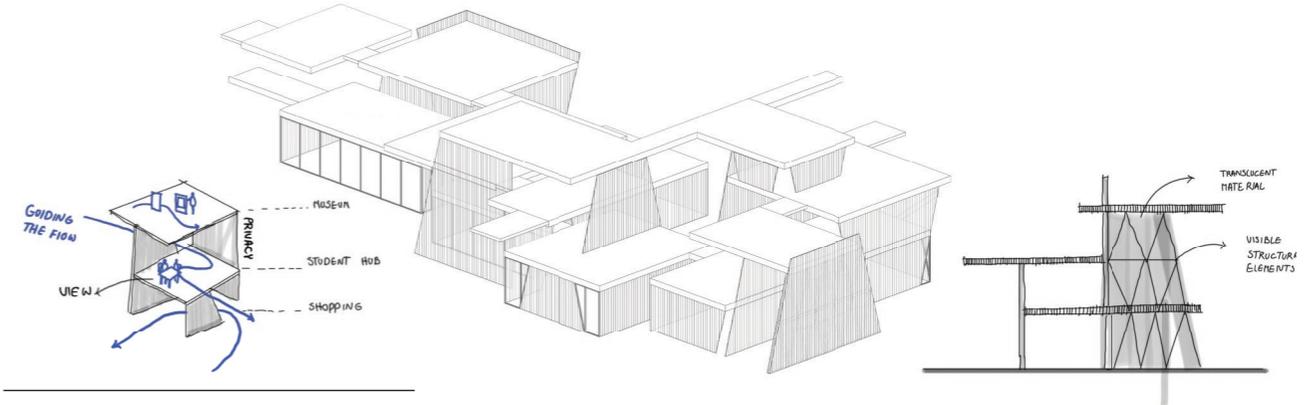


Figure 59: Scenario 2 - Hand Sketch

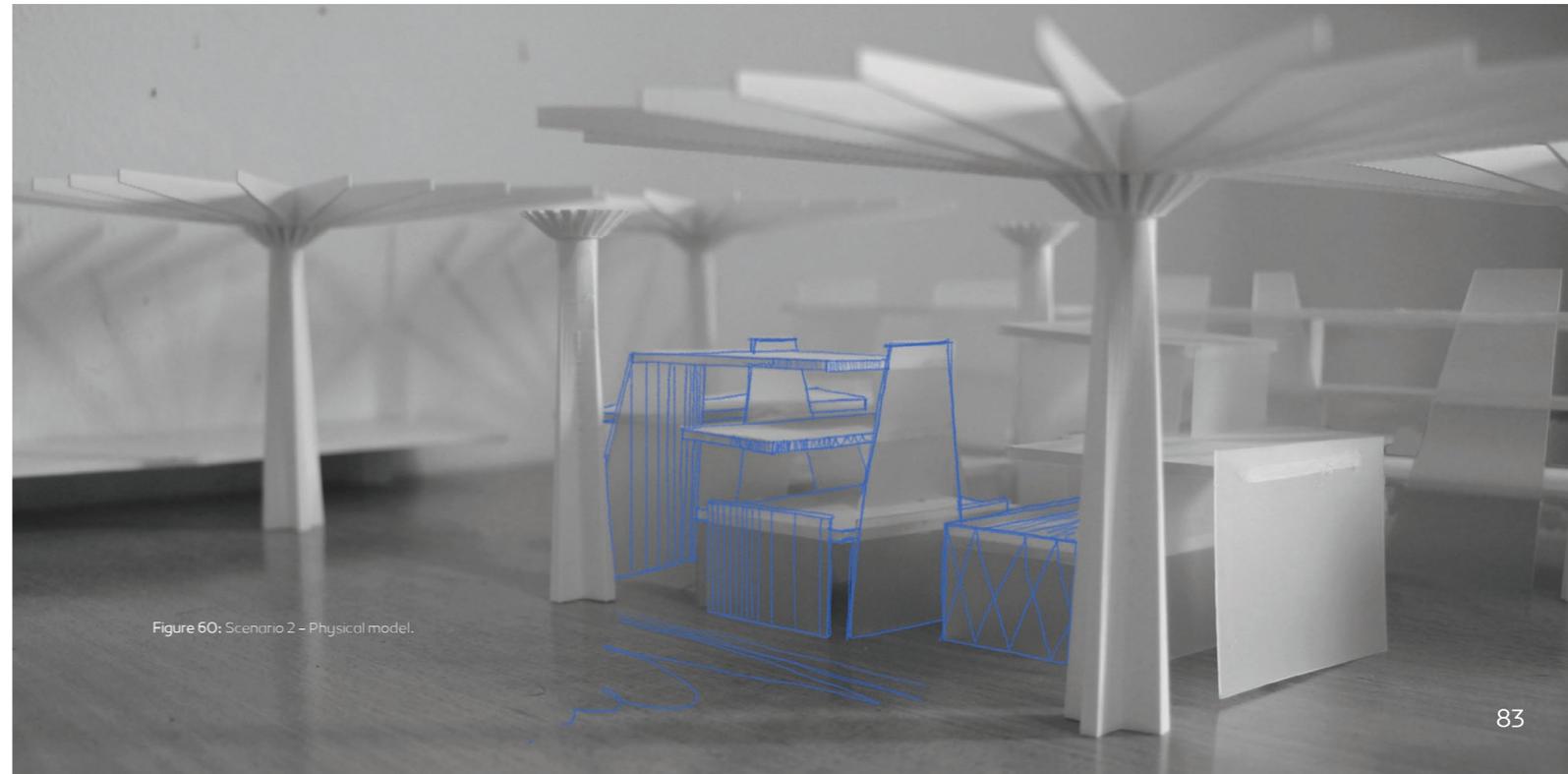


Figure 60: Scenario 2 - Physical model.

Shopping center

The shopping center, situated on the ground floor of the project, is designed to serve as an accessible and dynamic retail environment. It is anchored by two principal entrances from the south and north, each leading into one of the two newly created internal plazas. These entrances not only facilitate direct access but also symbolize the project's dual orientation: one plaza extends a welcoming gesture towards the city from the south, while the other integrates more closely with the adjacent park to the north. The interplay between the shopping center and the science museum, mediated through carefully considered circulation and gathering spaces, exemplifies a commitment to creating vibrant and inclusive public environments.

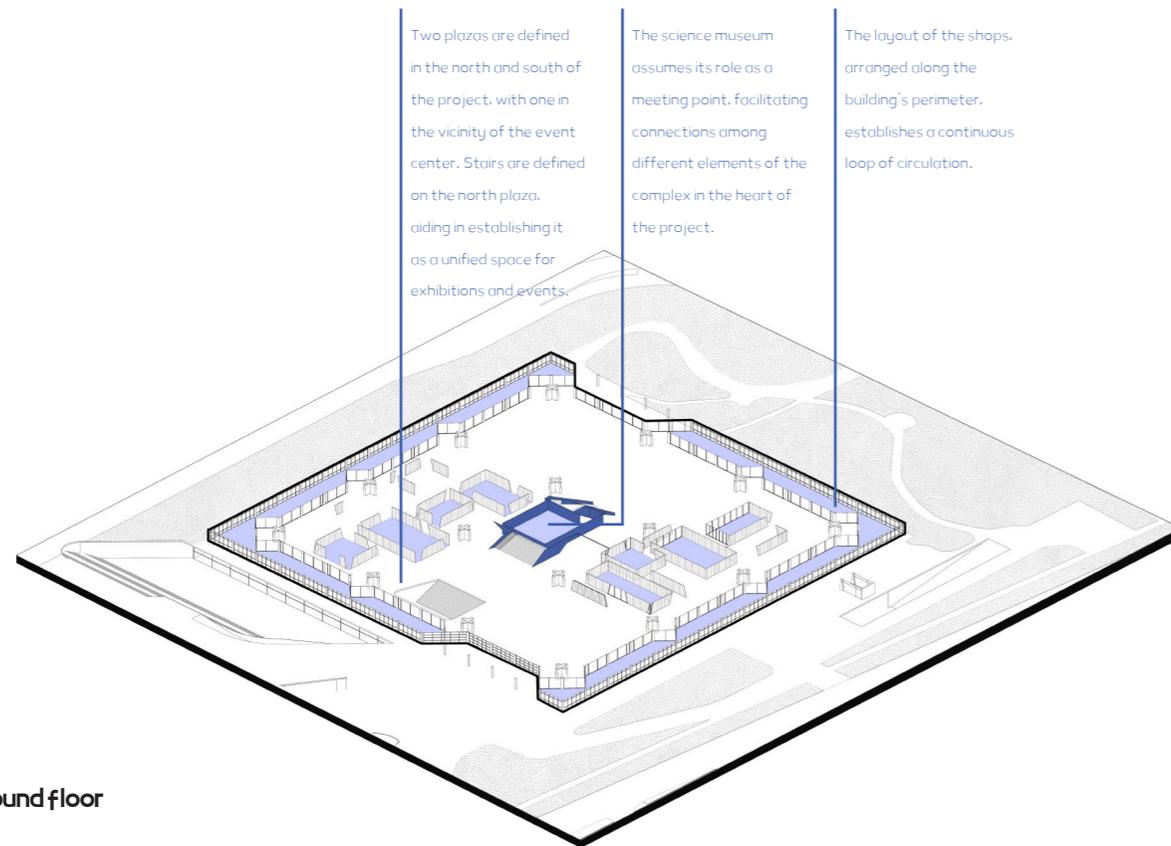
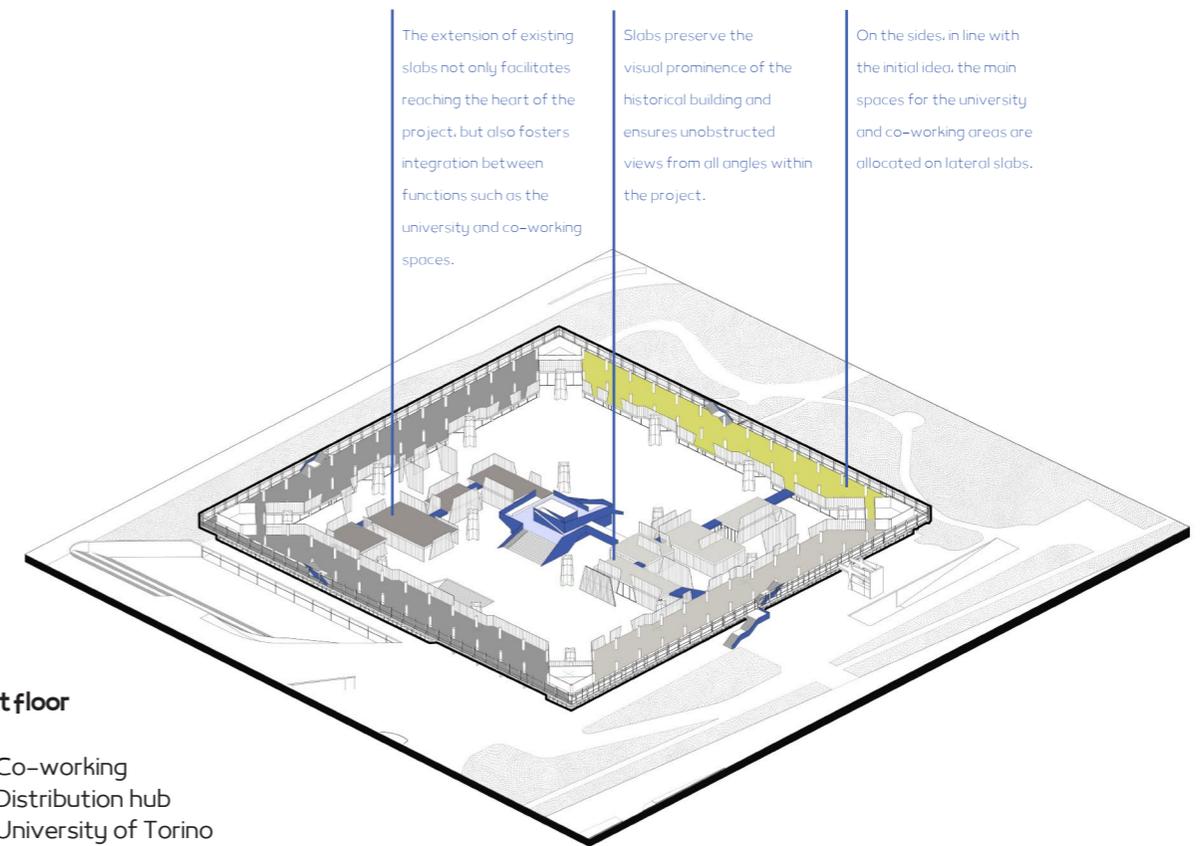


Figure 61: Scenario 2 – Ground floor Axonometric View.

University

On the first floor, the design strategically allocates lateral spaces to two significant academic institutions: Politecnico di Torino and the University of Torino. This allocation leverages the building's architecture to ensure that the main functions of each university benefit from ample natural daylight by positioning them along the building's perimeter. Consideration has been given to the accessibility between the universities and the co-working spaces, establishing a fluid connection that facilitates the transition between educational and professional environments.



First floor

- Co-working
- Distribution hub
- University of Torino
- Politecnico di Torino

Figure 62: Scenario 2 – First floor Axonometric View.

Laboratories

On the second floor, an innovative integration of the university laboratories with the science museum is introduced, blurring the traditional boundaries between academic research and public engagement. This arrangement allows the laboratories to serve a dual purpose: facilitating academic research and educational activities for the university, while also opening up to visitors of the science museum.

By combining the laboratories with the museum space, the design fosters an environment of openness and curiosity, encouraging a broader understanding and appreciation of scientific research among the general public.

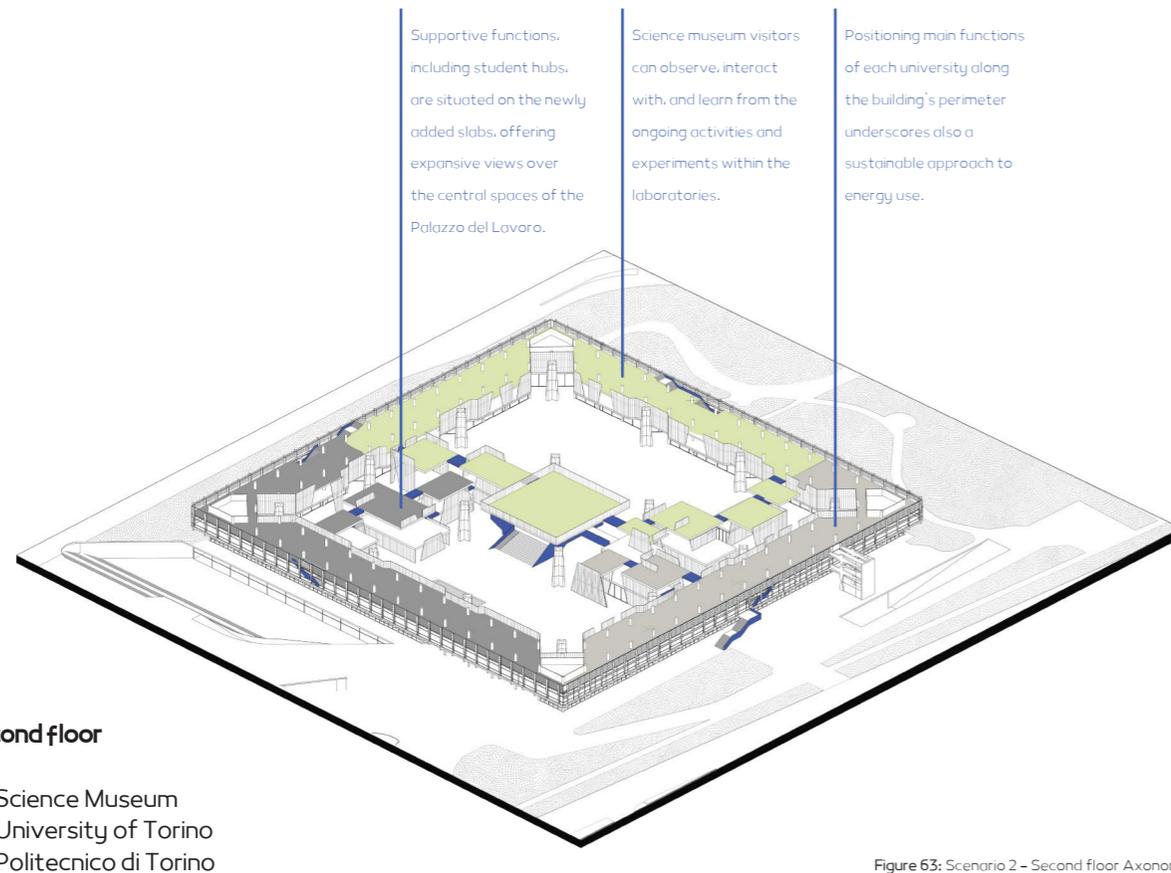


Figure 63: Scenario 2 – Second floor Axonometric View.

Co-working

On the third floor, the project extends its provision for co-working spaces within the lateral slabs, further enhancing the building's functional diversity. These spaces are positioned to cater to professionals, freelancers, and start-ups, offering a vibrant and flexible work environment. To complement the co-working areas, newly added slabs are designated as lounges and relaxation spaces. These areas are designed to serve as communal zones where individuals can unwind, network, and collaborate in a more informal setting.

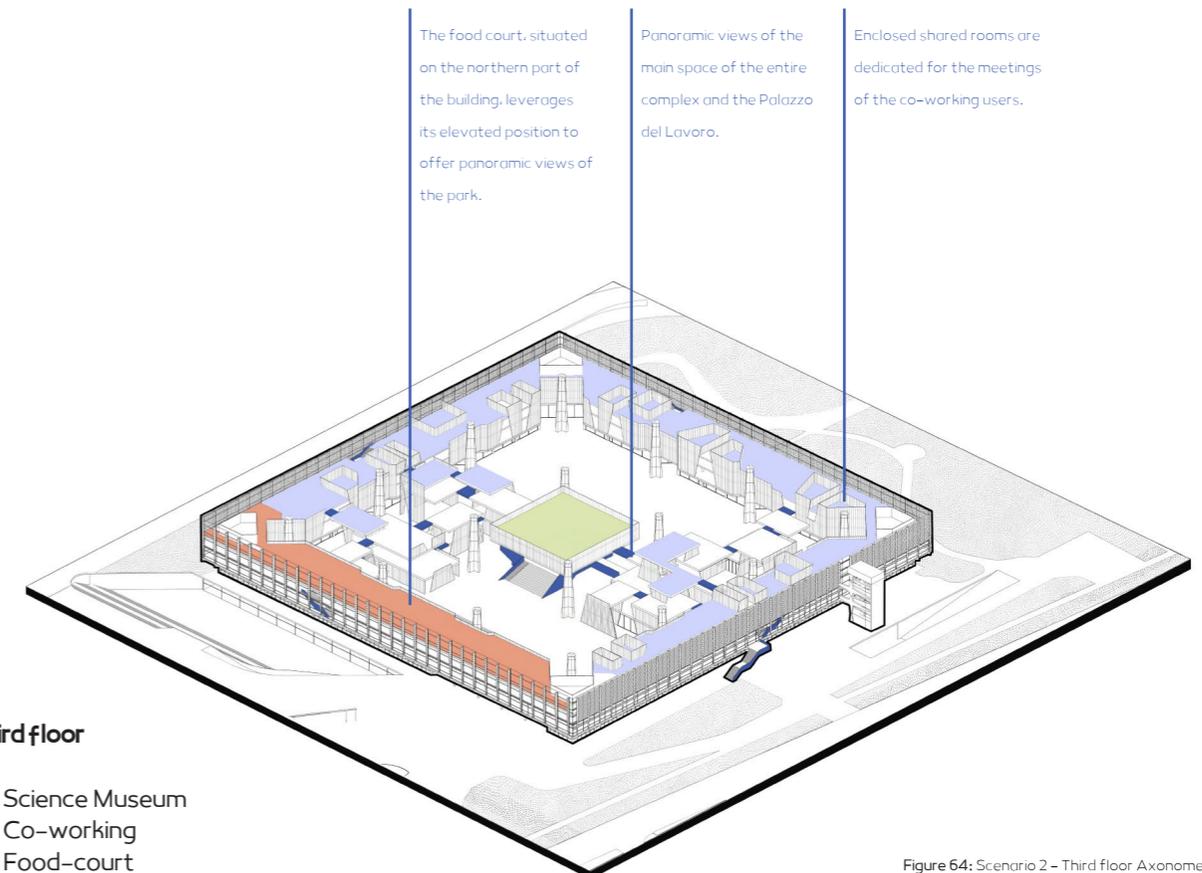


Figure 64: Scenario 2 – Third floor Axonometric View



30 June 2023

During this period of the project, our focus was on comprehensively understanding and documenting the various steps of the project through an innovative lens. We embarked on experimenting with artificial intelligence to facilitate the mapping of the project's progression. Our objective was to develop this AI-driven approach not merely as a novelty but as a practical tool that could be answer to a challenge of dynamic mapping process of the project integrated and utilized throughout different stages of the project. This endeavor was aimed at enhancing our methodological framework by introducing a dynamic, adaptive, and potentially predictive element into our project management and design process strategies.

AI MAPPING

Exploring the methodologies elucidated in the book "SIN-TESEI," the potential of mapping emerged as a tool for navigating the complexities of the project. This approach was particularly compelling given the multifaceted nature of the complex. Through the strategic application of mapping, it became possible to chronologically organize and present information related to different phases of the project.

In response to the need for a dynamic and diachronically adaptable mapping approach, the project sought to leverage artificial intelligence to enhance efficiency and effectiveness. ChatGPT²⁹ was selected as the AI language model of choice. Through prompt engineering in ChatGPT, it was defined the specific context and information parameters of the project, enabling it to accurately recognize and categorize critical elements, and to discern the intricate connections.

The primary goal was to enable ChatGPT to dynamically articulate the evolving nature of the project, allowing for the automatic updating and modification of the map as necessitated by changes. A framework was established to align with the project's desired outcomes, leading to the exploration of various visualization tools. The Kumu³⁰ website was identified as the most suitable platform for final visualization. To facilitate automation, the project's mapping process was enhanced by linking the KUMU map to a GitHub²⁹ webpage hosting the project's JSON code (representing elements and their interconnections). This webpage, in turn, was connected to the output of the Chatbot.

An example of this workflow, presented for a simplified segment of the project, demonstrates the process from the initial description fed into the chatbot, through to the chatbot's JSON response, and culminating in its visualization on the Kumu website.

ChatGPT 4.0

28. An advanced AI language model developed by OpenAI, designed to understand and generate human-like text based on the input it receives. It can engage in conversations, answer questions, and provide information or generate content on a wide range of topics, making it a versatile tool for various applications.



GitHub

29. GitHub is a web-based platform for version control and collaboration. It enables developers to store, manage, and track changes to their code projects in repositories. GitHub facilitates collaborative coding projects, allowing multiple contributors to work together on a single project from anywhere in the world.



Kumu.io

30. Kumu is a powerful online platform for creating interactive maps and visualizations of systems, networks, and complex relationships. It allows users to explore the dynamics of connections within any given context, making it a valuable tool for analysis, planning, and communication in diverse fields.



Due to the existence of the park Italia'61 and its historical value on the northern part of the building and to create better "connection building and park", we proposed an "outdoor plaza" on this side of the building. Also this proposal helped us to dedicate an "event center" on the existing underground level of the building. "Sufficient ceiling height" of the underground, gives us opportunities of designing the event center in the underground.



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    "description": "A proposed space to enhance the connection between the building and the park."
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    "type": "Analysis",
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  },
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    "label": "Event Center",
    "type": "Design",
    "description": "A newly designed space, re-purposing the underground level of the existing cinema."
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    "to": "Outdoor Plaza"
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  {
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    "to": "Event center"
  },
  {
    "from": "sufficient ceiling height",
    "to": "event center"
  }
]

```





The excavation outside the boundary of the building and creating the outdoor plaza, had the benefit of providing "natural light for underground level". also after proposing the event center for the underground level, thanks to the sufficient ceiling height of this part of the building, we proposed two multifunctional "cinema".

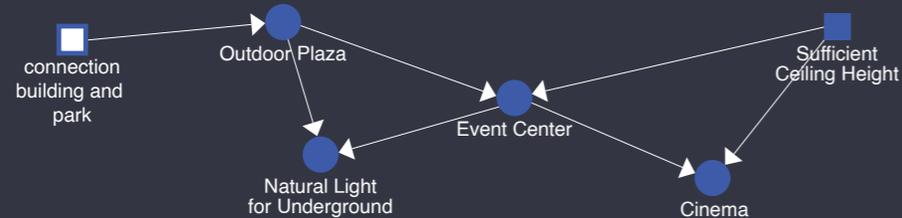


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    "to": "cinema"
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The idea of outdoor plaza also aligns with the strategy of "low impact on the building" which is driven from the historical value of the Palazzo del Lavoro. The outdoor plaza not only provide connection to the event center, but also "define event center entrance".

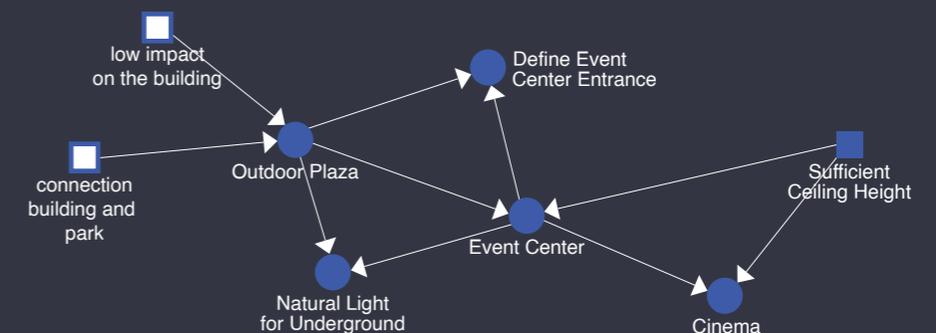


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  {
    "from": "event center",
    "to": "define event center entrance"
  }
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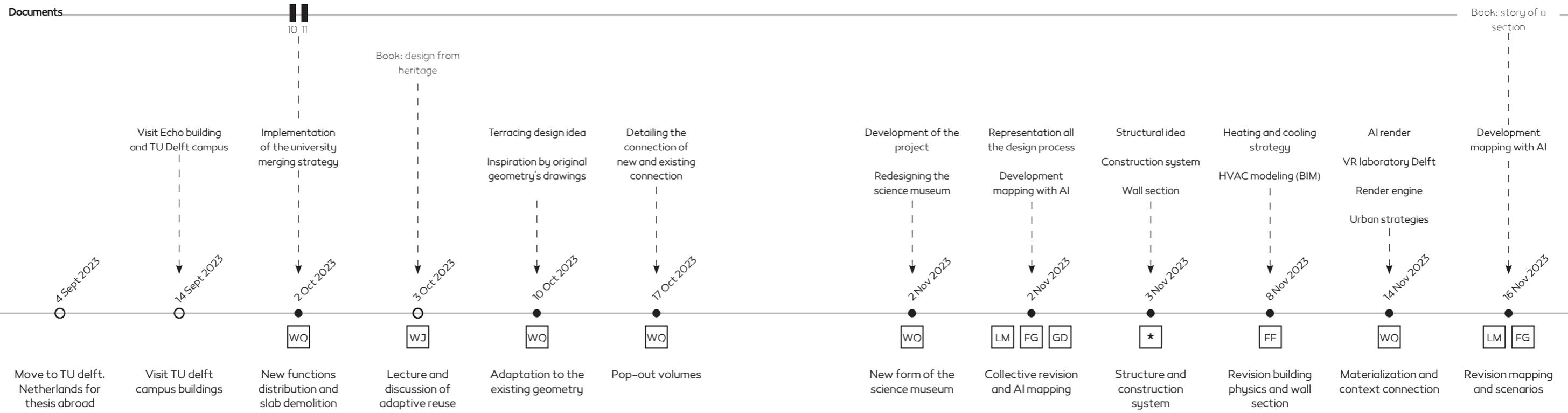
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10. The administration has been evaluating the project for the construction of a walkway connecting the Palazzo del Lavoro and the Palavela for some time, using the sections of the monorail, Philippe Versenti, October 17, 2023, on Torinocronaca website.

11. Paolo Mazzoleni: A single idea will hardly be enough to fill the vastness of the 43 thousand m² structure. 20 September 2023, on Torinoggi website.

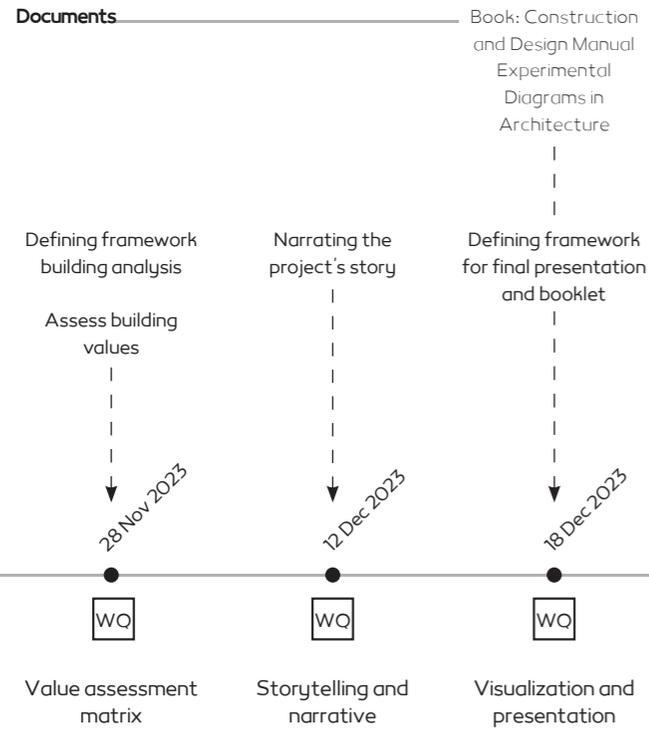
Documents



United under the roof of Palazzo del Lavoro

SCENARIO 03

Documents



SCENARIO 03

The development of the project in this phase is multifaceted, focusing on achieving a more harmonious adaptation with the existing building's geometry and fostering a stronger connection with the site of the project. Consequently, adaptations were made to the prior proposal to better conform to the building's structure and to integrate more seamlessly with the surrounding context. Furthermore, the chapter delves into the potential interactions between different functions within the building, highlighting how the strategic placement and design of spaces can facilitate cross-disciplinary collaboration and community engagement.

The chapter explores the concept of economic synergy through the strategic merger of academic functions within the Palazzo, proposing a novel configuration of spaces that foster dynamic interactions among various functions. This phase also sees the design evolving in various detailed aspects. These include the solutions and strategies related to the construction systems, heating and cooling systems, fire escape routes, and the careful selection and application of materials. Each of these elements is thoughtfully designed to enhance the project's functionality, safety, and aesthetic appeal.

03

UNITED UNDER THE ROOF OF PALAZZO DEL LAVORO

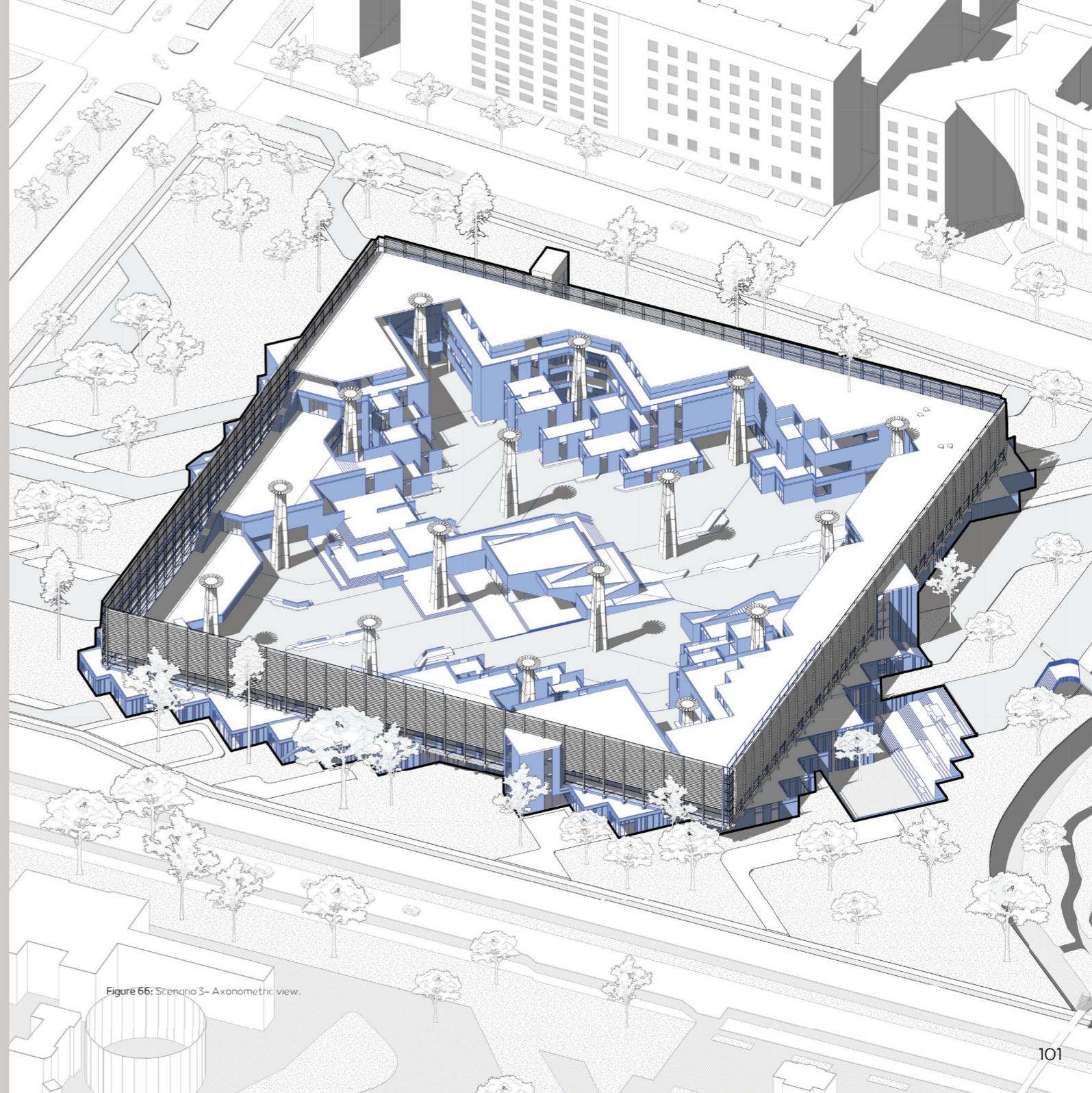
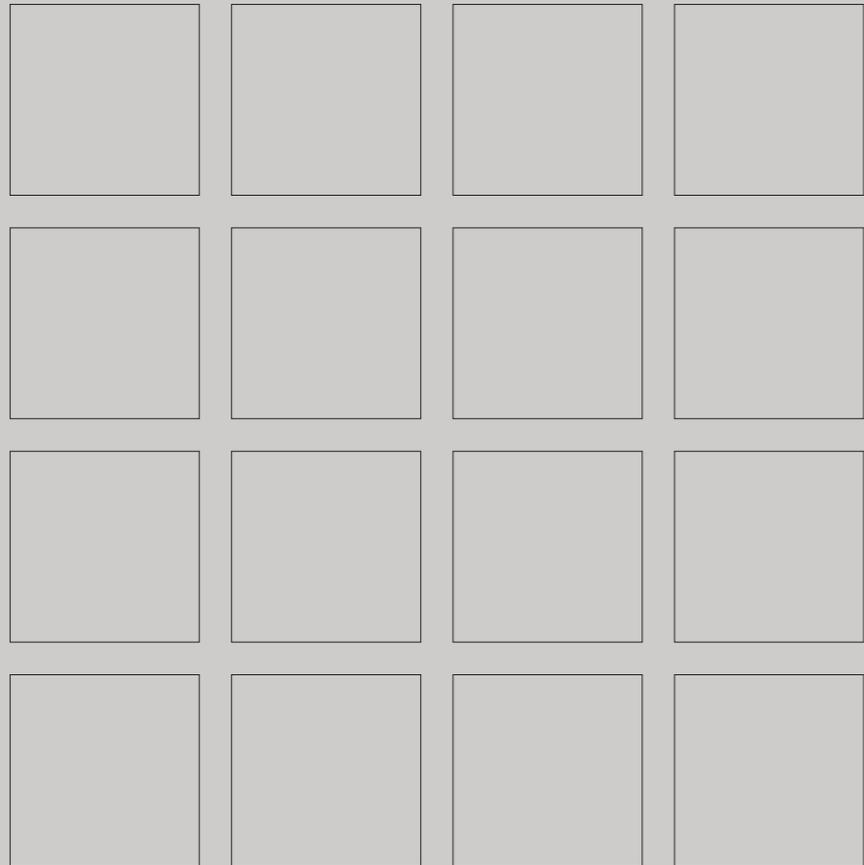


Figure 66: Scenario 3- Axonometric view.

FROM VISIT TO VISION

Among our early activities at TU Delft, a notable initiative was a comprehensive site visit to the campus buildings. Given our project's emphasis on designing educational, university, and innovation hubs, the firsthand exploration of various renowned buildings on the main campus was essential.

During this visit, a key source of inspiration emerged from TU Delft's innovative sustainable strategy, particularly evident in the construction of new educational buildings with shared facilities for all faculties. The Echo building, designed by UNStudio and completed in 2022, served as a prime example. This modern structure houses a large-scale lecture hall, debate room, study rooms, and workstations. The concept of different faculties sharing facilities not required daily in their departments struck us as a compelling strategy. By doing so, they enhance the quality of shared educational spaces collaboratively.

This observation sparked an idea for our project; merging the functions of the two universities involved (Politecnico di Torino and University of Torino). This strategic shift could facilitate the creation of shared facilities, including lecture halls, libraries, canteens, classrooms, and well-equipped laboratories. The collaborative use of these shared resources could significantly elevate the quality of these spaces. Furthermore, extending this strategy to the co-working and innovation hub aspects of our project could establish a more robust connection between the university, co-working spaces, and the innovation hub.

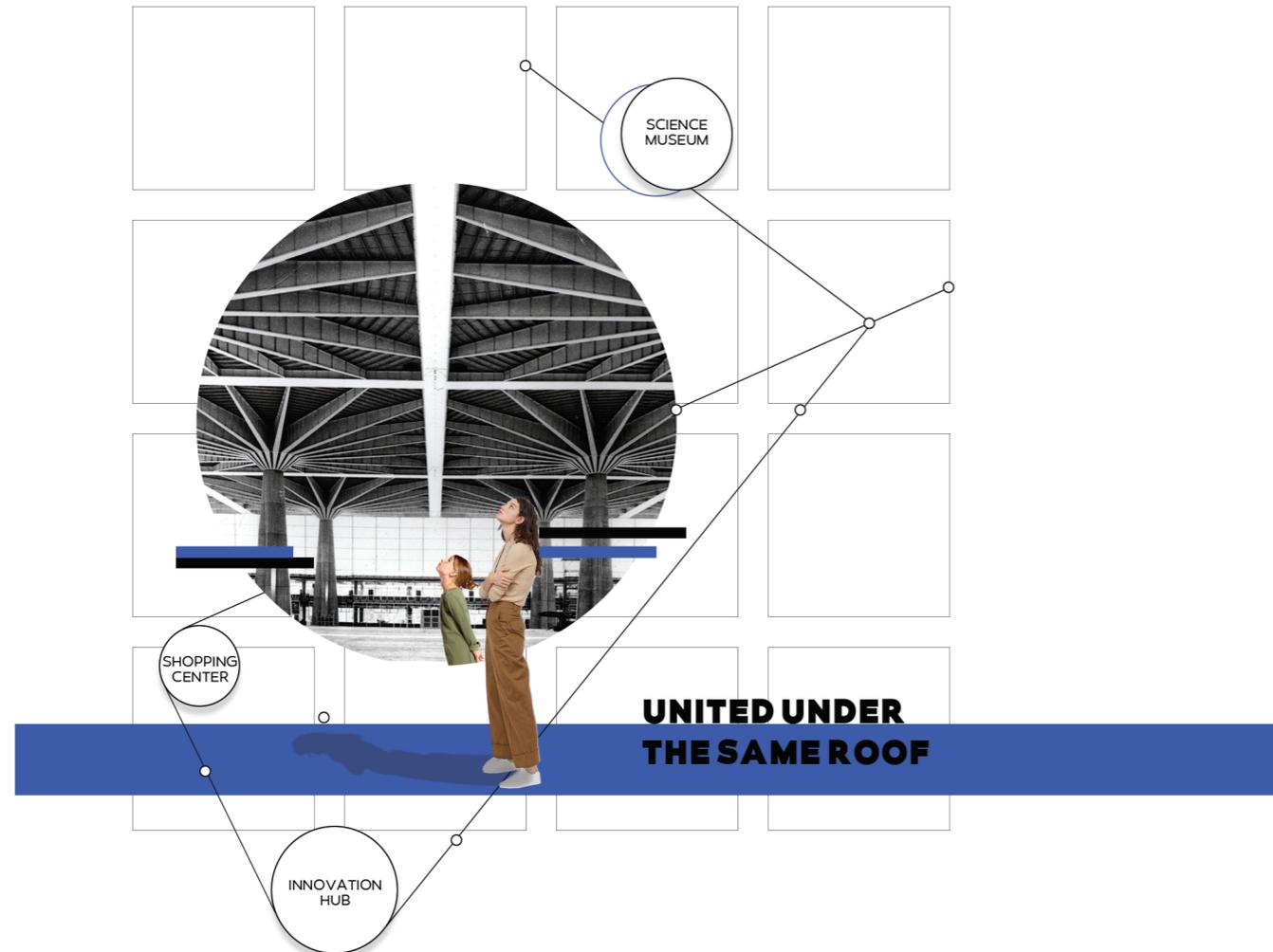
Consequently, our third proposal underwent modifications in function distribution and plan configuration to incorporate this innovative strategy inspired by TU Delft's approach.

4 September 2023

We relocated to Delft to work more closely with Professor Wido Quist and the DoCoMoMo team at TU Delft. This strategic move was intended to enhance our research and design process by providing direct access to key resources and expertise.

14 September 2023

Our time in Delft included visits to adaptive reuse projects in the Netherlands, offering practical insights into successful strategies. Additionally, exploring the TU Delft campus provided a real-world example that informed our approach to designing the educational functions within our project.

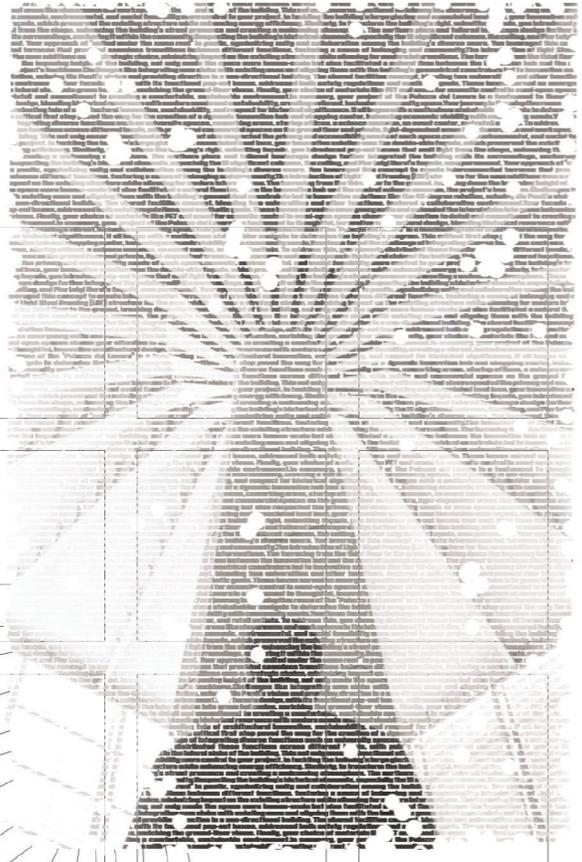


ECONOMIC SYNERGY

In response to recent developments, the Palazzo del Lavoro's metamorphosis into a multifunctional hub has gained traction, guided by a collaborative vision shared among actors. Under the stewardship of CdP, the iconic structure is poised to undergo a profound transformation, embodying a diverse array of service activities essential for community enrichment.³¹ Third-party observations, such as those articulated by Paolo Mazzoleni, the municipal councilor for urban planning, underscore the significance of accommodating various functions within the grand architectural framework.³² This strategic re-imagining, characterized by a comprehensive mix of hospitality, educational, commercial, public, and social functions, not only ensures the project's economic viability but also fosters synergistic relationships among its diverse occupants.

Central to this vision is the concept of economic synergy, where the interplay between different functions within the Palazzo del Lavoro generates mutual benefits and efficiencies. By consolidating disparate activities under one roof, the project optimizes resource utilization, minimizes operational costs, and maximizes revenue potential.³² For instance, the integration of a shopping center alongside educational institutions and innovation hubs not only diversifies revenue streams but also enhances the overall appeal of the complex, attracting a broader spectrum of visitors and tenants.³³ Moreover, shared facilities and infrastructure further amplify cost savings, fostering a sustainable model that transcends traditional divisions of development.

In conclusion, the latest updates herald a significant milestone in the evolution of the Palazzo del Lavoro, with the introduction of an innovation hub adding a new dimension to its multifunctional repertoire.³³ This strategic addition aligns with the evolving needs of actors, offering a dedicated space for collaborative research, development, and entrepreneurship. As the project continues to unfold, it exemplifies the power of adaptive reuse to breathe new life into historic landmarks while meeting the demands of a modern, dynamic society. Through innovative design, economic synergy, and actors collaboration, the Palazzo del Lavoro emerges not only as a symbol of architectural ingenuity but also as a catalyst for socio-economic transformation in the heart of Turin.



Conto alla rovescia per il Pal

La sua dovrebbe essere messa in sicurezza entro la fine del 2024. Nel frattempo si spera di definire meglio la sua destinazione d'uso, come l'assessore comunitario all'Urbanistica Paolo Mazzoleni ha spiegato ai consiglieri della Seconda e della Terza commissione durante il sopralluogo di ieri. «Abbiamo già approvato una variante e un piano esecutivo convenzionato per la riconversione di parti di servizio alle persone alle imprese. Significa il Palazzo del Lavoro potrà ospitare industrie

Così rinascerà Palazzo del Lavoro

La sede scelta da CdP per presentare il suo progetto "Rendebow" per il Palazzo è stata quella che si sta trasformando in un museo. La fabbrica di musica c'è, ma l'idea è di farne un polo di servizi. Ma lo sguardo è tutto puntato sul Palazzo del Lavoro, la prima e urgente sfida per la città, è occupare il meglio di un luogo storico e di un luogo pubblico. Il 100% proprietà. «In questo

Palazzo del lavoro, finalmente

Anche la Compagnia di SanPaolo al tavolo sul futuro del capolavoro di Nervi. «Le priorità deve stabilirle il Comune, poi noi ci siamo»

Una cittadella dell'innovazione

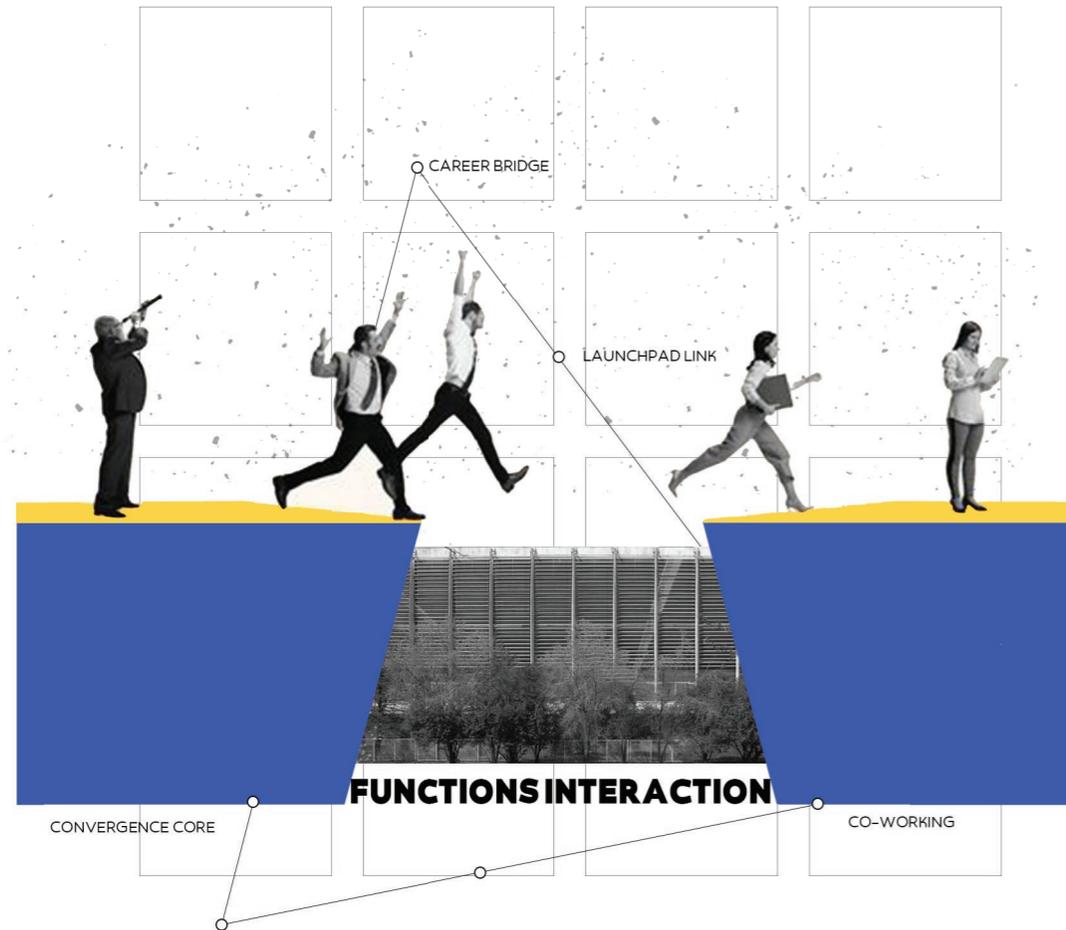
La sede scelta da CdP per presentare il suo progetto "Rendebow" per il Palazzo è stata quella che si sta trasformando in un museo. La fabbrica di musica c'è, ma l'idea è di farne un polo di servizi. Ma lo sguardo è tutto puntato sul Palazzo del Lavoro, la prima e urgente sfida per la città, è occupare il meglio di un luogo storico e di un luogo pubblico. Il 100% proprietà. «In questo

ECONOMIC SYNERGY



Palazzo del Lavoro, qualcosa si muove. «Abbiamo un dossier importante per un polo iconico e di grande valore per un'attività di sviluppo in questa direzione».

FUNCTIONS DISTRIBUTION



With the implementation of the mentioned strategy, the design program and functions distribution of the project have undergone updates. The primary concept of locating functions on lateral floors to maximize daylight exposure remains unchanged. In the revised distribution, the shopping center maintains its position on the ground floor, forming a loop around the perimeter of the project.

The first and second floors, initially designated for Unito and Polito separately, are now allocated to universities without segregation. Classrooms are proposed for the first floor, while laboratories find their place on the second floor. A shared lecture hall, designed as a double-height space accessible from both levels, enhances collaborative learning environments. This approach allows shared spaces such as the library, canteen, and study rooms to benefit from increased size and improved quality.

The innovation hub is situated on the northern and western parts of the third level. Following the integration of universities, a similar logic was applied to the co-working and innovation hub. In the previous design, they were located in the southern and northern parts, respectively, without a strong connection. To foster a more robust link between the innovation hub and co-working, the proposal suggests a leveling and terracing of co-working, spanning multiple levels.

Considering the historical value assessment, particularly noting that the second-floor slab lacks historical significance as an original element, a partial demolition of the southern part of the second-floor slab was proposed. This alteration allows co-working spaces to extend not only to the first floor but also across the first, second, and third floors, connecting them to the innovation hub.

This concept aids in categorizing co-working spaces based on user types. On the first floor, co-working spaces are easily accessible to the public from the ground floor, offering flexible options for daily and hourly use. The second level, an extension of the universities, caters to users requiring more frequent and extended periods, with the option for specific reserved spots. On the third level, co-working spaces seamlessly connect to the innovation hub, suitable for longer-term use, such as monthly. The proposed names for these three types of co-workings are "My Flex," "My Desk," and "My Office," respectively.

REFERENCE

LocHal Library (Tilburg, Netherlands)

The LocHal, an adaptive reuse project, diverges from the conventional notion of a library. Positioned as the vibrant heart of Spoorzone Tilburg, it breathes new life into the former locomotive workshop, transforming it into a bustling public city hall. Through an innovative concept termed 'through-destination,'³⁴ the project seamlessly integrates the existing heritage with contemporary architecture, crafting a compelling new narrative. It was inspiring to see how the project addressed the challenge of maintaining continuity within such a vast space, avoiding the insertion of separate volumes while identifying heating zones.³⁵ Additionally, it was inspiring to witness how the interconnected staircase network not only serves as functional access points but also defines and identifies various spaces within the building.

The integration of these stairs made it possible to access levels that were previously inaccessible, offering breathtaking views within the building. Rather than mere re-purposing, the design ethos celebrates continuity, transcending traditional building paradigms to evoke the ambiance of

34. "LocHal." (n.d.). nrp Vernieuwend in het bestaande website. Retrieved from <https://nrp.nl/projecten/lochal-tilburg/>

35. "LocHal Library." (2019, January 16). ArchDaily website. Retrieved from <https://www.archdaily.com/909540/lochal-library-mecanoo-plus-civic-architects-plus-braakma-and-roos-architectenbureau>

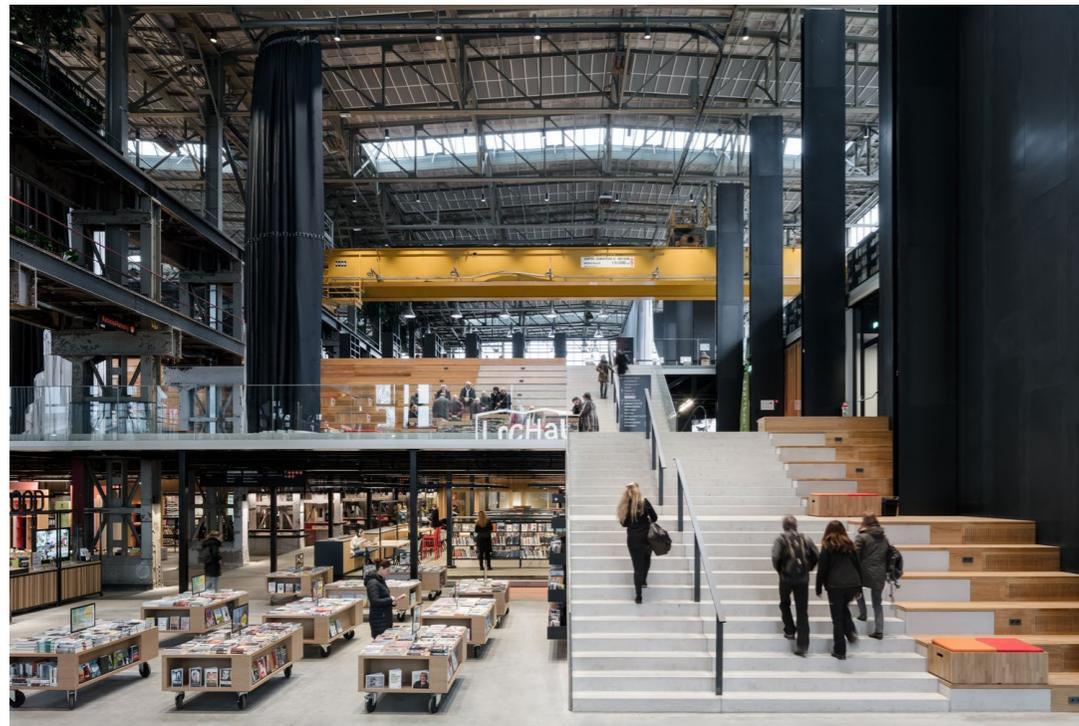


Figure 67: Bollaert, S. (Photographer). (2019). LocHal [Photograph]. Stijn Bollaert.

an expansive covered plaza—a welcoming, multifunctional public interior. Furthermore, the integration of multifunctional areas within this space, where various functions coalesce, showcases effective collaboration and utilization of the available space. Notably, the project's emphasis on spatial fluidity and strategic sightlines creates an expansive atmosphere while innovative climate control systems ensure comfort throughout. Through this holistic approach, the LocHal project successfully preserves the building's integrity as a unified space, eliminating the need for fragmented sections or extensive structural modifications.³⁶

Palazzo del Lavoro adaptive reuse project faced a similar challenge from the beginning, focusing on preserving the utility of the space. Both projects share similarities in their approach to maximizing interior space without dividing it into separate volumes. It's inspiring to note how LocHal project utilize innovative design solutions, such as zoning for heating and the strategic use of acoustic materials, to maintain utility while addressing energy and acoustic concerns.

36. "LocHal Library." (2019, January 16). ArchDaily website. Retrieved from <https://www.archdaily.com/909540/lochal-library-mecanoo-plus-civic-architects-plus-braakma-and-roos-architectenbureau>

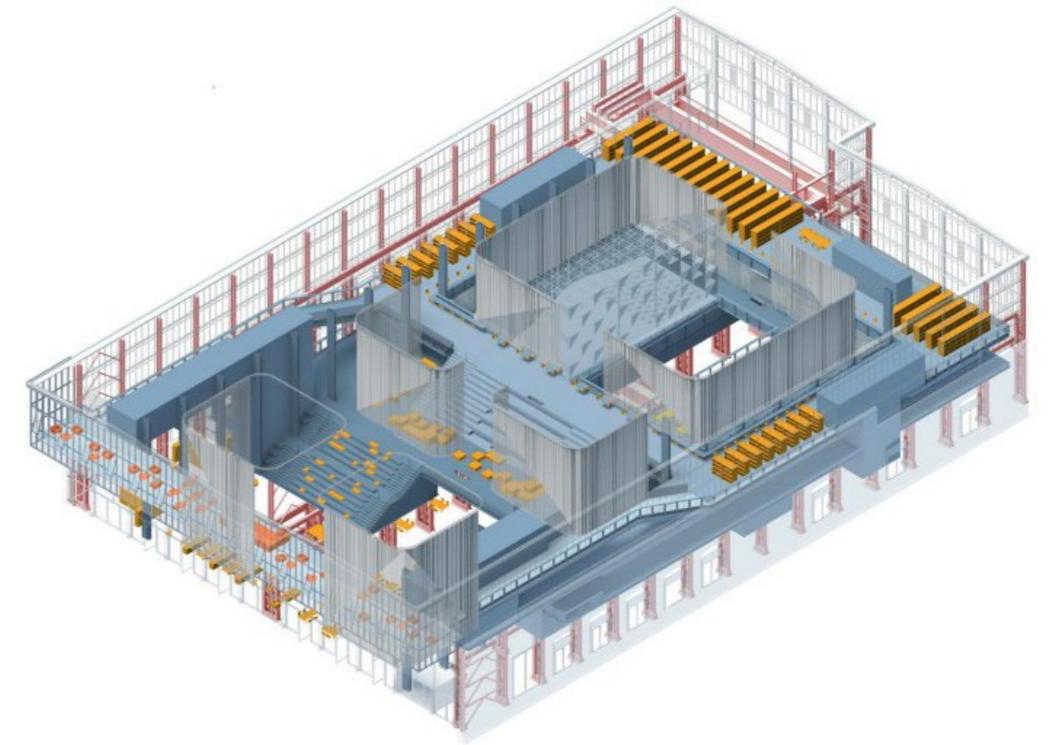
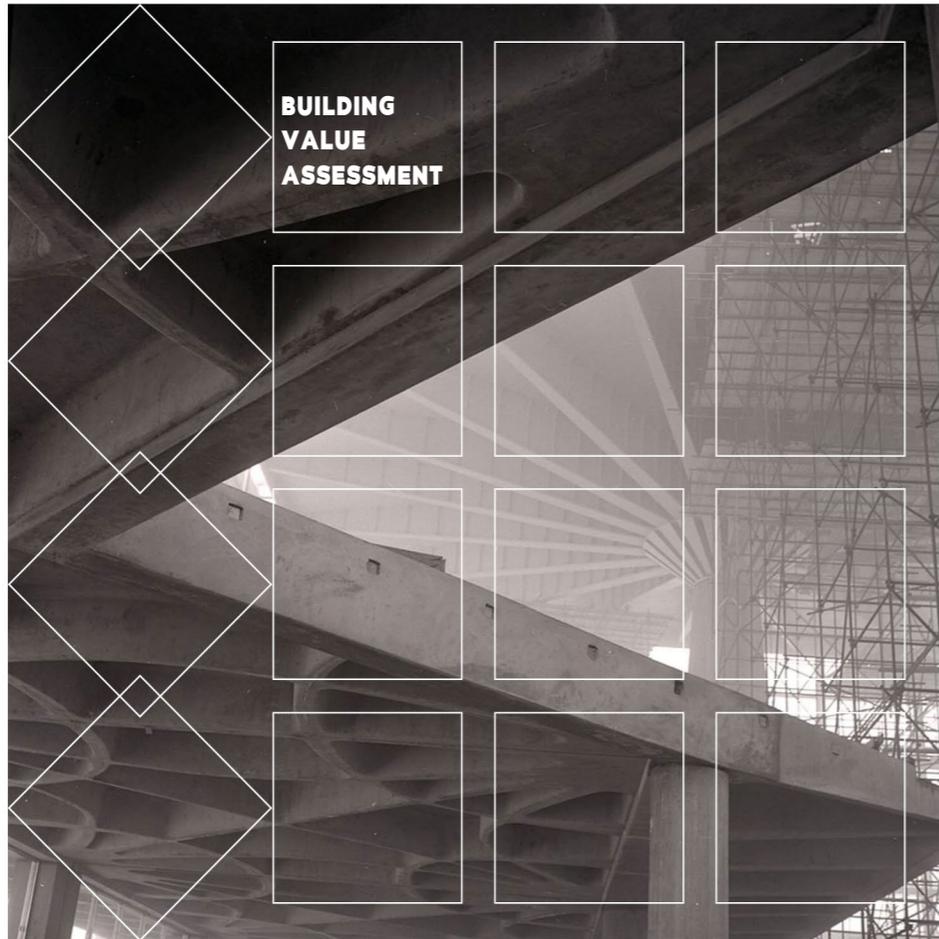


Figure 68: Civic Architects. (n.d.). LocHal public library Tilburg [Illustration]. Retrieved from <https://www.civicarchitects.eu/projects/lochal-tilburg>



3 October 2023

During this phase, our understanding of heritage building value assessment deepened significantly upon our engagement with Wessel de Jonge's "Design from Heritage" book. This pivotal moment led us to define a heritage value matrix specifically tailored to our project, intending to utilize it as a structural framework for our preceding analyses. We endeavored to categorize our accumulated analyses within this framework, aligning them with Brand's concept of the building's shearing layers. This approach not only enriched our methodological rigor but also provided a coherent structure to interpret and integrate the diverse aspects of our research within a heritage-Focused.

BUILDING VALUE ASSESSMENT

The project refrains from engaging in highly specialized investigations but advocates for a systematic approach to building observation, drawing parallels with the structured methodology of medical anamnesis. Similar to the guided series of questions in medical practice, this approach seeks relevant information crucial for diagnosing specific conditions and determining appropriate treatments. The primary goal of this chapter is to furnish a comprehensive guide on systematically observing an inherited building in its current state. This involves examining its original construction, subsequent modifications, and factoring in evidence of damage and potential repairs.³⁷

To structure the analysis of tangible building layers, Steward Brand's framework, outlined in his well-known study on 'how buildings learn,' is embraced. Brand's framework emphasizes the inherent physical coherence of a building and underscores the varied rates of change within pre-defined layers.³⁸

Brand identifies six general-purpose layers for a building: Site, Structure, Skin, Services, Space Plan, and Stuff. Each layer is associated with an estimated life cycle for change, ranging from one day to eternity. Viewing a building as a composite of interrelated layers offers valuable insights into assessing the impact of interventions on its physical condition in terms of sustainability. This approach implicitly considers the enduring success of architectural conservation efforts. Due to its practical nature, adopting Brand's set of physical layers as a basis for the analytical process of building observation, with extensions as deemed necessary, is advocated.

The subsequent phase of investigating built heritage involves a multidisciplinary and systematic interpretation of findings based on professional knowledge. This phase necessitates a clearly structured procedure for identifying and classifying the typical and characteristic features of the heritage building in its present state.

The investigation procedure entails a site-specific identification and classification of distinctive features in and

37. Designing from Heritage - Strategies for Conservation and Conversion, Marieke Kuipers, Wessel de Jonge, p.31
2. Brand 1994, pp. 12-13.

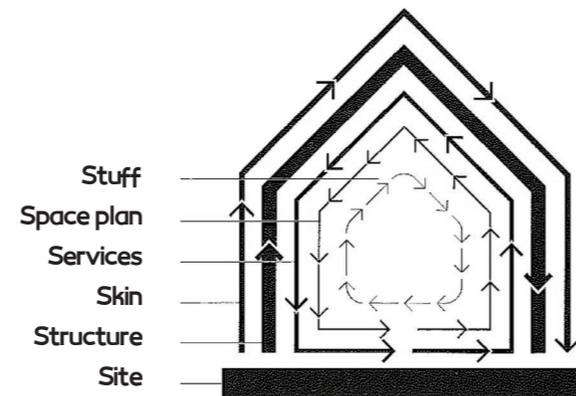


Figure 69: Steward Brand's Shearing Layers diagram from his book *How Buildings Learn* (adapted)

around the heritage site related to construction, architecture, and socio-cultural history. This extends the process of anamnesis discussed before but focuses on aspects pertinent to the cultural historical value of a place. For historically registered or protected monuments, detailed descriptions are available, covering relevant stylistic, functional, physical, or cultural-historical elements. However, these formal motivations, often couched in architectural-historical or legal jargon, may lack sufficient information for architects responsible for adaptations to the physical and spatial features of heritage buildings.

The value-mapping method introduced here is an extension of construction-historical analysis, with a greater focus on architectural and socio-cultural aspects. It involves studying additional sources of information beyond the heritage building itself, facilitated by a specially developed tool, to be explained later on. While many parameters and criteria exist for listing and the 'classical' conservation of built heritage, they may not always specify the essential aspects to keep a building functional in a dynamic environment, where a 'modern' and 'integrated' conservation approach is crucial.³⁹

In the value assessment, elements are assessed based on Brand's six layers, considering core heritage values derived from Riegl's dialectic value set, augmented by two additions. The opposition of 'age' versus 'use' or 'newness' values guides the heritage architect's approach in subsequent steps, including conservation, adaptive reuse, or, at the extremes, reconstruction or demolition. 'Rarity value' is added to Riegl's defined values, recognizing its importance as a criterion for the eligibility of historical buildings as monuments.

The Heritage Value assessment, presented here in a slightly revised version, doesn't strictly adhere to Riegl's framework or Brand's model. However, it compactly aids

38. The initial version of the valuation matrix was developed by Nicholas Clarke, Marieke Kuipers and Hielkje Zijlstra in 2016, building also on other methodologies to analyze architecture, and meant to be applied in the Master studios of H&A. The second version published here in this book is a further refinement based on our experiences in the education practice. Clarke & Kuipers 2017.

	RIEGL +	AGE value	HISTORICAL value	INTENTIONAL COMMEMORATIVE value	NON INTENDED COMMEMORATIVE value	USE value	NEW-NESS value	(relative) ART value	RARITY value [+]	OTHER relevant values [+]
BRAND +										
SURROUNDINGS / SETTING [+]										
SITE										
SKIN (exterior)										
STRUCTURE										
SPACE PLAN										
SURFACES (interior) [+]										
SERVICES										
STUFF										
SPIRIT of PLACE [+]										

Figure 70: Visualizing Heritage Values. Excerpted from "Designing from Heritage: Strategies for Conservation and Conversion" by Kuipers, M., & de Jonge, W. (2017).

in classifying relevant heritage values at various scales, encompassing whole heritage buildings, their surroundings, setting, typical elements per layer, and interior spaces. The matrix is versatile and can potentially be applied to 'green heritage' or a richly furnished interior after further refinement.



Figure 71: Collage Illustrating Value Assessments for the Surrounding Layer.

Surrounding

The surrounding environment of the Palazzo del Lavoro holds multifaceted values, deeply rooted in its historical context as a central piece of the Italia' 61 expo. Its direct connection to the Italia' 61 park is not merely a matter of historical significance but also of aesthetic and utilitarian importance. The park, a pivotal gathering space during the expo, continues to serve as a vital link between the building and its community, offering a blend of historical and aesthetic values that enhance the Palazzo's environment.³⁹

Key architectural and infrastructural elements within the park, such as the Palavela, the remnants of the monorail, and the lake, each carry their unique value. The Palavela, with its distinct form, presents an aesthetic value, while the monorail, though no longer operational, stands as a commemorative monument, evoking memories of a bygone era of innovation and excitement in Turin. Historical photographs capturing moments with the monorail serve as a testament to its lasting impact on the city's cultural memory.

Beyond the immediate vicinity of the park, the surrounding Lingotto neighborhood, with its array of facilities including the Lingotto shopping center, train, and metro stations, is crucial for the Palazzo del Lavoro. These amenities, particularly those related to public transportation, are recognized for their significant use value, offering accessibility and connectivity to the Palazzo. Furthermore, the proximity of the upcoming innovation and health park promises additional synergies, reinforcing the Palazzo's role within a broader urban regeneration and development context. This multifaceted assessment underscores the surrounding's integral role in shaping the Palazzo's identity and future potential.

³⁹ MuseoTorino. (n.d.). Parco Italia' 61. Retrieved April 12, 2023, from <https://www.museotorino.it/view/s/94f07beb360a40c280d75cbab26d06b4>



Figure 72: Collage Illustrating Value Assessments for the Site Layer.

Site

Analyzing the site of the Palazzo del Lavoro unveils the pivotal role of its geographic placement at the southern gateway of Turin. The eastern boundary, graced by the Corso Unita d'Italia, brings the building into immediate prominence for those entering the city, offering distinct views that highlight its presence. This strategic location bestows a significant functional value on the site, marking it as a landmark that greets visitors.⁴⁰

Transitioning from the urban fabric to the building's immediate surroundings reveals a rich tapestry of green spaces that envelop the structure, with the park to the north and venerable trees dotting the perimeter. This blend of natural elements introduces a layer of historical significance, as the mature greenery evokes a sense of continuity and connection with the past. The ecological assessment of these trees, considering their species and age, underlines their environmental value, contributing positively to the site's biodiversity and ecological health.

Moreover, the verdant surroundings are not just a backdrop but an integral part of the site's identity, enhancing its aesthetic and ecological worth. This green envelope serves as a vital link between the building and its broader context, allowing for seamless interactions with the natural landscape. The presence of these green spaces, therefore, is not merely decorative but holds profound use value, fostering a harmonious integration of the Palazzo del Lavoro with its green context and underscoring the importance of nature in urban settings.

40. Pace, S., Chiorino, C., & Rosso, M. (2005). *Italia '61: La nazione in scena. Identità e miti nelle celebrazioni per il centenario dell'Unità d'Italia*. U. Allemandi.

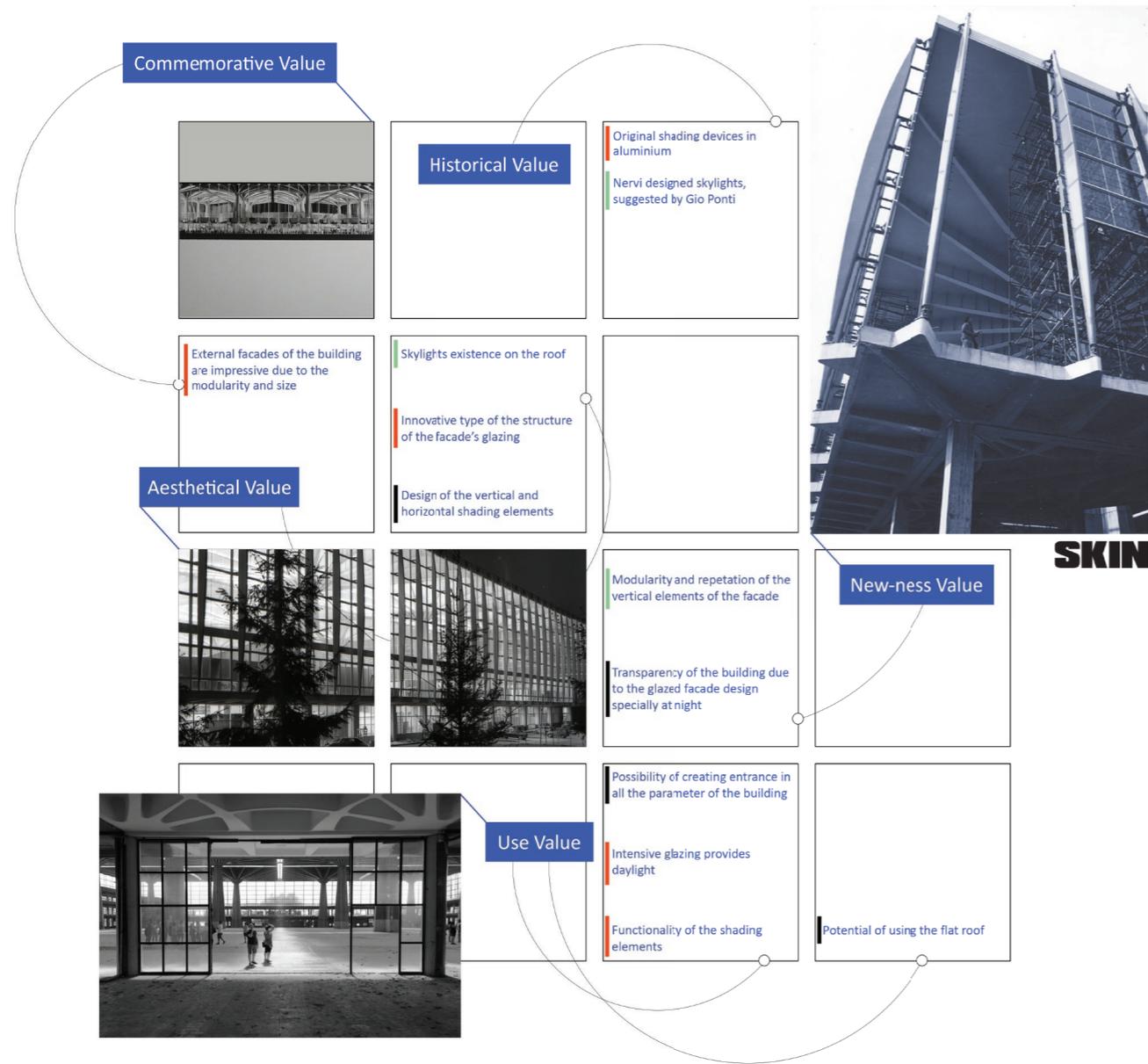


Figure 73: Collage Illustrating Value Assessments for the Skin Layer.

Skin

Analyzing the skin of the Palazzo del Lavoro reveals its defining architectural feature: the extensive use of glazing across all four main facades. This design decision is primarily evaluated for its functional value in maximizing daylight penetration into the building's interiors, thereby significantly enhancing the indoor environment and reducing the dependency on artificial lighting. The full-height glass facades not only serve a practical purpose but also hold commemorative value, symbolizing the building's architectural significance and innovation over its 60-year existence.

Additionally, the presence of repeated vertical aluminum elements as part of the curtain wall system introduces a structural innovation that has historical and aesthetic implications. These elements not only contribute to the structural integrity of the facade but also support horizontal shading devices on the south, east, and west facades. The shading devices, original to the Palazzo del Lavoro, are recognized for their historical value, reflecting the building's architectural heritage. Beyond their commemorative significance, these shading elements are also valued for their practical use in mitigating solar gain, demonstrating a thoughtful integration of design features that balance aesthetic appeal with functional performance.

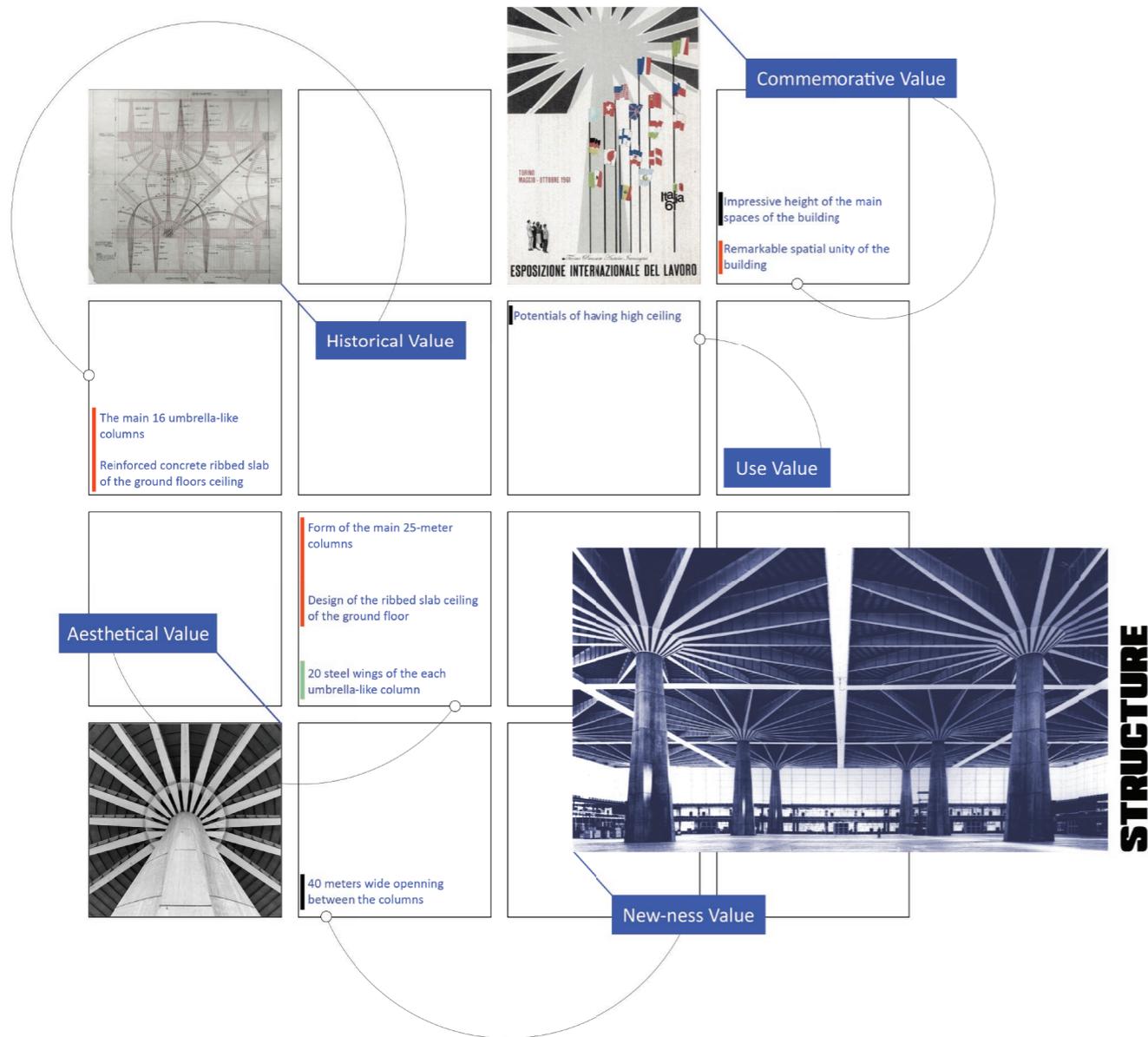


Figure 74: Collage Illustrating Value Assessments for the Structure Layer.

Structure

Analyzing the structure of Palazzo del Lavoro reveals its monumental architectural character, particularly highlighted by the 25-meter high columns that have become emblematic of the building's identity. These umbrella-like columns not only confer an aesthetic value that cements Nervi's work as a masterpiece but also embody an innovative approach to architectural design at the time of construction. Each column's ability to support a vast 40x40 meter roof space not only showcases a remarkable feat of engineering but also contributes to the building's newness value, marking a significant architectural advancement. This design choice facilitated an expansive, unified interior space, creating an indelible memory for visitors during the Expo 1961 and imbuing the structure with a profound commemorative value.

Furthermore, the lateral slabs of the building, designed as isostatic ribbed concrete slabs, stand out as crucial original components that carry substantial historical significance. Their modular design and aesthetic appeal, capable of spanning 10x10 meter openings, enhance the building's architectural beauty while serving a practical purpose. These elements together underscore the innovative spirit of the Palazzo's design, blending functional engineering with aesthetic elegance, thus adding layers of value to the structure that extend beyond mere utility to embody a piece of architectural history.

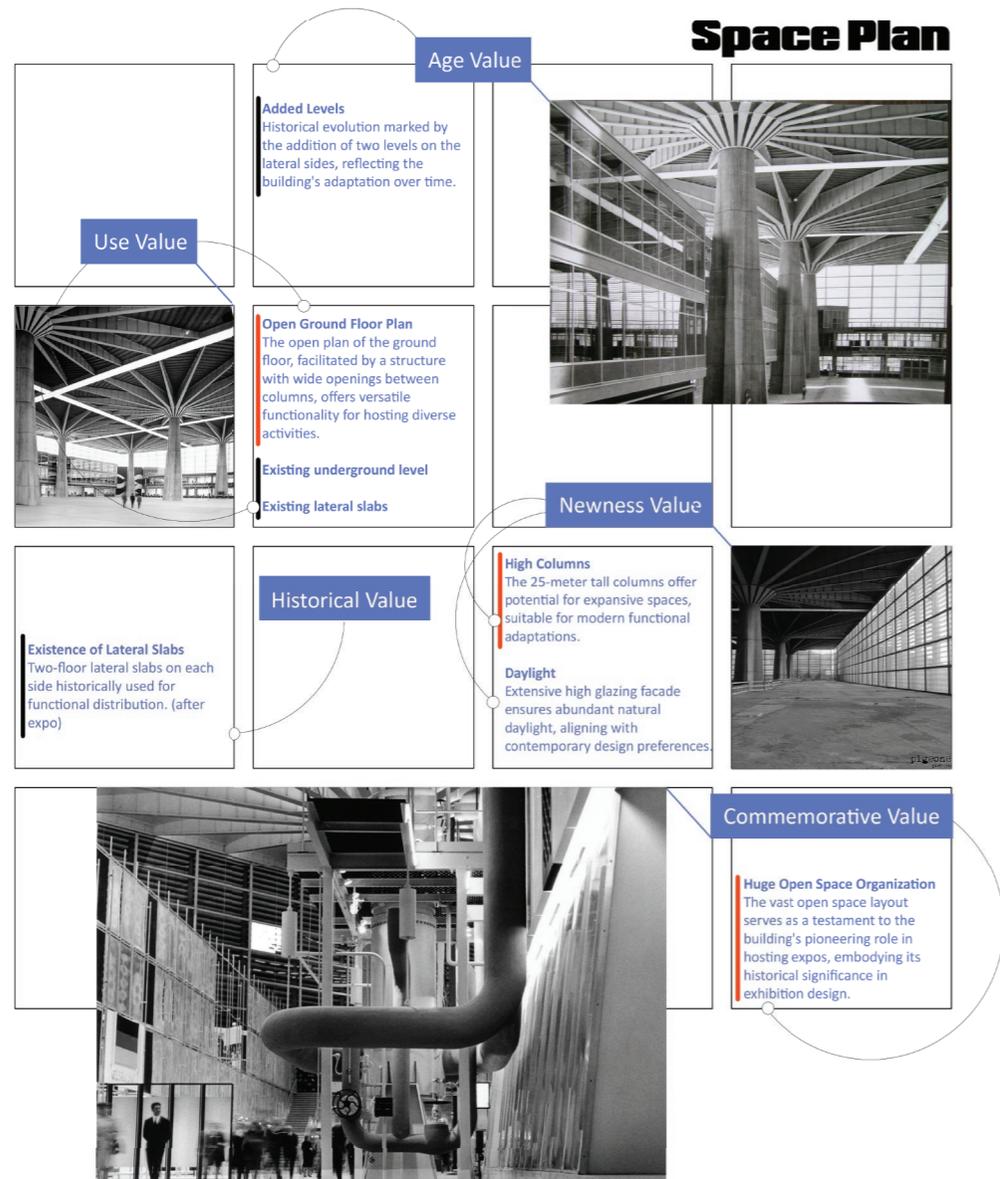
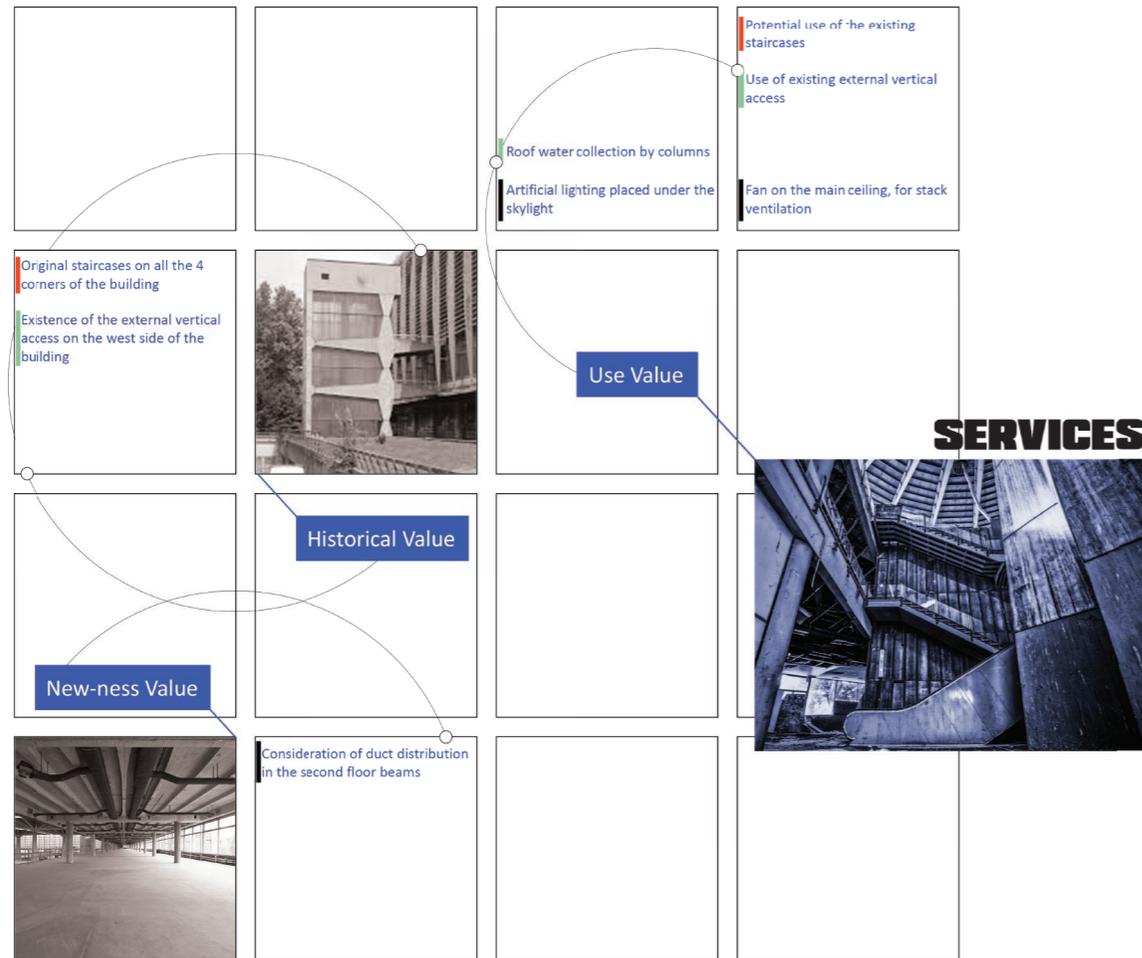


Figure 75: Collage Illustrating Value Assessments for the Space plan Layer.

Space Plan

The Palazzo del Lavoro's space plan is distinguished by its remarkable spatial unity, characterized by a vast interior space that spans 25,000 square meters, supported by merely 16 columns, and with ceiling heights reaching nearly 25 meters. This architectural decision not only demonstrates an innovative approach to structural design at the time of its construction but also contributes a significant newness value to the building. The immense open space layout, a rarity that has stood the test of time, bestows the Palazzo with a strong commemorative value, leaving a lasting impression on visitors and those who have previously experienced its grandeur. Moreover, the flexibility of this open space plan is of immense use value, offering versatile design opportunities for adaptive reuse, allowing architects and planners to envision a multitude of functions and activities that can be accommodated within this iconic structure.



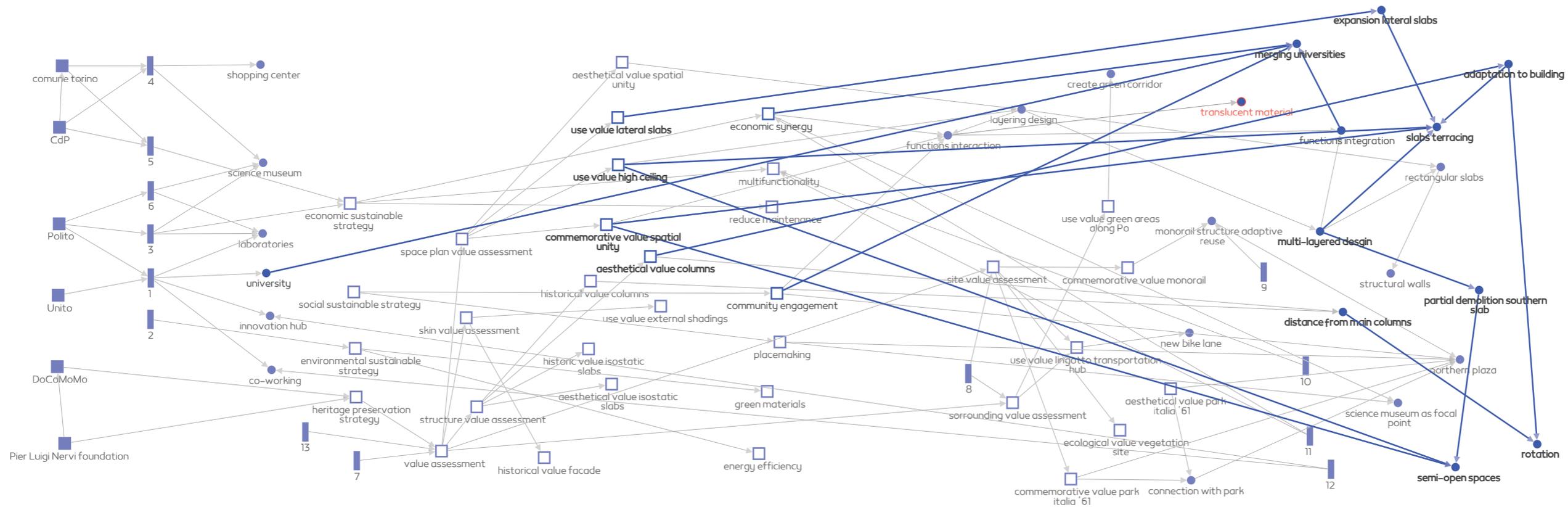
Services

In the analysis of the Palazzo del Lavoro's services, distinct elements play pivotal roles in its functionality and historical significance. The external staircase, positioned on the western facade within a solitary volume adjacent to the building's primary cubic form, serves a critical use value by facilitating access from the underground to the second level. This staircase not only underscores the building's functional design but also its adaptability to modern uses.

Interior staircases located at all four corners of the building are emblematic of the era of Expo '61, imbued with historical value due to their preservation of original architectural elements. These staircases, beyond their historical significance, are essential for vertical circulation within the building, hence possessing a pronounced use value. The design of the parking access, through a ramp on the building's west side, showcases innovation characteristic of its time, offering both newness and use value by remaining operational for current needs.

Moreover, the strategic placement of ducts and system distributions along the second floor's beams exemplifies a thoughtful integration of services, enhancing both the newness and use value by facilitating efficient system distribution in any forthcoming redesign. Additionally, the inclusion of mechanical fans on the main ceiling for ventilation purposes illustrates a pragmatic approach to maintaining indoor air quality, further emphasizing the building's use value.

Figure 76: Collage Illustrating Value Assessments for the Service Layer.



Legend

- Human Actors
- Non human Actors
- Documents
- Design Actions
- New instances
- Removed instances

Figure 77: Project process mapping, 10 October 2023.

10 October
2023

We focused on aligning our proposal with the original geometry of the Palazzo, ensuring our design was both user-centric and respectful of its heritage. We continually sought to find a balance between new and old, aiming to create a design that honors the building's past while serving contemporary needs.

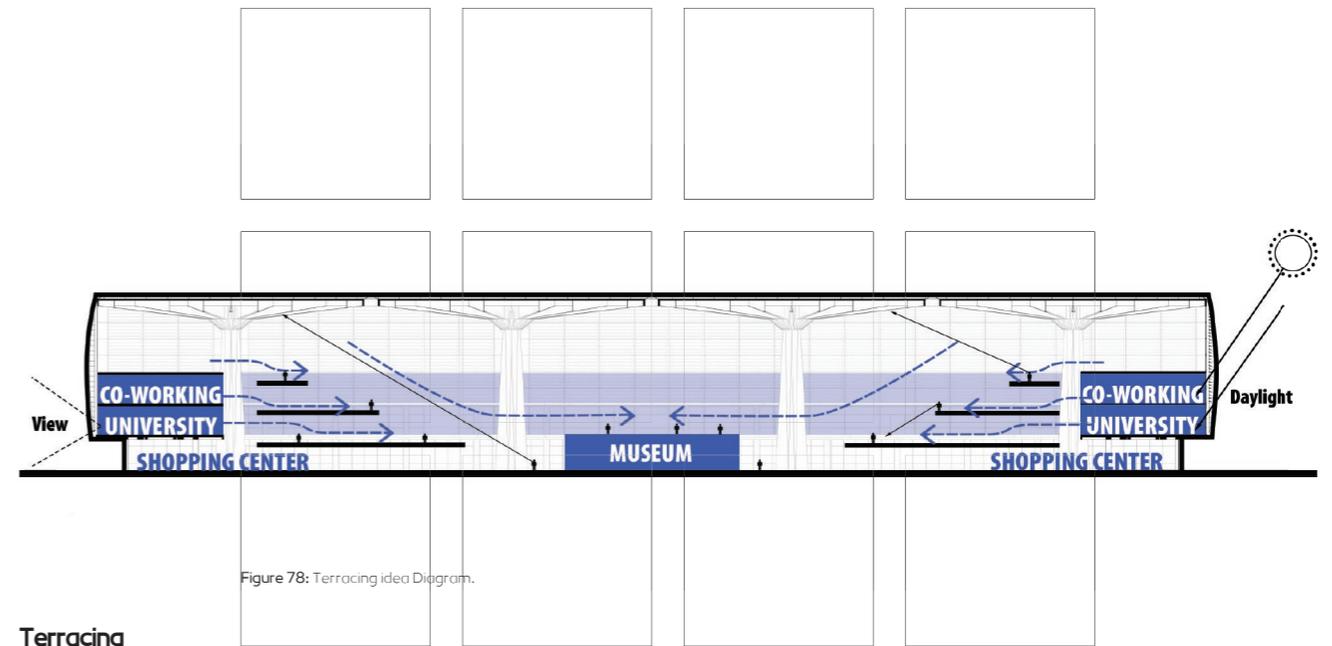
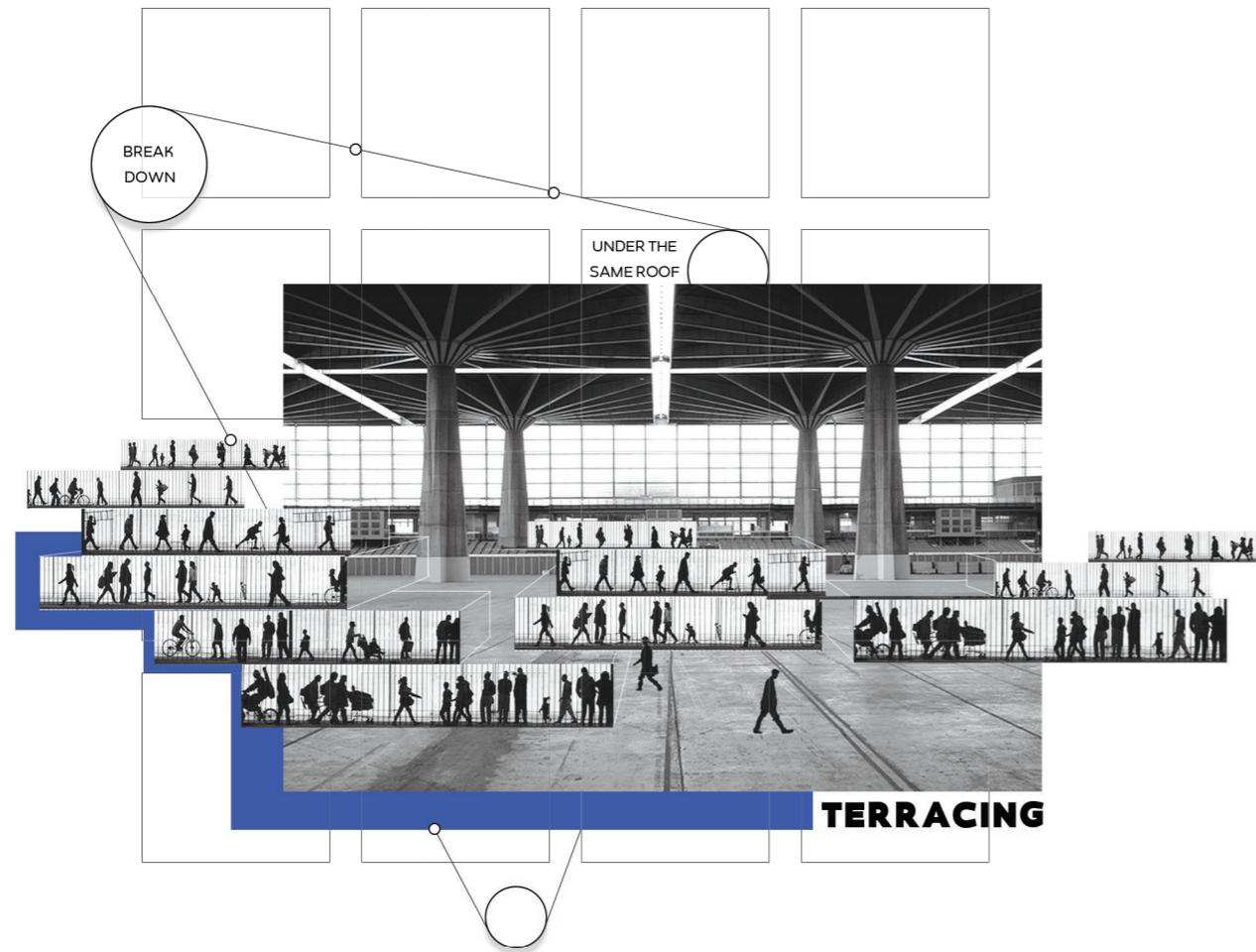


Figure 78: Terracing idea Diagram.

Terracing

After implementing the rotation of slabs to establish a harmonious connection with the existing Palazzo del Lavoro, a crucial consideration was preserving the building's essential unity. Given the Palazzo's towering 23-meter ceiling height, inherently lacking a human scale, a strategic proposal emerged to address this challenge—the introduction of terracing.

To infuse a human scale into the project and maintain the unity of the space, the concept of terracing involved breaking down the primary building height from the third floor (12 meters) to the ground floor. This was achieved through leveling and the use of different slab heights. As these new slabs approached the existing lateral slabs,

their heights mirrored those structures. However, as they extended toward the center of the Palazzo, the slabs gradually descended closer to the ground. This intentional variation in height sculpted different semi-open and open spaces, each offering distinctive views and perspectives. The introduction of terracing not only humanized the scale of the building but also contributed to the easy readability of the project. By avoiding a monolithic structure, this approach prevented obstruction of the existing architecture and the primary internal space of the Palazzo. The terraced design thoughtfully respects the unity of the Palazzo del Lavoro while enhancing its adaptability for contemporary use.



Figure 79: Scenario - Section perspective.

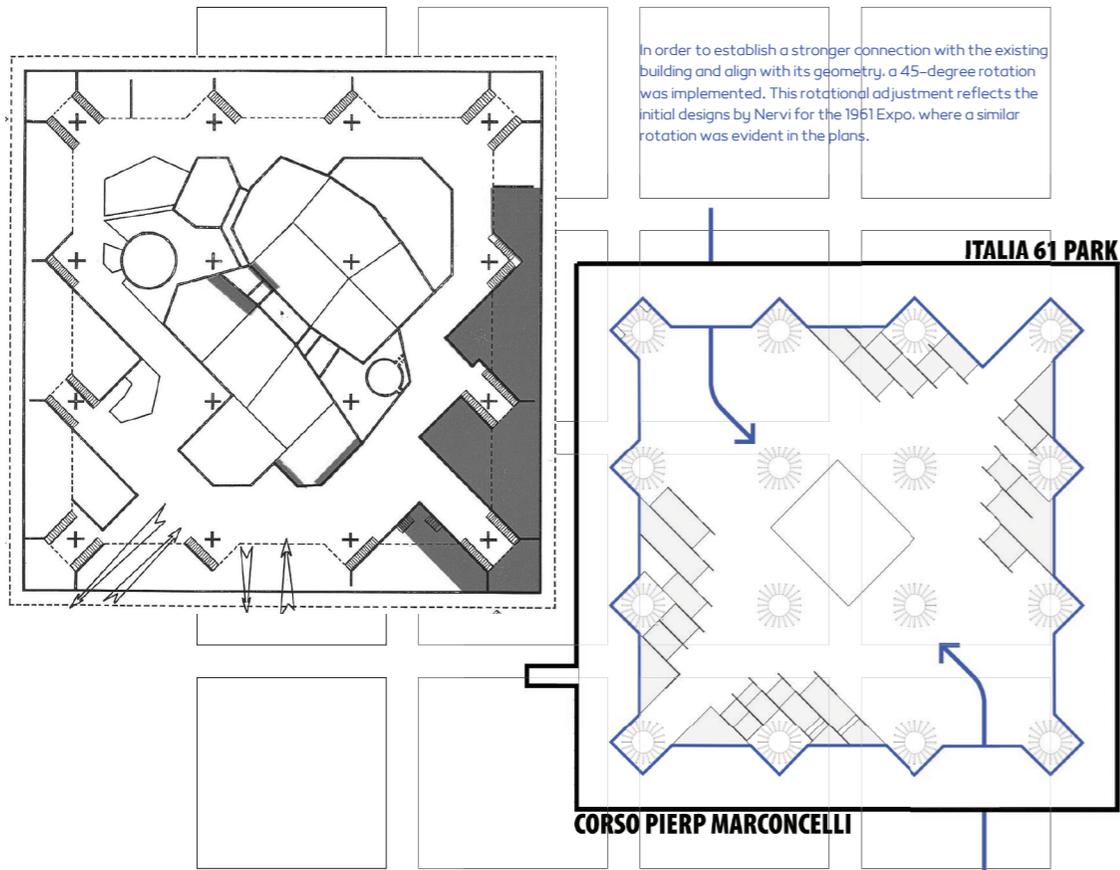


Figure 80: Rotation idea diagram.

With a rotation of 45 degrees inside the existing building, directionality was introduced to the previously non-directional proportions of the structure. This adjustment facilitated the creation of two plazas: one situated adjacent to the Italia' 61 Park, and the other positioned near the main entrance from the street.

Rotation

In the subsequent phase, the revised proposal aimed to enhance the integration and coherence with the Palazzo del Lavoro. Retaining the concept of utilizing slab surfaces instead of volumes with structural walls, this idea was further refined to establish a more seamless connection and a shared design language with the existing Palazzo del Lavoro (PL).

The adaptation to the intervention with the existing building was guided by the original geometry employed by Pier Luigi Nervi. In the PL's original plans, Nervi introduced a 45-degree rotation for additional elements like staircases, maintaining a consistent angle throughout. Gio Ponti, the architect of Expo 1961, also followed a similar rotation direction in the internal plans and pavilions designed for the exhibition.

Drawing inspiration from this 45-degree rotation, the new proposal sought to establish a harmonious connection with the existing geometry of the Palazzo del Lavoro. The rotation of the newly added slabs served to seamlessly extend the current lateral floors, adhering to the original design language. This rotational approach not only preserved the coherence with the Palazzo's structure but also provided an opportunity to create additional space for functions requiring more extensive areas. The ratio of the original slabs, measuring 160 x 20 meters, was effectively extended, allowing for the accommodation of diverse functions.

Furthermore, this design choice introduced a new tension and direction within the building. The Palazzo del Lavoro, initially a non-directional square structure, now acquired a diagonal orientation through the 45-degree rotation. This not only introduced a dynamic element to the building but also complemented the existing geometry, resulting in a cohesive and purposeful architectural expression.

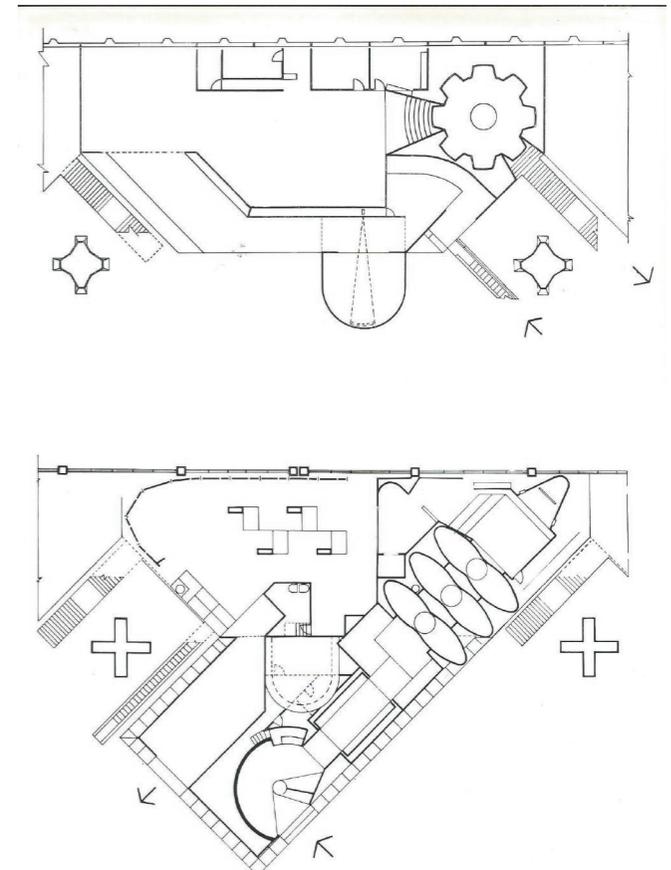


Figure 81: General plan of the international labor exposition designed by Pier Luigi Nervi.



Figure 82: Scenario3- Render from interior plaza.

The strategic incorporation of a structural wall, oriented in a specific direction, plays a pivotal role in balancing privacy with openness on the extended slabs adjacent to the Palazzo del Lavoro's lateral sections. This design approach creates a contrast of space; it crafts secluded areas for specific functions on one side, effectively shielding these activities from the main activity areas of the Palazzo. Conversely, the design embraces transparency, allowing these same spaces to remain visually and spatially connected to the central area's impressive scale. This thoughtful arrangement not only ensures functional privacy where necessary but also permits an abundance of natural light to filter through skylights, illuminating the interior.



In addressing the adaptive reuse of the Palazzo del Lavoro, the pursuit of energy efficiency emerged as a critical yet challenging objective, underscored by a commitment to environmental sustainability. The inherent architectural and functional characteristics of the building posed unique challenges to achieving this goal, necessitating a nuanced and innovative approach to its design and retrofitting.

One of the primary obstacles to optimizing the building's energy performance is its remarkable ceiling height, reaching approximately 25 meters. While this architectural feature offers potential benefits, such as facilitating stack ventilation during the summer months to aid in cooling, it simultaneously complicates heating efforts during colder periods. The tendency of warm air to rise in such a voluminous space necessitates more sophisticated and efficient heating solutions to maintain a comfortable environment at the occupant level. Additionally, the decision to position functional spaces directly under the main roof, rather than as independent, enclosed volumes, introduces complexity into the zoning of heating and cooling systems. This complexity is further amplified by the introduction of terracing and the creation of semi-open spaces, which demand a careful selection of heating-cooling systems tailored to the specific requirements of each area.

The building's vast exposed surfaces further contribute to the challenge of energy efficiency. With a roof covering approximately 25,000 square meters and facades featuring around 12,000 square meters of glazed surfaces, the potential for significant heat loss is substantial. To mitigate this, a combination of passive and active design solutions has been proposed. These solutions aim to minimize heat transfer through these extensive surfaces, thereby reducing overall energy consumption. Techniques such as the strategic use of insulation, the incorporation of double-skin facade, and the integration of shading devices are among the measures adopted to enhance the building's thermal envelope.

Daylighting strategies also play a pivotal role in the building's energy efficiency and occupant comfort. By allocating key functional spaces along the lateral slabs, the design ensures ample natural light penetration, reducing the reliance on artificial lighting. The innovative terracing concept, which breaks down volumes towards the center of the building, further facilitates the distribution of daylight throughout the interior spaces. This not only enhances the visual and environmental quality of the Palazzo del Lavoro but also contributes to energy savings by maximizing the use of natural light.

ENERGY EFFICIENCY SOLUTIONS

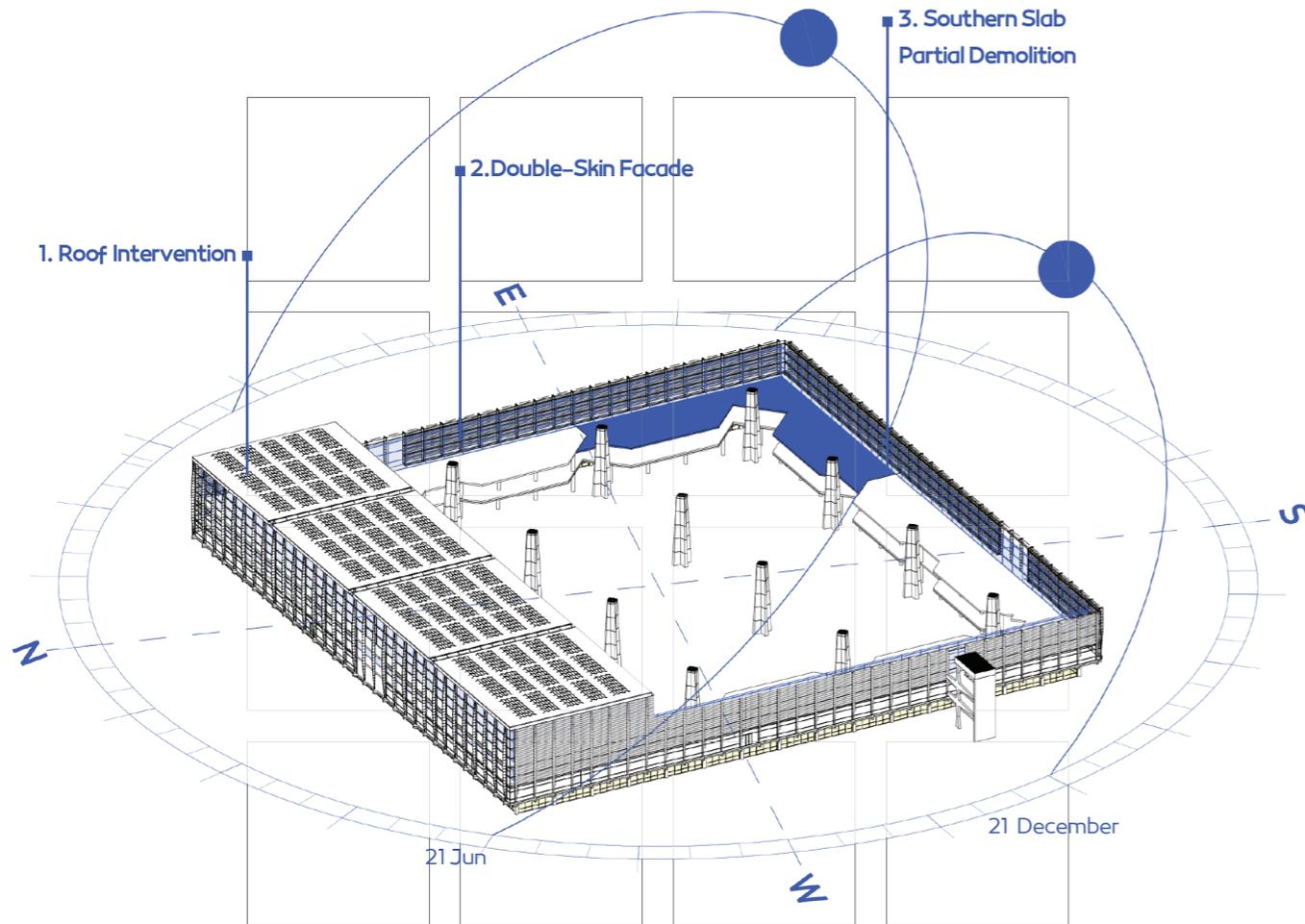


Figure 83: Energy Solution diagram.

Addressing the challenge of energy efficiency within the Palazzo del Lavoro required careful consideration of interventions that would both respect the building's architectural integrity and enhance its performance. Three primary strategies were identified to address these concerns, each tailored to leverage the building's existing features while introducing sustainable improvements.

Roof intervention

The first intervention focused on the roof, a significant surface area directly exposed to sunlight, presenting both a challenge and an opportunity for energy efficiency. The proposal for a standing seam metal roof, integrated with solar panels, aimed to minimize heat transfer while generating renewable energy.

Double-skin facade

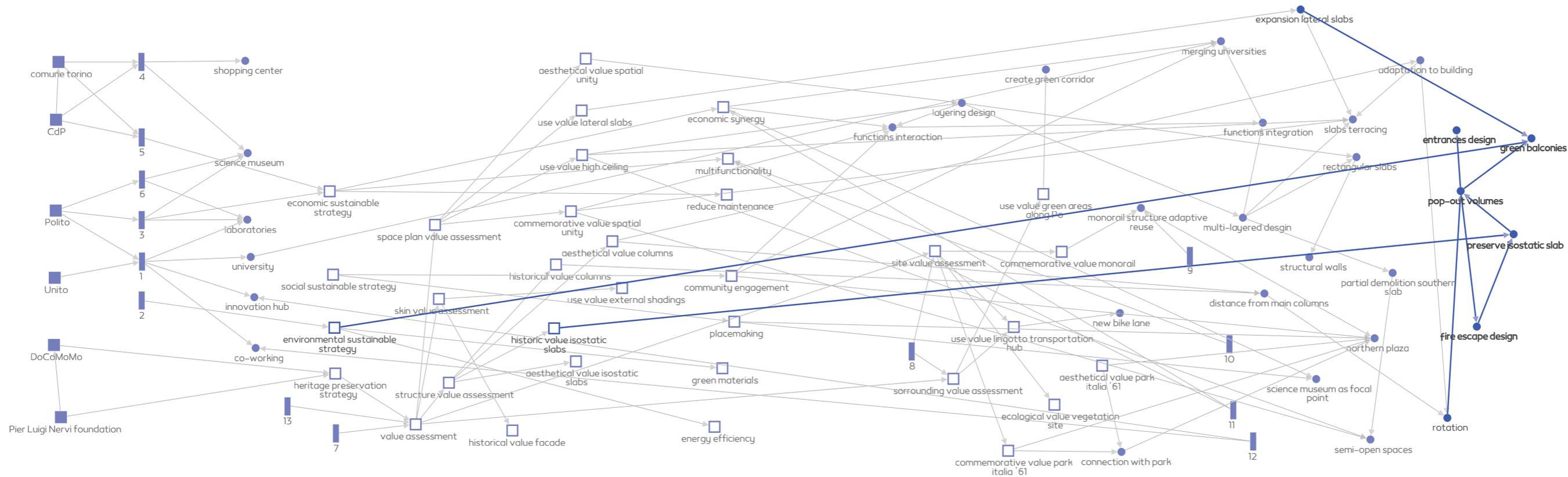
The second strategy involved the implementation of an internal double skin facade. This innovative approach not only reduces heat transfer through the facade surfaces but also preserves the building's historical facade. This solution, detailed further in this chapter

Southern slab partial demolition

The third intervention involves a partial demolition of the southern slab. By partially removing sections of the southern slab, the design introduces a terracing effect that radically transforms the building's internal light environment. This terracing not only enhances the penetration and distribution of natural light but also facilitates passive solar heating.

During the colder months, sunlight can more effectively permeate the interior spaces, contributing to warming the building naturally and reducing the need for heating. This intervention is especially beneficial in terms of energy conservation, as it leverages the building's orientation and structural features to maximize daylight use and solar gain.

In the warmer months, the risk of overheating due to increased sun exposure is mitigated through the existence of external shading devices. These shades are blocking excessive sunlight, preventing the interior from becoming uncomfortably warm while still allowing for sufficient natural light. This balance ensures that the building remains energy efficient and comfortable throughout the year.



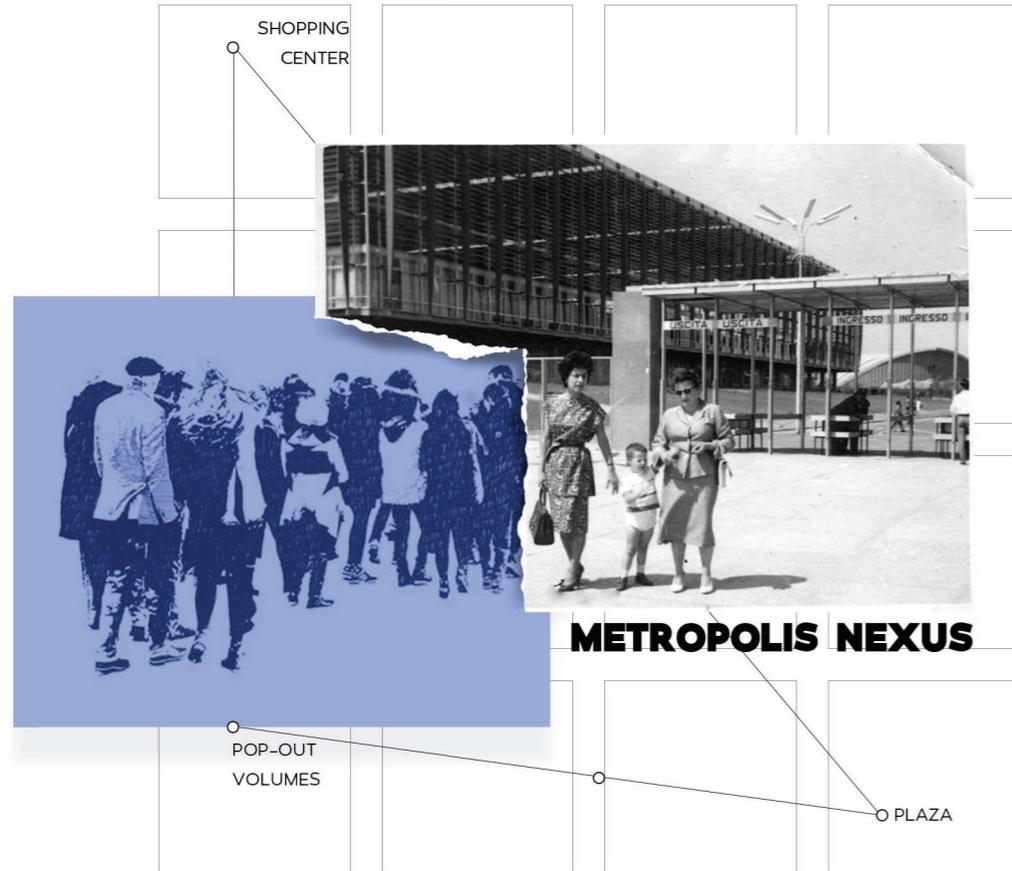
Legend

- Human Actors
- Non human Actors
- Documents
- Design Actions
- New instances**

Figure 84: Project process mapping, 17 October 2023.

17 October
2023

We faced the challenge of integrating the monolithic structure of the Palazzo with its surrounding context, while contemplating ways to diversify its facade without detracting from its historical value. Our solution was to introduce subtle disruptions at the ground level of the building's rigid 'box' structure. This approach was metaphorically akin to gently opening the Palazzo's exterior to welcome the outside world, fostering a connection between the building and its environment.



Pop-out Volumes

In addressing the architectural and urban integration challenges presented by the Palazzo del Lavoro, the introduction of pop-out volumes emerges as a strategic intervention aimed at reinvigorating the building's relationship with its immediate context. This approach is grounded in a nuanced understanding of the building's historical, architectural, and urban significance, alongside a commitment to respecting and enhancing its character within the constraints of contemporary adaptive reuse principles.

The Palazzo del Lavoro, characterized by its monolithic stature and uniform facade design, lacks a meaningful connection to its surroundings. The building appears detached from its context, offering no distinct sense of belonging to the surrounding urban fabric. The identical design of all four facades, each stretching 160 meters, further exacerbates this issue by rendering the building uninviting and unattractive, devoid of any delineation for a main entrance. The decision to introduce pop-out volumes is predicated on a critical analysis of these factors, aimed at fostering a more dynamic and engaging relationship between the building and its environment.

Despite constraints from the Soprintendenza, which mandates that new interventions remain within the existing architectural footprint to avoid consuming new land, this proposal advocates for a strategic deviation to facilitate the revival of the Palazzo del Lavoro. The introduction of external pop-out volumes is identified as a crucial strategy for reinvigorating the building's interaction with its urban context, despite initially seeming to contradict preservation guidelines.

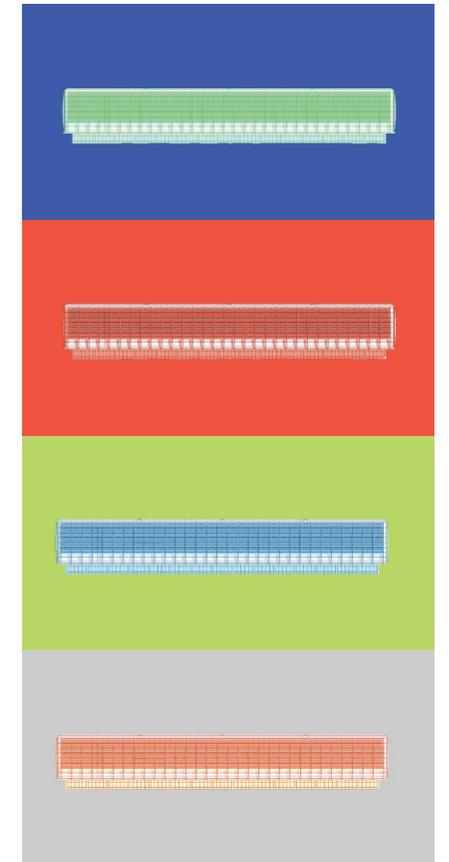


Figure 85: Facades of Palazzo del Lavoro illustration.

To respect the historical facade elements above the ground floor and to mitigate the impact of these interventions and align with the overarching goal of minimal intrusion, the proposal focuses these pop-out volumes exclusively on the ground floor. This decision not only aligns with regulatory requirements but also leverages the potential for activating the building's interface with the public realm. By introducing retail spaces through pop-out volumes, the proposal seeks to animate the building's perimeter, inviting engagement and offering a new layer of accessibility and visibility to the Palazzo.

The methodology behind the pop-out volumes employs a careful balance between extrusion and intrusion, redefining the building's entrances and its spatial dynamics in relation to its functions and users. This approach not only enhances the building's connectivity with its surroundings but also integrates it more seamlessly into the urban landscape. The integration of these volumes into the surrounding landscape design further underscores a holistic vision for the site, one that is responsive to both the built and natural environment.

Furthermore, the transformation of the first floor lateral slabs into green balconies through the extension of these pop-out volumes introduces a biophilic element into the design. This not only enriches the aesthetic and experiential qualities of the building but also promotes a sustainable and healthful environment for users. The active engagement of users with the facade through these green spaces revitalizes the building's exterior, imbuing it with a sense of scale and activity that was previously absent.

The incorporation of pop-out volumes also presents an approach to integrating essential building elements such as external vertical access to upper levels, fire escape routes, and the design of HVAC ductwork, all of which are detailed further in this chapter.



Figure 85: southern facade of the PL. Site visit 8 March 2023



Figure 86: existing ground floor glazing. Site visit 8 March 2023

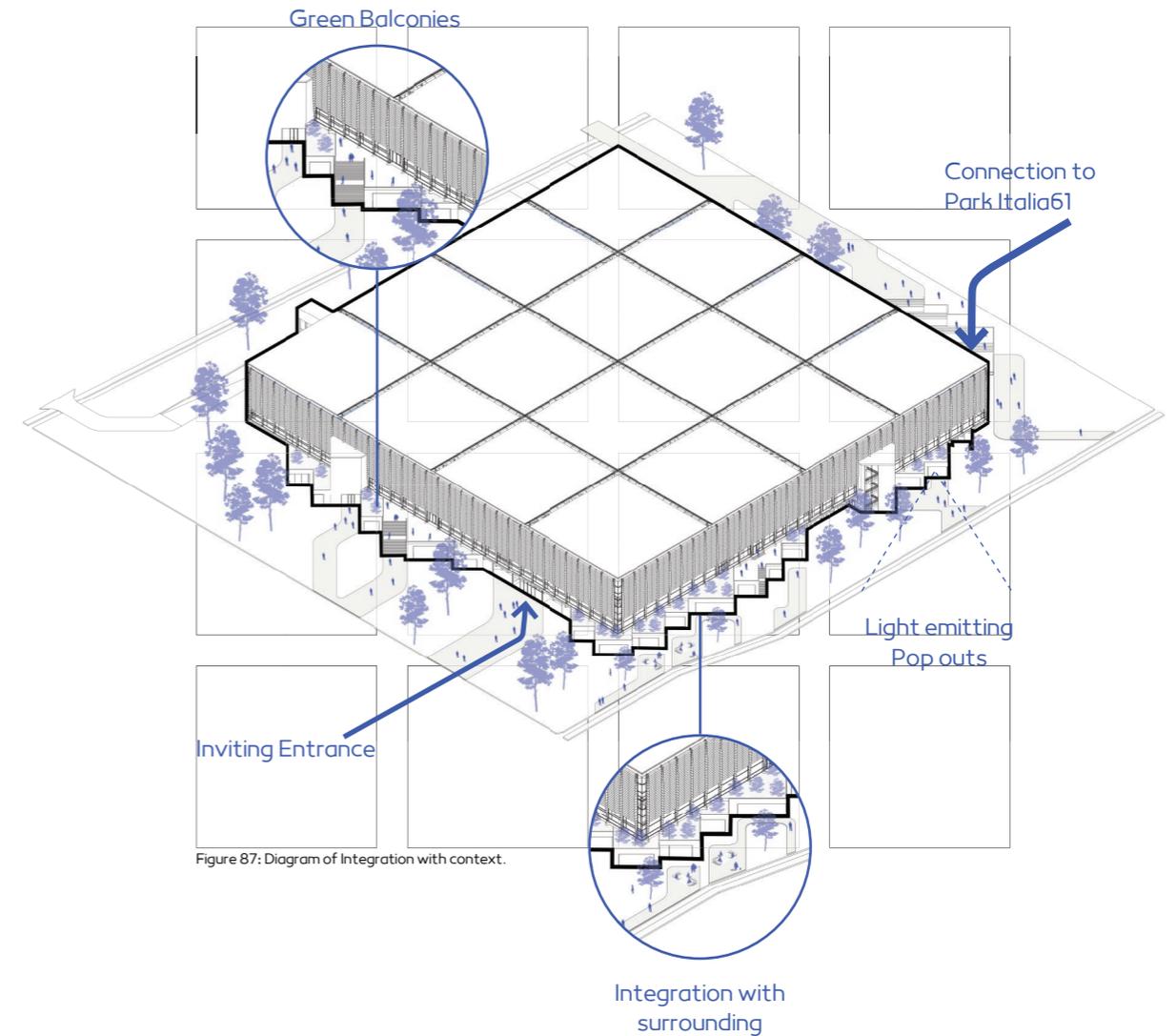


Figure 87: Diagram of Integration with context.

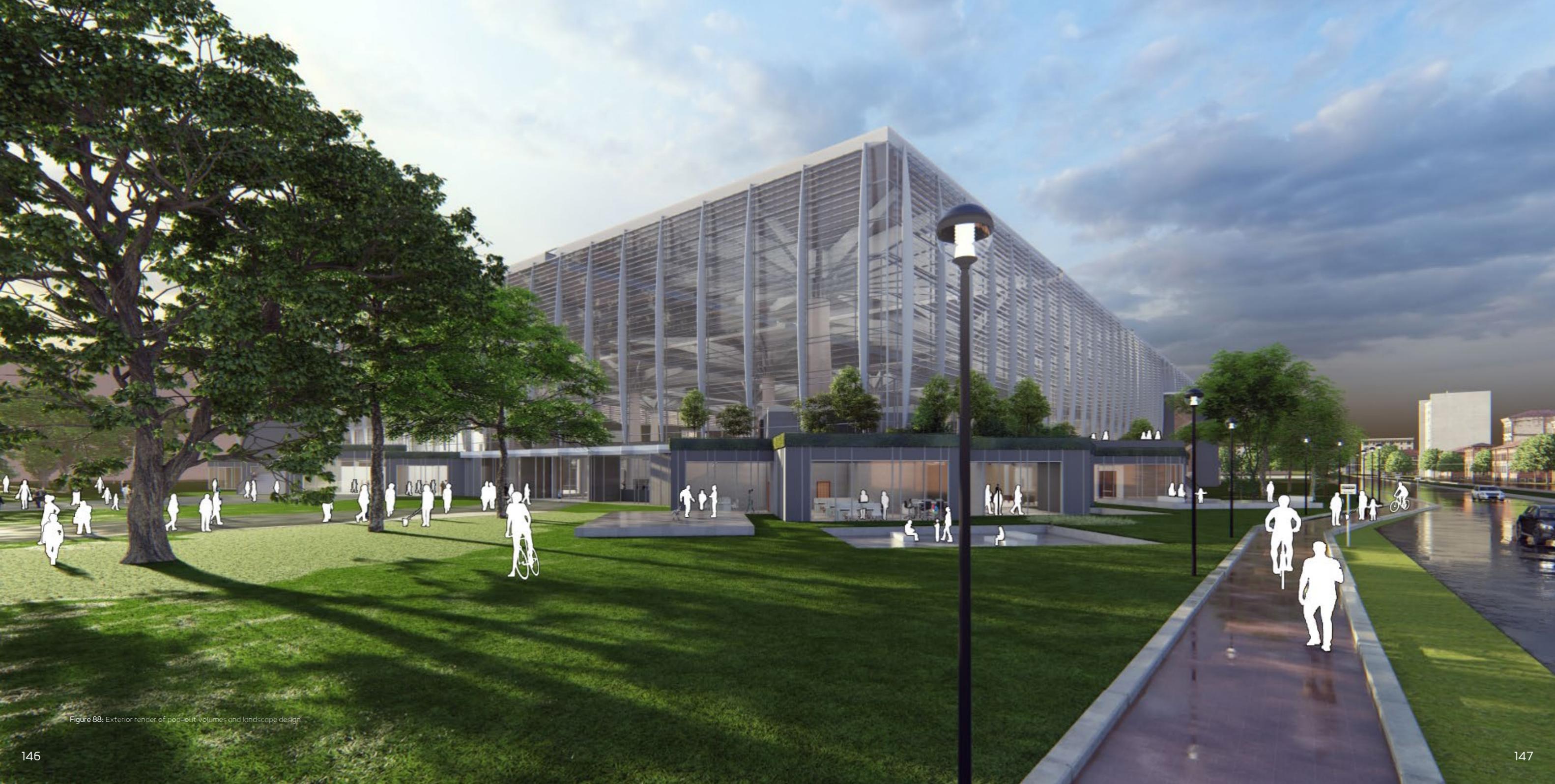


Figure 88: Exterior render of pop-out volumes and landscape design

2 November 2023

This period marked a crucial phase of collective review with our professors, providing us with a reflective pause in our design process. We presented our evolving designs as interconnected pieces of a complex puzzle, enabling us to map out the progression of our ideas and their interrelations. This session extended beyond critique, serving as a strategic planning moment to outline the remaining steps towards completing our thesis.

In this proposal, a distinctive approach is taken in the distribution of functions, opting for layers instead of separated volumes. The primary layers consist of the existing lateral slabs, which are expanded and enlarged towards the center of the Palazzo del Lavoro. The ground floor accommodates the shopping center and food court along the project's perimeter. University functions are strategically placed on the first and second floors, while the third floor is dedicated to the innovation hub. Crucially, co-working spaces span across all three floors, establishing a seamless connection between the university and the innovation hub. Conceptually, co-working serves as a bridge, linking education to professional work. At the heart of the project, the science center takes center stage, symbolizing science, and all functions cascade down to the ground floor through the terracing concept, converging at the science museum – the symbolic backbone of the project. This conceptual framework aligns all functions to work cohesively for science, with the science museum acting as the central access point connecting the ground floor to co-working spaces and upper levels.

EXPLODED DIAGRAM

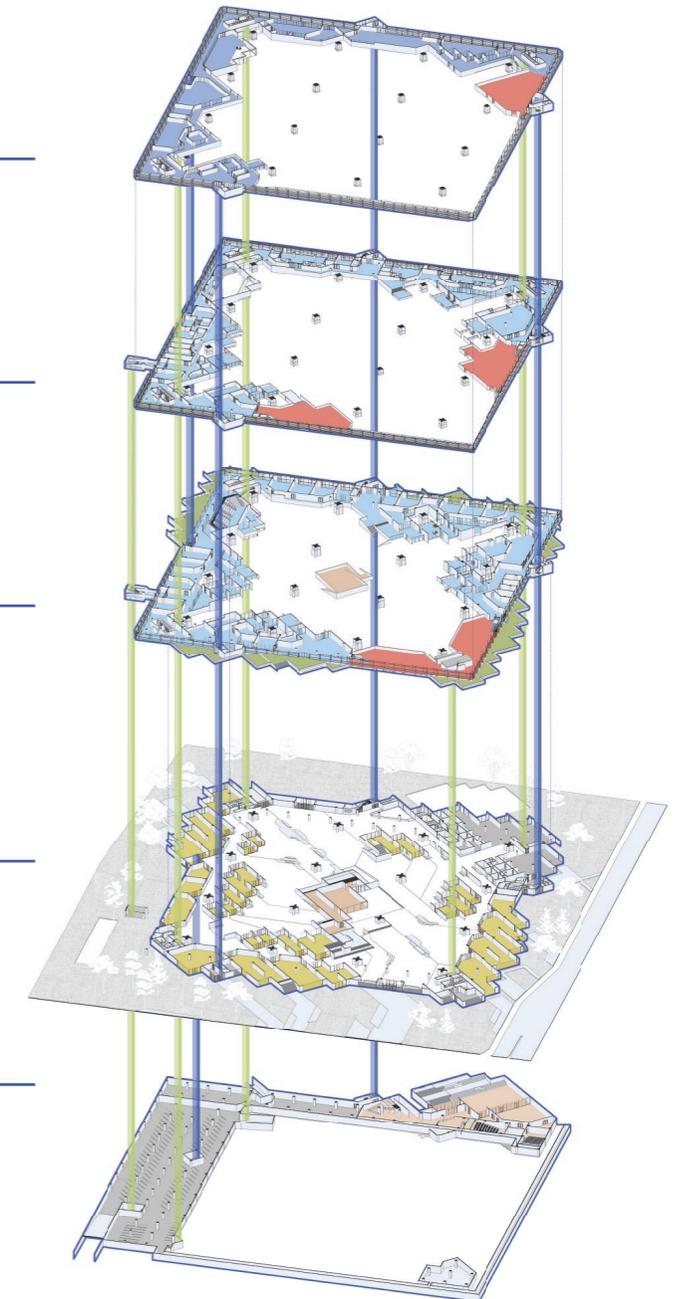


Figure 89: Scenario 3- Exploded diagram.

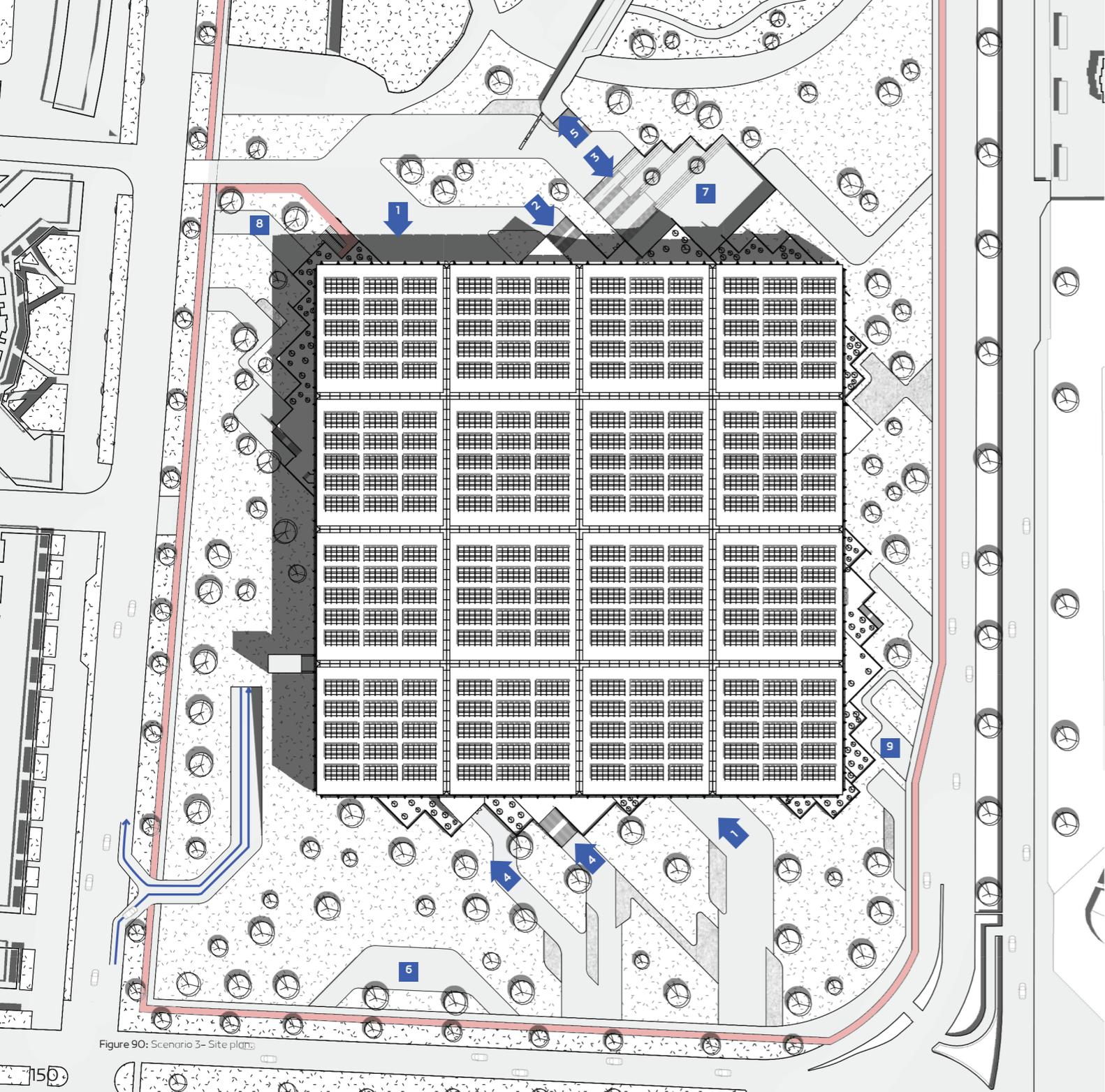
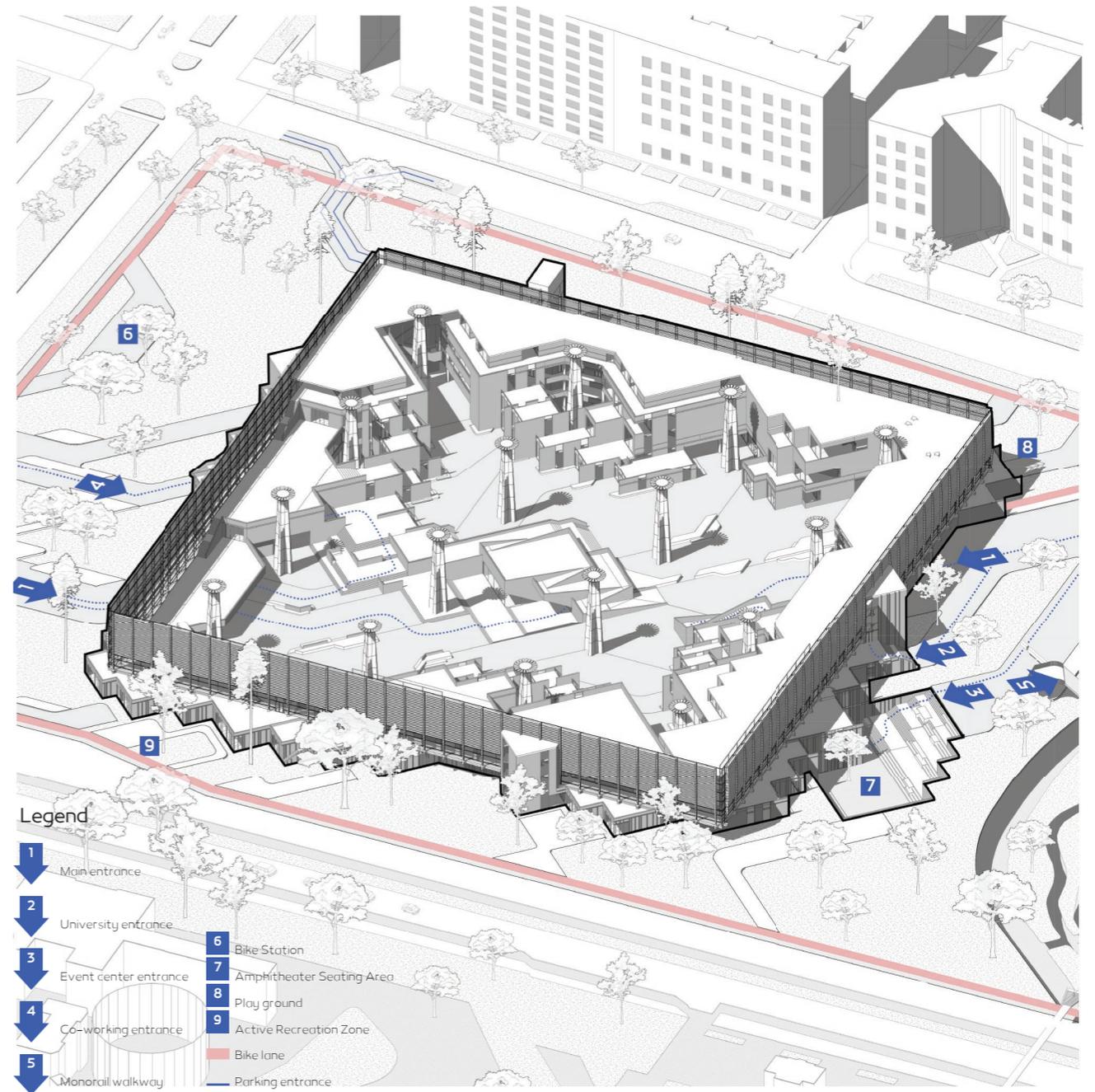


Figure 90: Scenario 3 - Site plan



Legend

- 1 Main entrance
- 2 University entrance
- 3 Event center entrance
- 4 Co-working entrance
- 5 Monorail walkway
- 6 Bike Station
- 7 Amphitheater Seating Area
- 8 Play ground
- 9 Active Recreation Zone
- Bike lane
- Parking entrance

Figure 91: Entrances diagram



Figure 92: Exterior render of proposal for monorail.

Enhancing the Palazzo del Lavoro's connection with its surroundings, a new walkway is proposed along the abandoned monorail structure, a notable element of the Italia' 61 complex with significant commemorative value according to the analysis.⁴¹ This walkway aims to offer a unique path for pedestrians, enabling them to walk above the lake within the park, thus providing a captivating perspective towards the building and inviting engagement with it. By re-purposing the monorail, the project not only breathes new life into a forgotten infrastructure but also strengthens the urban fabric by creating a meaningful link between the building and its context.

41. "The administration has been evaluating the project for the construction of a walkway connecting the Palazzo del Lavoro and the Palavela for some time, using the sections of the monorail" (Versienti, 2023).

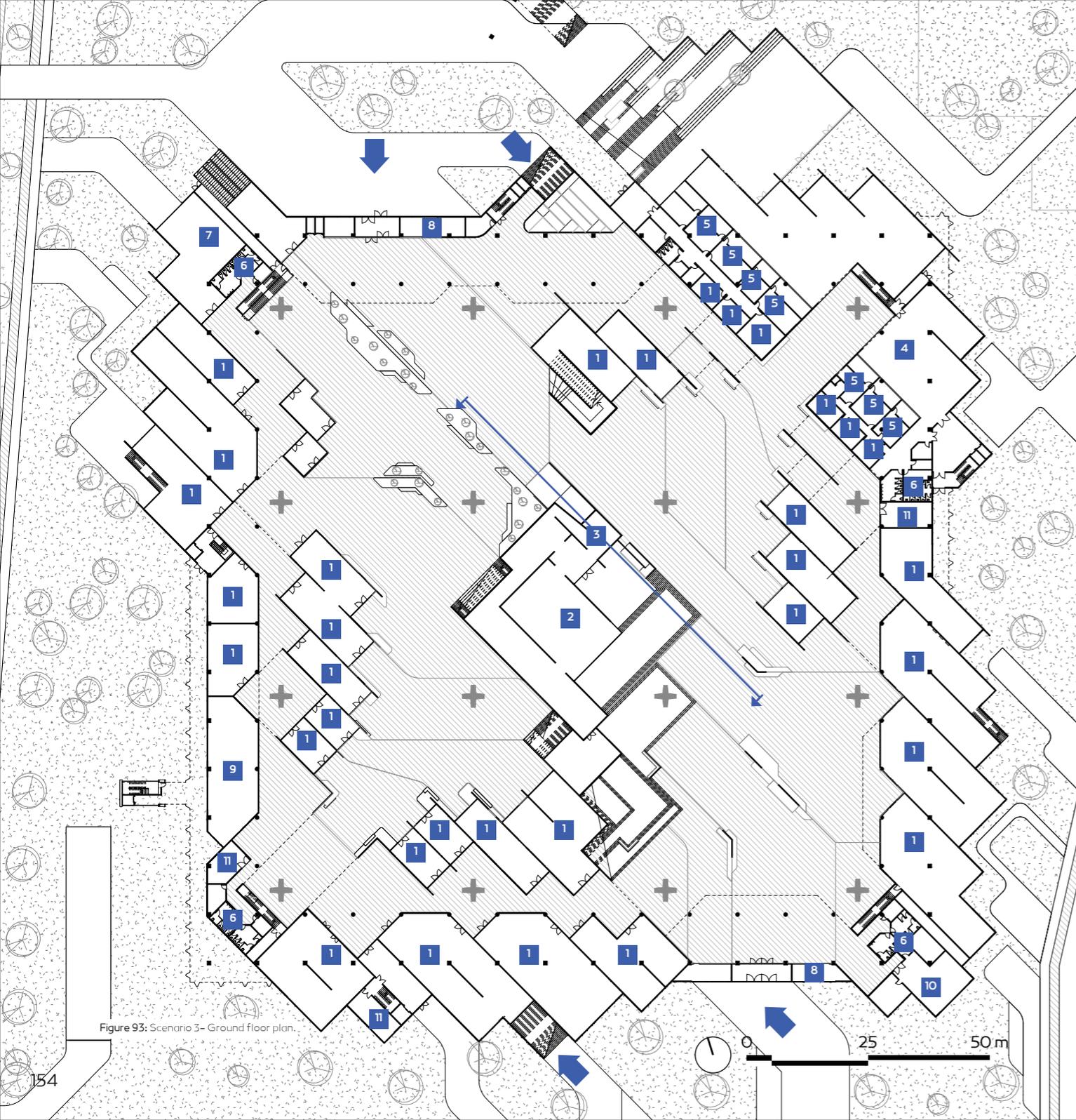


Figure 93: Scenario 3- Ground floor plan.

GROUND FLOOR PLAN

The integration of a shopping center, food court, and science museum on the ground floor of the Palazzo del Lavoro forms a dynamic nexus of activities that serves as a vibrant public space, enhancing both the building's functionality and its engagement with the urban and natural context.

The architectural articulation of two main entrances; one from the north, channeling the tranquility and essence of the park into the internal plaza, and the other from the south, reflecting the more urban characteristics into its counterpart, epitomizes the project's thoughtful integration with its diverse context.

Legend

- 1 Shops
- 2 Science Museum
- 3 Museum Shop
- 4 Food court
- 5 Kitchens and Counters
- 6 Services
- 7 Kindergarten
- 8 Information
- 9 Hypermarket
- 10 Mall Business Center
- 11 Mechanical Room

Museum	Science Museum	1300 m ²
Shopping Center	32 Shop	6050m ²
	Administration Offices	254 m ²
	Children care	275 m ²
Food Court	Food Preparation and counter	410 m ²
	Food Court Seating	1345 m ²

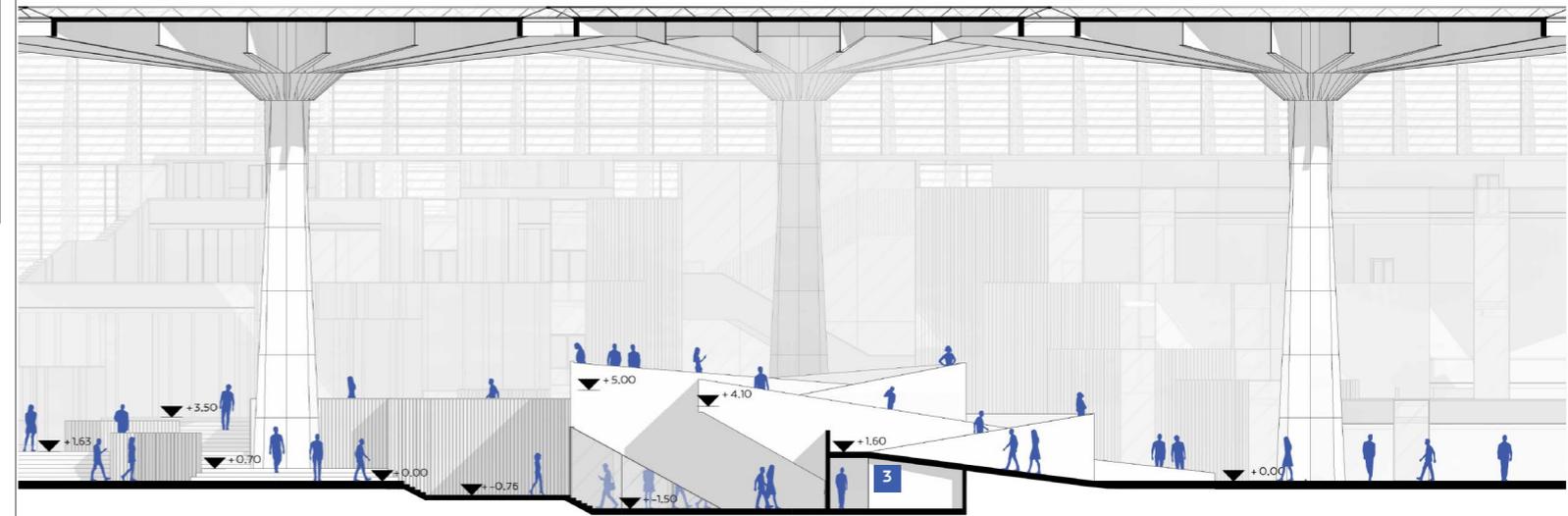


Figure 94: Scenario 3- Museum Section

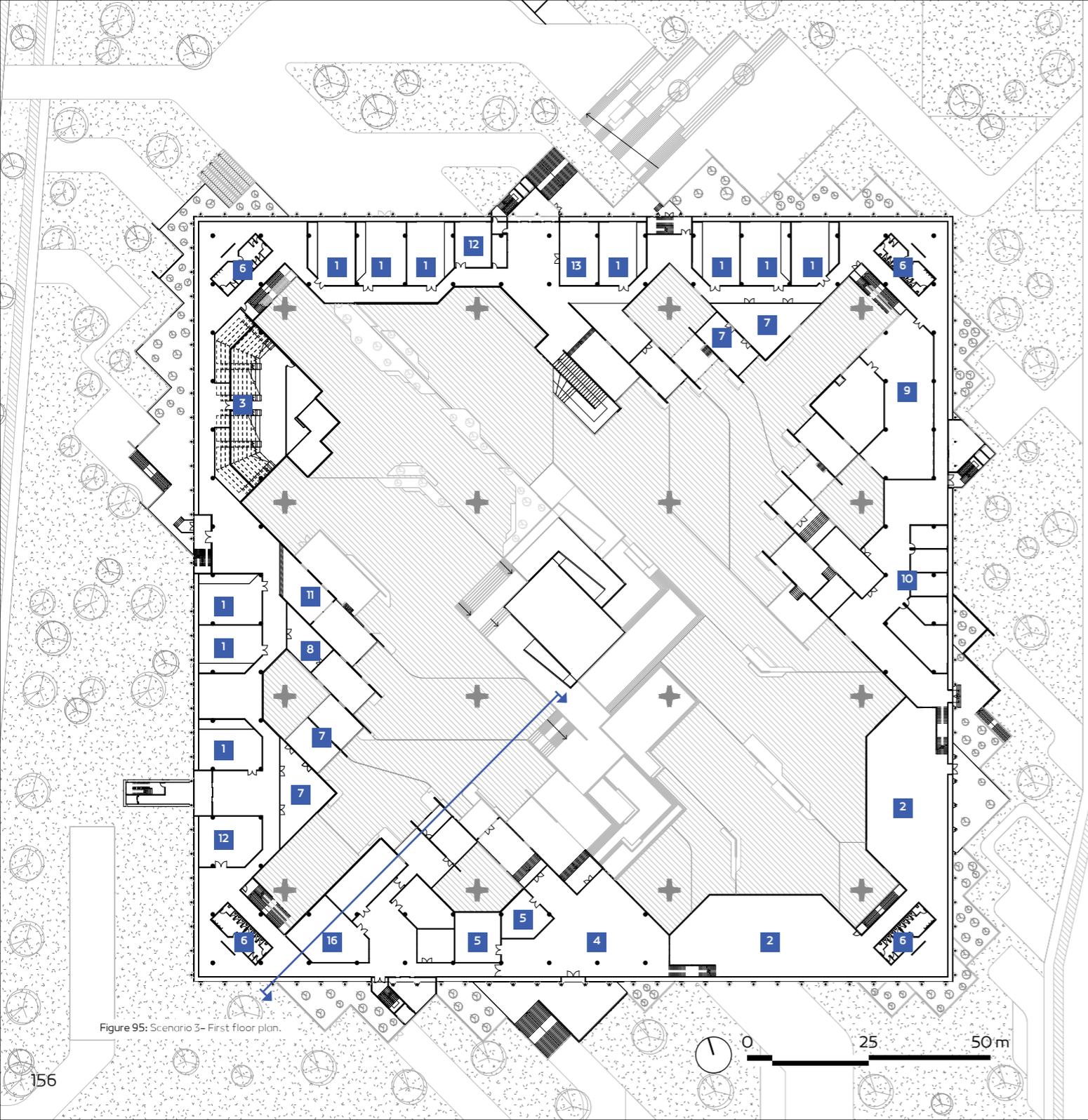


Figure 95: Scenario 3- First floor plan.

FIRST FLOOR PLAN

The first floor of the Palazzo del Lavoro is designed to accommodate the functions of the co-working spaces and university, comprising classrooms and a lecture hall. Acting as a conceptual and physical mediator between the university and co-working areas, shared functions are placed to enhance interaction while maintaining the distinct identities of each zone. On one side, the library is situated, serving as a bridge that connects the collaborative realms of the university and co-working spaces. On the opposite side, the university offices and a lobby

delineate the boundary between the university and co-working spaces. Beyond the designated external entrances, both the university and co-working spaces are accessible through the central hub of the project, a design choice that emphasizes connectivity and accessibility. This central access point functions as the heart of the Palazzo, enabling users to navigate the building's offerings intuitively and interact with the diverse functions it houses.

Legend

- | | |
|----------------------------------|------------------------------|
| 1 Classroom | 9 Library |
| 2 Co-Working | 10 Career Development Center |
| 3 Lecture hall | 11 Student Lounge |
| 4 Lobby | 12 Mechanical Room |
| 5 Co-Workspace Management Center | 13 Computer lab |
| 6 Services | 14 University Offices |
| 7 Study room | 15 Shop |
| 8 Cafeteria | 16 Networking Pavilion |

University	10 Classroom (for 60 person)	1400 m ²
	Lecture Hall (For 320 person)	485 m ²
	Library & study room	1250 m ²
	University Offices	540 m ²
Co- working	Co-Working (My flex)	1374 m ²

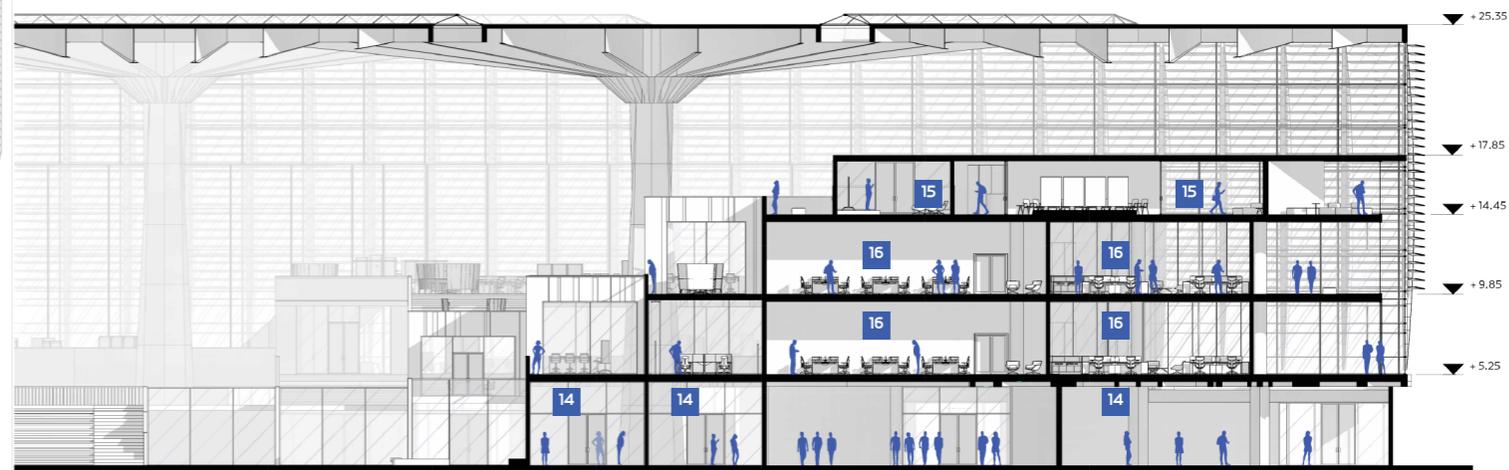


Figure 96: Scenario 3- Terraces Section.

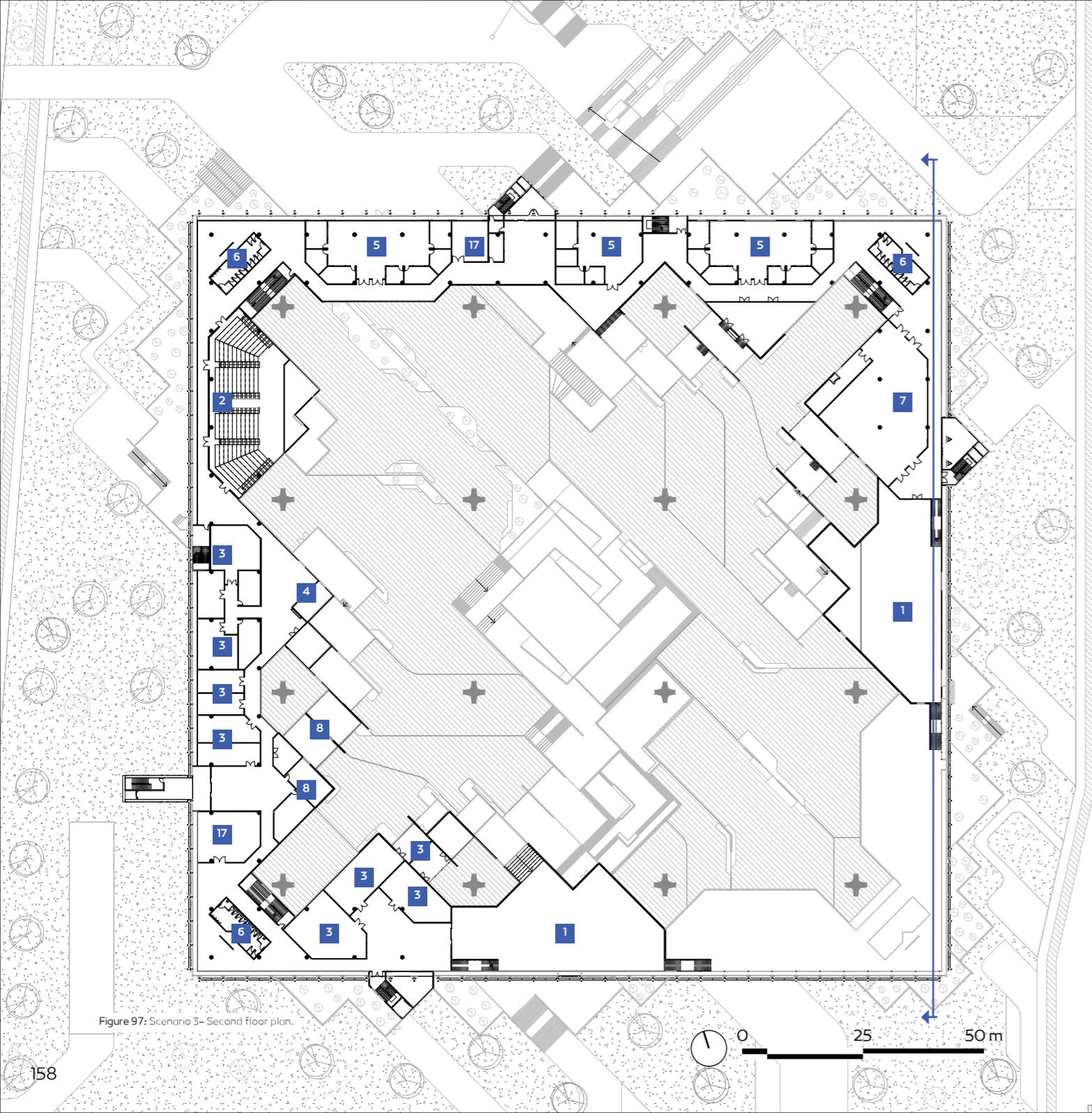


Figure 97: Scenario 3- Second floor plan.

SECOND FLOOR PLAN

The second floor continues the thematic integration of university and co-working spaces, further expanding the facility's capacity for academic and professional endeavors. This level is particularly characterized by its focus on research and development, housing laboratories and staff offices for university use. The presence of staff offices in close proximity to these labs facilitates efficient administration and oversight, ensuring that the academic staff remains connected to the core activities of their departments.

The co-working space on this floor is tailored for users requiring a more permanent setup, catering to professionals and teams engaged in longer-term projects. This design decision reflects an understanding of the diverse

needs of co-working users, offering them a dedicated space conducive to sustained productivity and focus. By providing an environment that supports steady, ongoing work, the Palazzo del Lavoro accommodates a wider range of professional activities, from individual freelancers to collaborative teams working on complex projects. Bridging the university and co-working areas, the offices and a canteen serve as communal spaces that encourage interaction between the two groups. The canteen, in particular, stands out as a social hub, offering a place for relaxation and informal networking. By catering to both university affiliates and co-working professionals, it promotes a sense of community and fosters connections that transcend the boundaries of each domain.

Legend

- | | | | |
|---|---------------------|----|-----------------------|
| 1 | Co-Working | 9 | Student Lounge |
| 2 | Lecture hall | 10 | Library |
| 3 | University Office | 11 | Mall Business Center |
| 4 | Office Lounge Area | 12 | Shop |
| 5 | Laboratory | 13 | Kitchens and Counters |
| 6 | Services | 14 | Food court |
| 7 | Canteen | 15 | Cinema |
| 8 | Office Services Hub | 16 | Banquet hall |
| | | 17 | Mechanical Room |

University		Laboratory	950 m ²
		Canteen	670 m ²
		University Offices	1180 m ²
<hr/>			
Co-Working		Co-Working (My desk)	1510 m ²

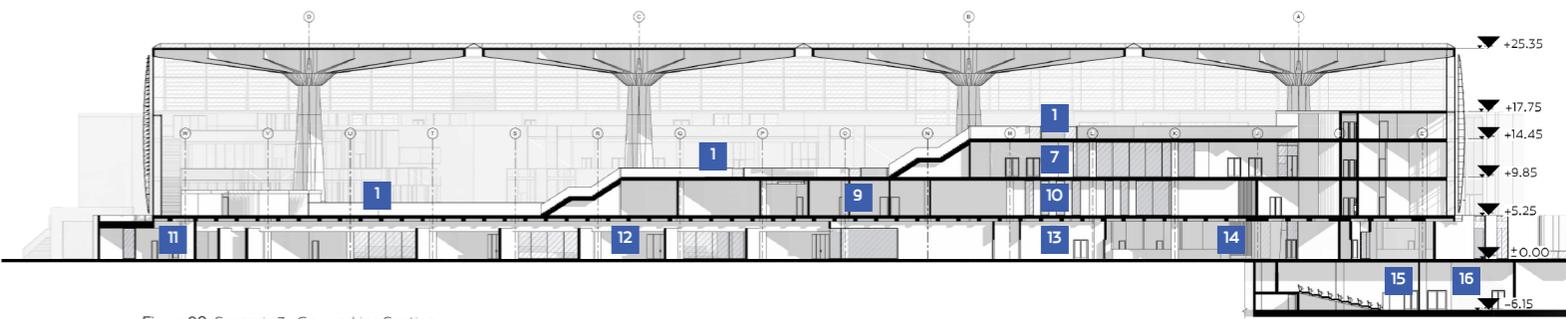


Figure 98: Scenario 3- Co-working Section.

THIRD FLOOR PLAN

The third floor of the Palazzo del Lavoro is envisioned as a dynamic innovation hub, specifically designed to cater to startups and various innovative teams. This dedicated space, strategically located on the northern and western sides of the building, is not only accessible from within, seamlessly connecting to the different levels of co-working spaces, but also features two distinct external access points. The southern access leads directly to the presentation pavilions of the innovation hub. These pavilions are essential components of the hub, designed to showcase the cutting-edge work being developed within the startups. This space is pivotal for teams to engage with potential investors, partners, and the public, facilitating demonstrations and discussions that are integral to the innovation process.

The northern access is oriented towards the offices and meeting rooms, areas where the critical work of ideation, collaboration, and strategic planning takes place. These spaces are designed to foster creative thinking and effective teamwork, equipped with the necessary amenities to support a wide range of activities, from deep work sessions to collaborative meetings. A common cafe and kitchen area serves as a communal space for the innovation hub users, providing a casual environment for relaxation and informal interaction. This shared amenity is vital for building a sense of community among the various teams and individuals working within the hub.

Legend

- 1 Collaboration Hub
- 2 Co-working space (My Office)
- 3 Welcome Center
- 4 Networking Pavilion
- 5 Meeting room
- 6 Presentation Pavilion
- 7 Cafe Commons & Bistro
- 8 Innovation Studio
- 9 Services

Innovation hub		Innovation Studio	1540 m ²
		Presentation Pavilions	425 m ²
		Cafe commons & Lounge Area	620 m ²
Co-working		Co-Working (My desk)	715 m ²

Figure 99: Scenario 3- Third floor plan.

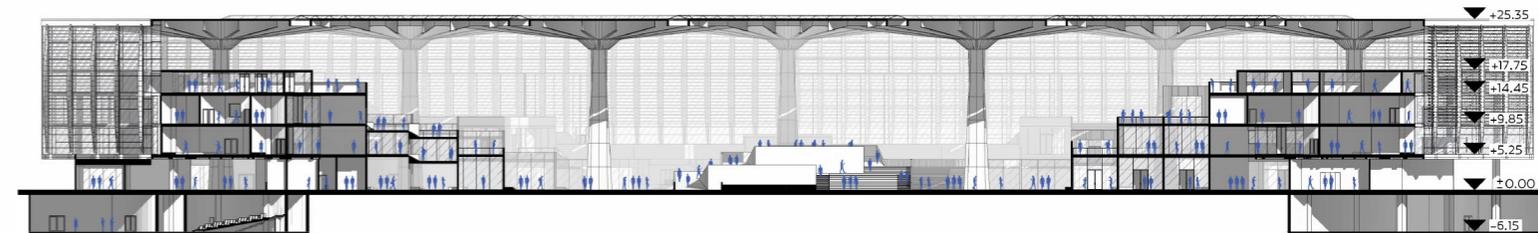


Figure 100: Scenario 3-Section.

UNDERGROUND PLAN

The underground level of the Palazzo del Lavoro, thoughtfully integrating the existing ramp, is allocated for car parking, bike parking, and a comprehensive event center.

Car parking is accessible via the main ramp, with three principal vertical access points strategically positioned to guide visitors efficiently to their intended function.

On the northern side, a dedicated bike entrance links directly to the external bike lane, underscoring the project's commitment to sustainable transportation and

providing cyclists with a secure and accessible parking solution that encourages the use of alternative transport modes.

The event center is designed for versatility and direct accessibility. It can be accessed externally through the plaza, enhancing the center's connection with the surrounding park and urban fabric. Internally, a ramp and elevator provide additional access routes, ensuring that the center remains an integral part of the Palazzo's ecosystem.

Legend

- | | |
|--------------------------------------|-----------------------------|
| 1 Amphitheater Seating Area | 9 Mechanical Equipment Room |
| 2 Banquet hall | 10 Food court |
| 3 Cinema | 11 Kitchens and Counters |
| 4 Event Center Administration Office | 12 Classroom |
| 5 Gallery | 13 Laboratory |
| 6 Bike Parking Area | 14 Innovation Studio |
| 7 Parking | |
| 8 Disabled parking | |
| 1 Bike Entrance | |
| 2 Car Entrance | |

Parking	Parking	#120
	Bike parking	#900
Event Center	Gallery	344 m ²
	Cinema	289 m ²
	Banquet hall	425 m ²
	Amphitheater	880 m ²

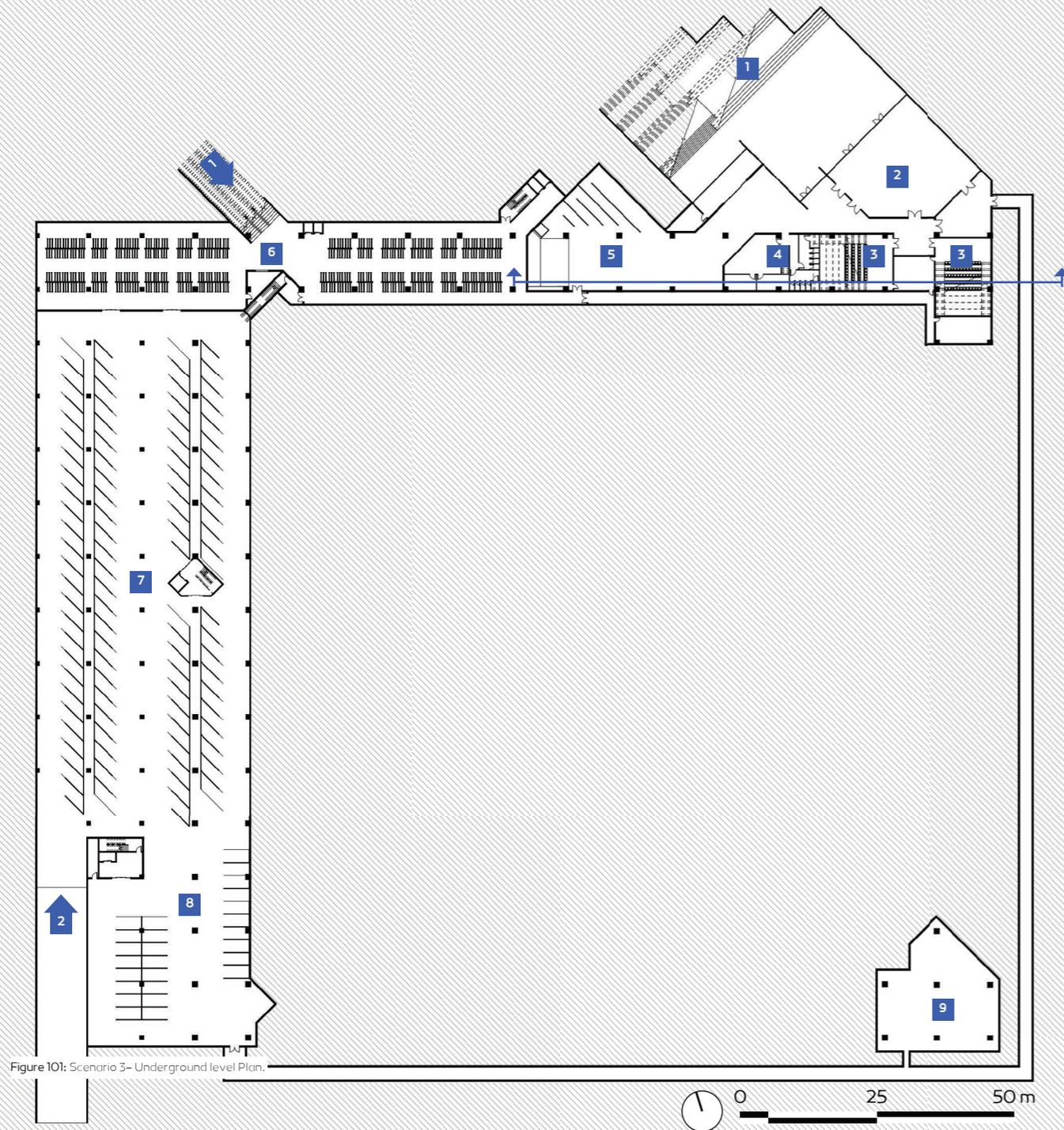


Figure 101: Scenario 3- Underground level Plan.

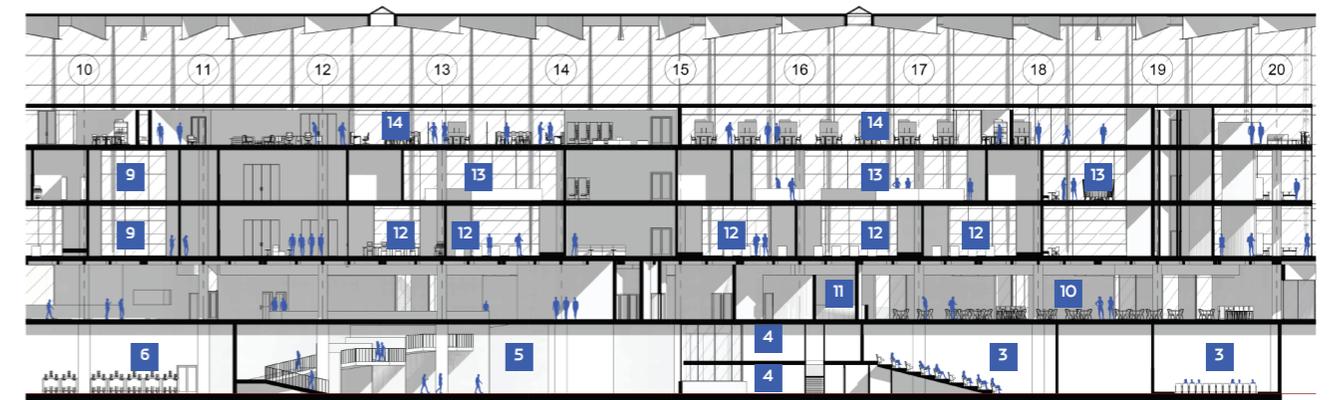


Figure 102: Scenario 3-Section

FIRE ESCAPE

Addressing the challenge of designing fire escape routes for the upper levels of the Palazzo del Lavoro required careful consideration of both safety requirements and the preservation of the building's historical elements, particularly the isostatic ceiling of significant historical value. The proposed fire escape solutions needed to ensure the safety of occupants without compromising the integrity of the building's heritage features. The strategy involved the development of three distinct types of escape routes, each tailored to integrate seamlessly with the existing structure while adhering to fire safety regulations.

Firstly, the existing staircases located at the corners of the building are enhanced to meet fire safety standards through fireproofing measures. These staircases are upgraded to allow for a safe and protected passage to the exterior. (Type A)

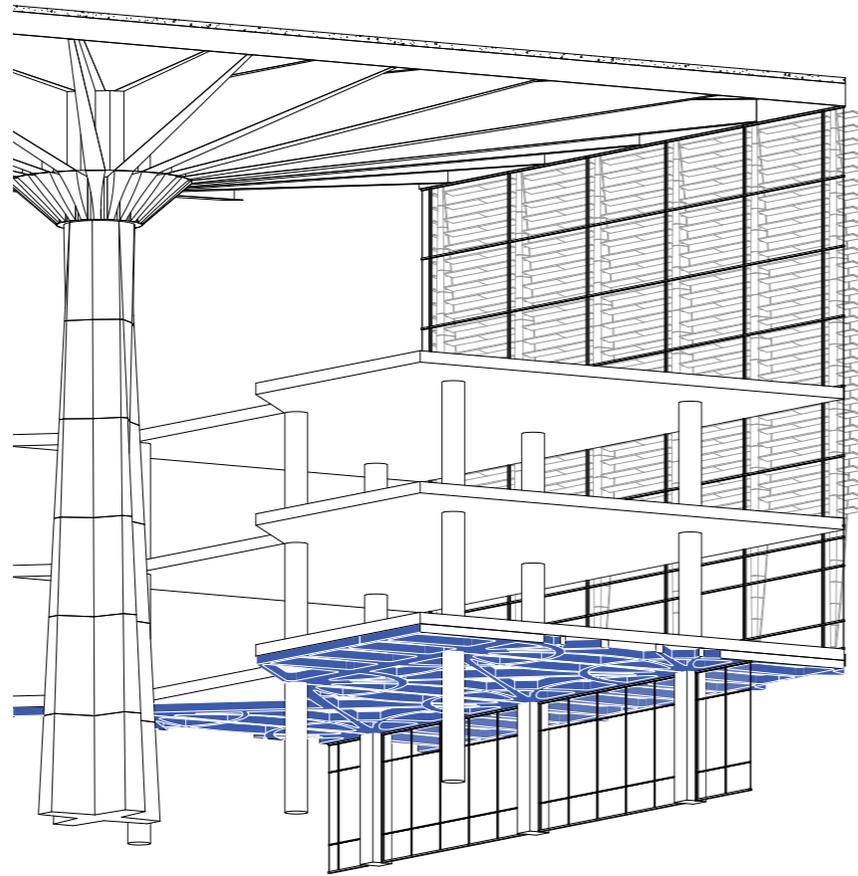


Figure 103: Scenario 3- Diagram of saving existing First floor slab.

Secondly, the introduction of exterior staircases provides a direct means of egress from the upper levels to the outside, circumventing the need to alter or damage the historically valuable isostatic ceiling. This approach minimizes the impact on the building's original fabric. (Type B)

Lastly, an innovative solution involves the use of external staircases attached to the pop-out volumes. In this scenario, occupants would descend to the first floor within the emergency staircases and then proceed to the ground level via the staircases integrated into these additional volumes. This method provides an alternative route that leverages the architectural modifications of the pop-out structures, offering a practical and aesthetically coherent means of egress without compromising the historical ceiling's preservation. (Type C)

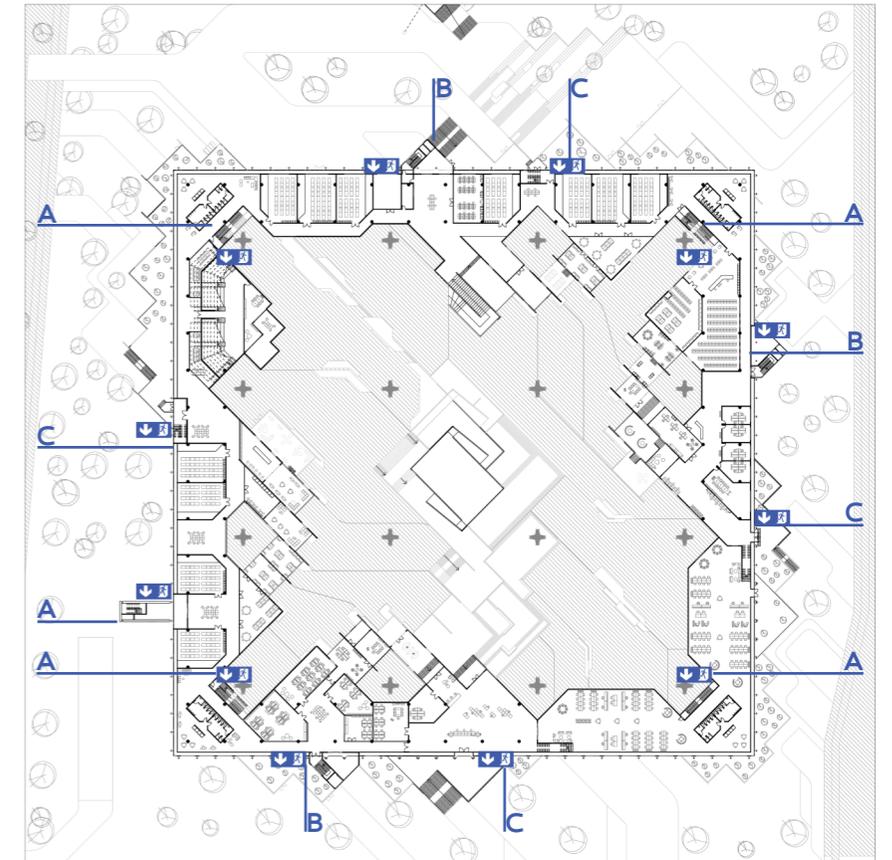
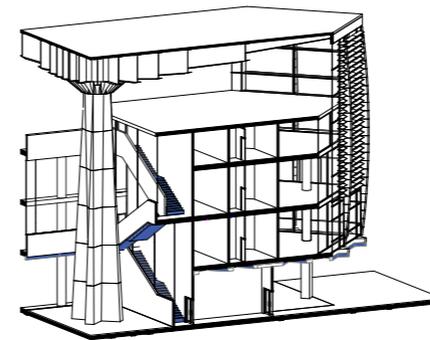
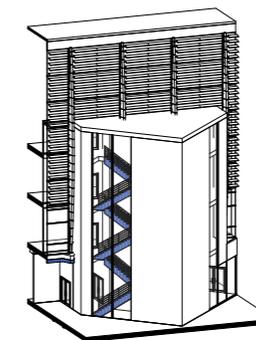


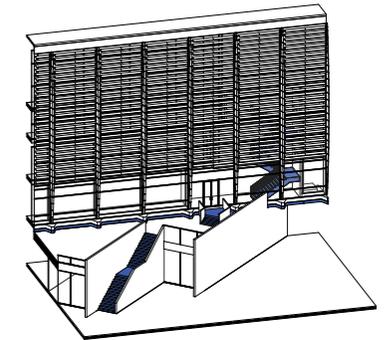
Figure 104: Scenario 3-Fire exit key plan.



Type A Existing staircases



Type B Exterior staircases



Type C Staircases from terraces

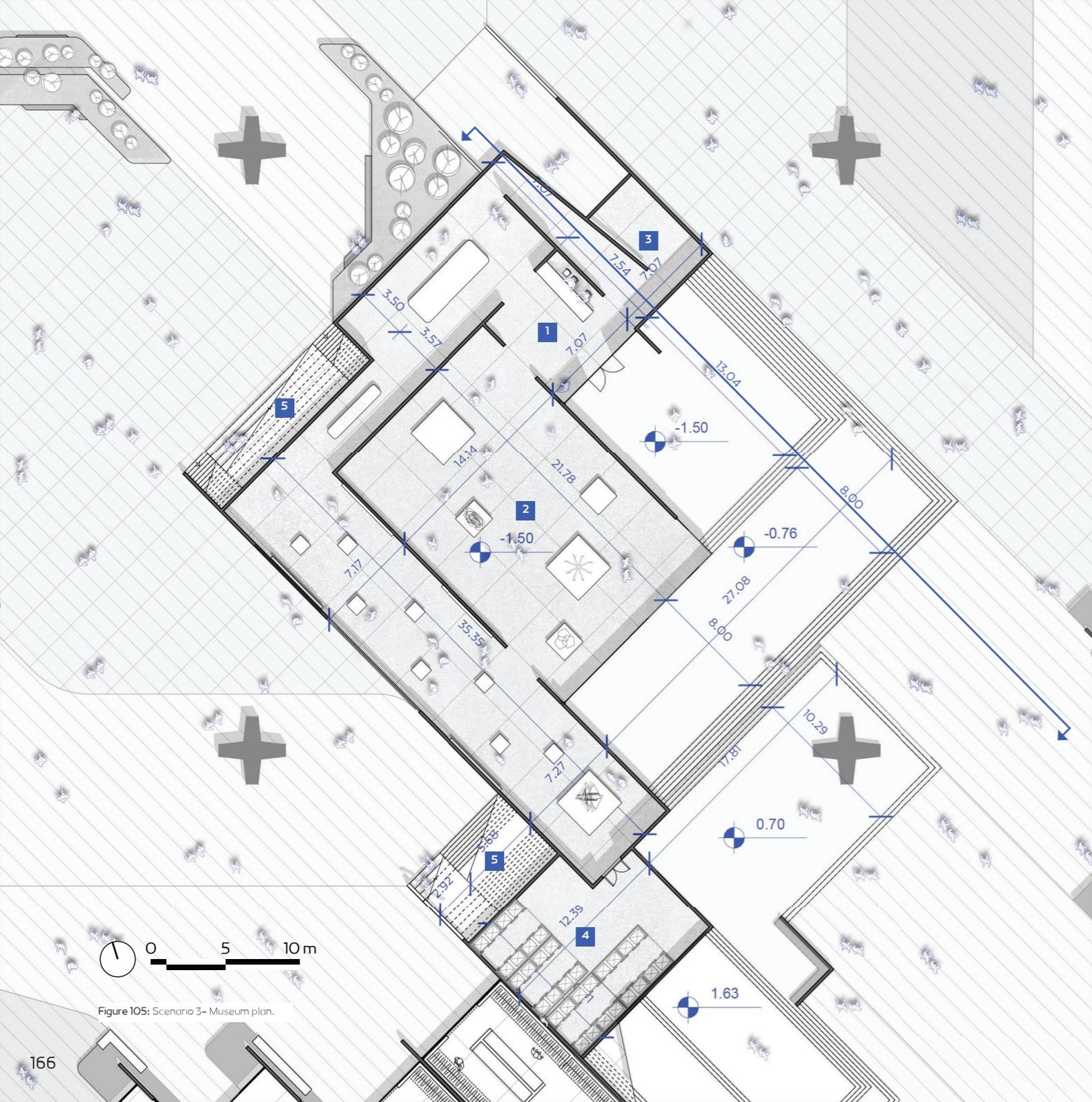


Figure 105: Scenario 3- Museum plan.

SCIENCE MUSEUM

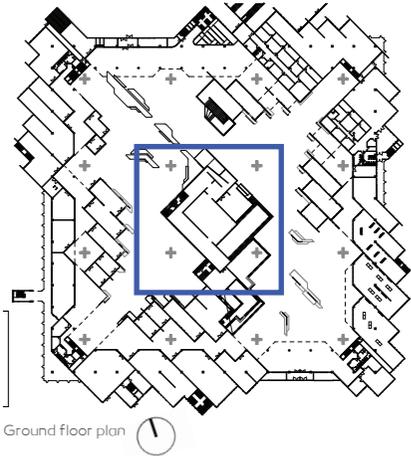
The Science Museum, strategically positioned at the center of the project, serves as a pivotal connection point, not only visually and physically but also conceptually. Its central location aims to convey the idea that all functions within the complex are working in harmony for the advancement of science. The Science Museum stands as a symbolic representation of science, acting as the heart of the project where universities, co-working spaces, and innovation hubs converge conceptually. It serves as a meeting point for shoppers, university communities, and individuals involved in various innovation activities.

Despite its central location within the Palazzo del Lavoro, the Science Museum adopts a modest form by descending into the ground by one meter. This deliberate choice enhances the museum's aesthetic appeal and reinforces its role as a unifying element within the architectural landscape.

The lowered structure creates an intriguing opportunity—the rooftop of the museum serves as a viewpoint, accessible through ramps and staircases. These architectural features not only offer a panoramic view of the entire complex of the Palazzo del Lavoro but also double as an amphitheater-like seating area. Positioned to overlook the main internal courtyards of the Palazzo, these staircases contribute to the dynamic and multifunctional nature of the space, providing a unique vantage point for visitors to engage with the architecture.

Legend

- 1 Museum entrance
- 2 Museum exhibition center
- 3 Museum shop
- 4 Museum storage
- 5 Amphitheater Seating Zone



Ground floor plan



Figure 106: Scenario 3- Render of Museum view.

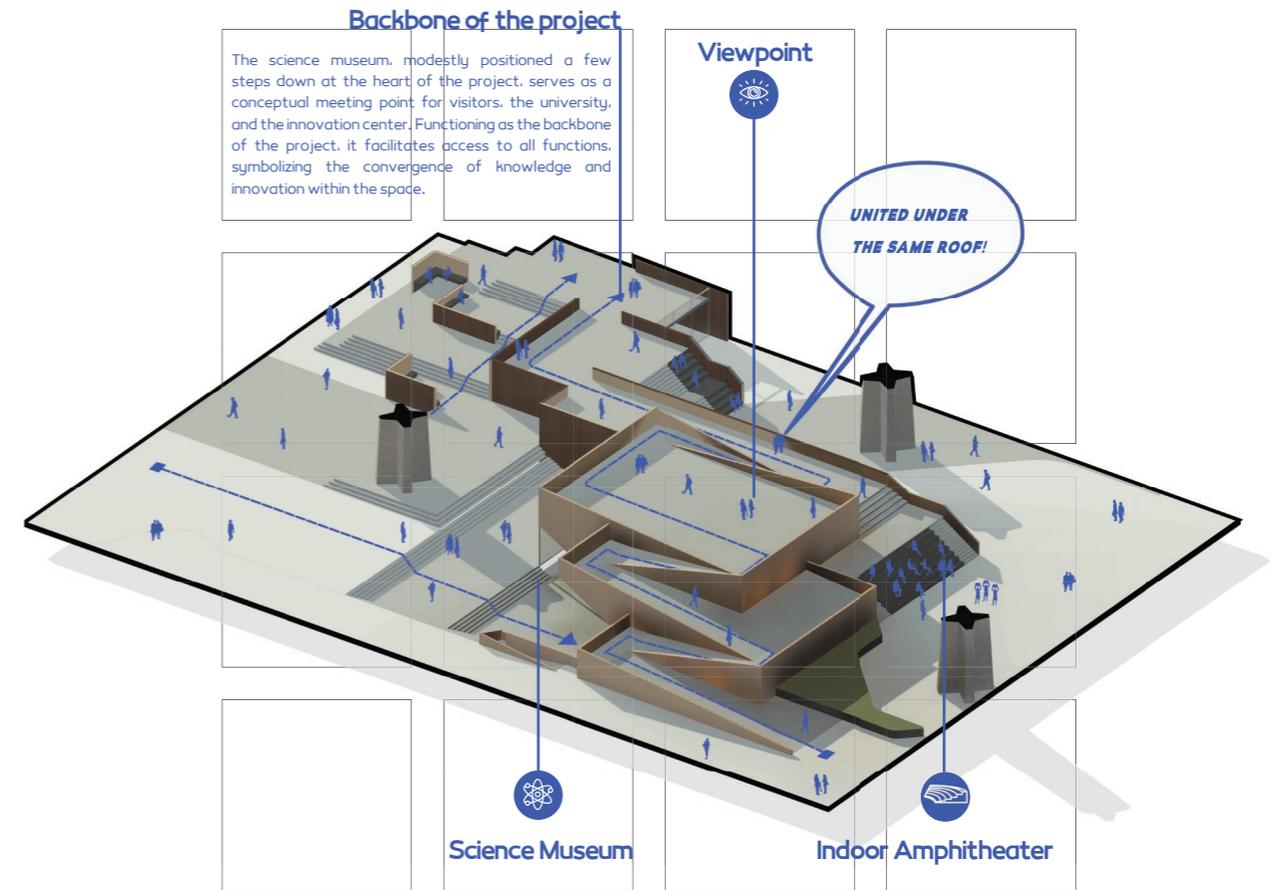
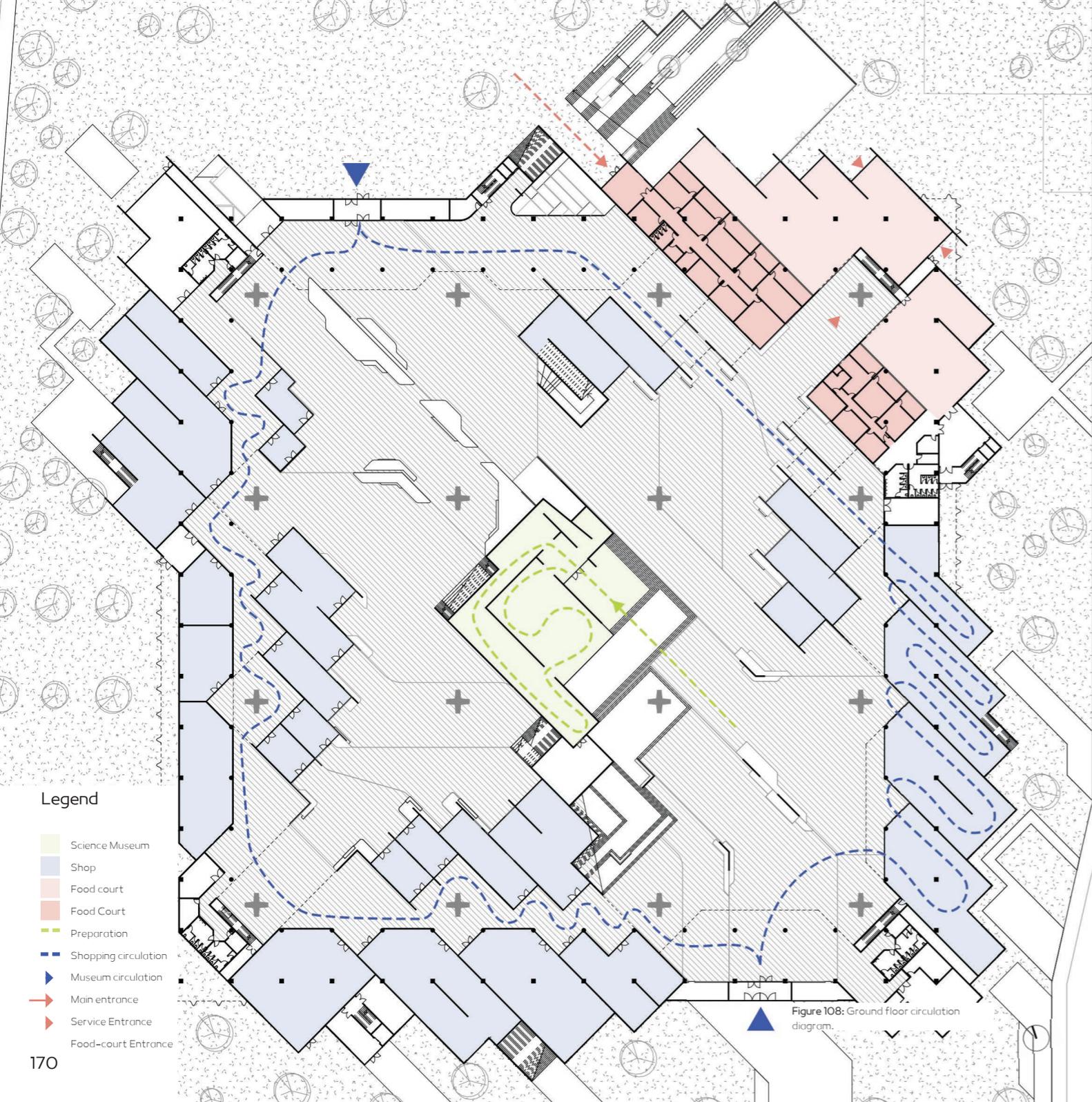


Figure 107: Scenario 3- Museum Axonometric view.



- Legend**
- Science Museum
 - Shop
 - Food court
 - Food Court
 - Preparation
 - Shopping circulation
 - Museum circulation
 - Main entrance
 - Service Entrance
 - Food-court Entrance

Figure 108: Ground floor circulation diagram.

SHOPPING CENTER

The design of the shopping area introduces a loop circulation pattern, ensuring that visitors entering from both the north and south entrances are naturally guided through a continuous pathway that encompasses all the shops. This circulation strategy not only maximizes the exposure of each retail outlet but also enhances the overall shopping experience by creating a seamless flow that encourages exploration and discovery.

A key feature of the shop design is the careful consideration given to the preservation of the original ceiling of the lateral slabs, which holds historical significance. The shops are thoughtfully designed to ensure that most parts of this distinctive ceiling remain visible to shoppers, integrating the building's architectural heritage into the retail environment. The food court, proposed to be located on the northern side of the building, is placed to ensure easy access for shoppers, enhancing the convenience and attractiveness of the shopping center. Additionally, the design incorporates direct access to service areas for the food court, streamlining operations and facilitating efficient connection to the food preparation zones.

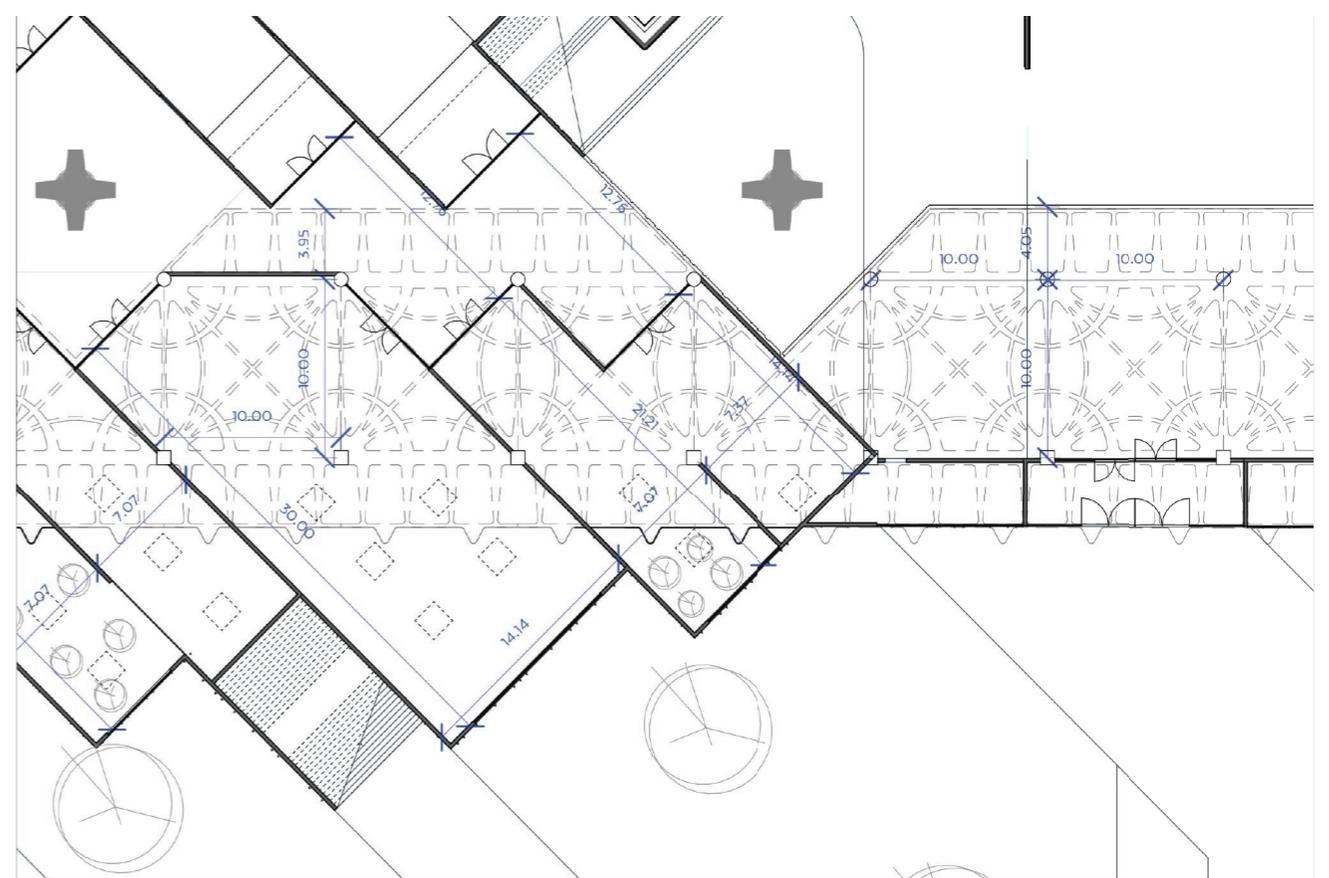


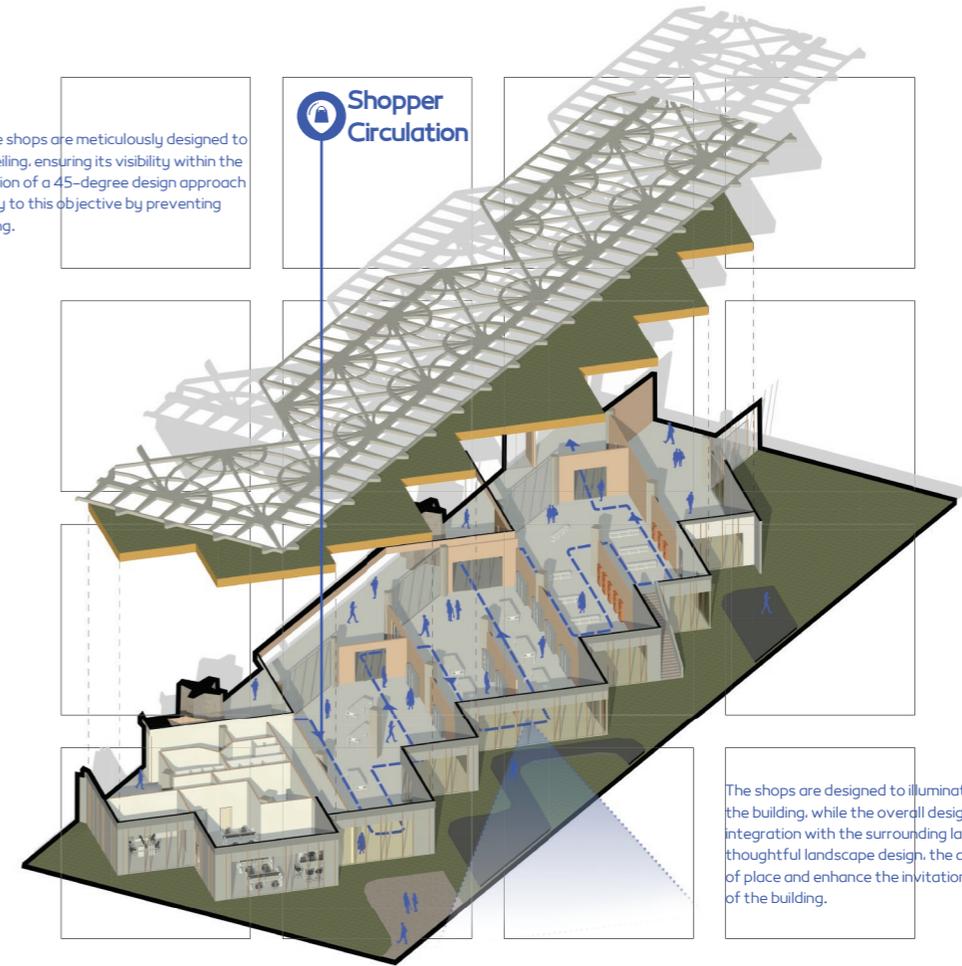
Figure 109: Reflected ceiling plan of shops interior



Figure 110: Scenario 3- interior render shop.

The interior plans of the shops are meticulously designed to highlight the existing ceiling, ensuring its visibility within the shop spaces. The inclusion of a 45-degree design approach contributes significantly to this objective by preventing obstruction of the ceiling.

Shopper Circulation



The shops are designed to illuminate the surroundings of the building, while the overall design strives for greater integration with the surrounding landscape. Through thoughtful landscape design, the aim is to create a sense of place and enhance the invitation to explore the interior of the building.

Figure 111: Scenario 3- Shops axonometric view.

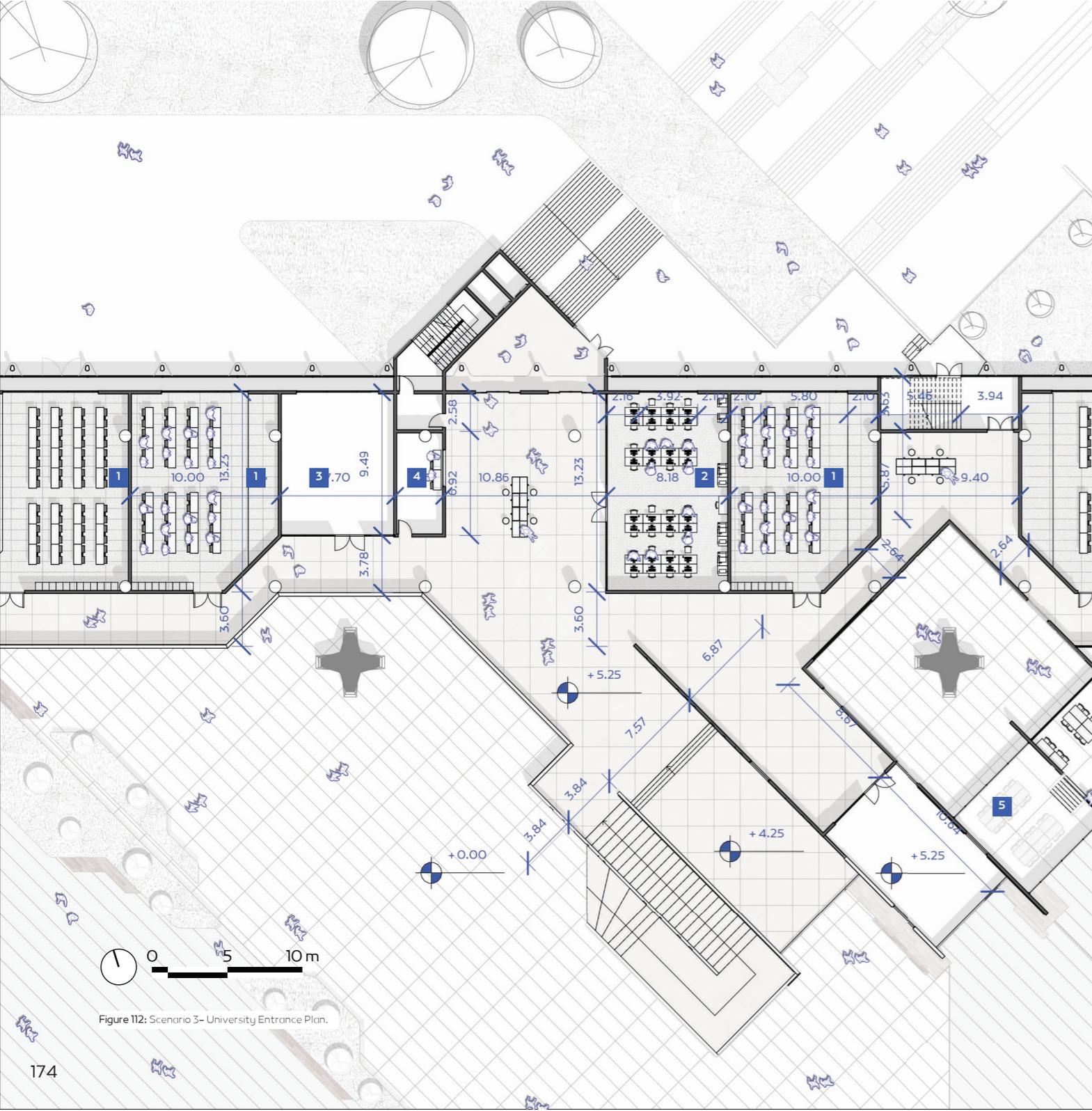


Figure 112: Scenario 3— University Entrance Plan.

UNIFIED UNIVERSITIES HUB

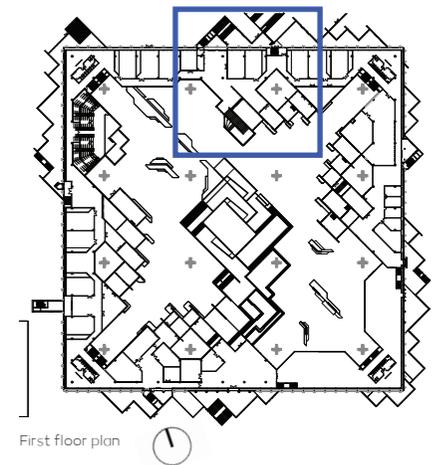
The primary external entrance to the university is positioned on the north side of the building. This location not only facilitates a seamless urban connection with the park but also ensures easy accessibility via public transport and bike. The internal connection to the university is thoughtfully established through staircases originating from the center of the project, fostering a visual and conceptual link with the Science Museum.

In line with the design principles of the co-working entrance, the university entrance adheres to a similar logic. The goal is to create a space that is both open and border-less, welcoming everyone while prioritizing safety. Information and reception points are strategically placed in the main lobby of each floor of the university, serving as central hubs for users.

The design of these lobbies serves a dual purpose. On one hand, they contribute to the border-less and open nature of the space, providing accessibility for all users through internal stairs, external stairs, or the elevator. On the other hand, the information and reception points within the lobby provide visual control over different users accessing the university. This thoughtful design allows the space to be open and accessible while also enabling controlled access when necessary. The approach taken in designing these lobbies aligns with the overall ethos of the project; creating spaces that are both inviting and secure.

Legend

- 1** Classroom
- 2** Computer lab
- 3** Mechanical room
- 4** Information
- 5** Study room terraces



First floor plan



Figure 113: Scenario 3—Interior render



The orientation and distribution of the main functions along the lateral slabs are designed to harness the benefits of ample natural lighting. Natural light is a critical component in creating spaces that are both energy-efficient and conducive to the well-being of occupants.

The decision to position most classrooms and laboratories on the northern side of the building, facing Parco Italia' 61, is motivated by the desire to capitalize on the serene views of the park.

On the first floor, the incorporation of green balconies serves as a natural extension of the indoor functional spaces, further enriching the connection between the building's occupants and the surrounding environment.



First floor plan

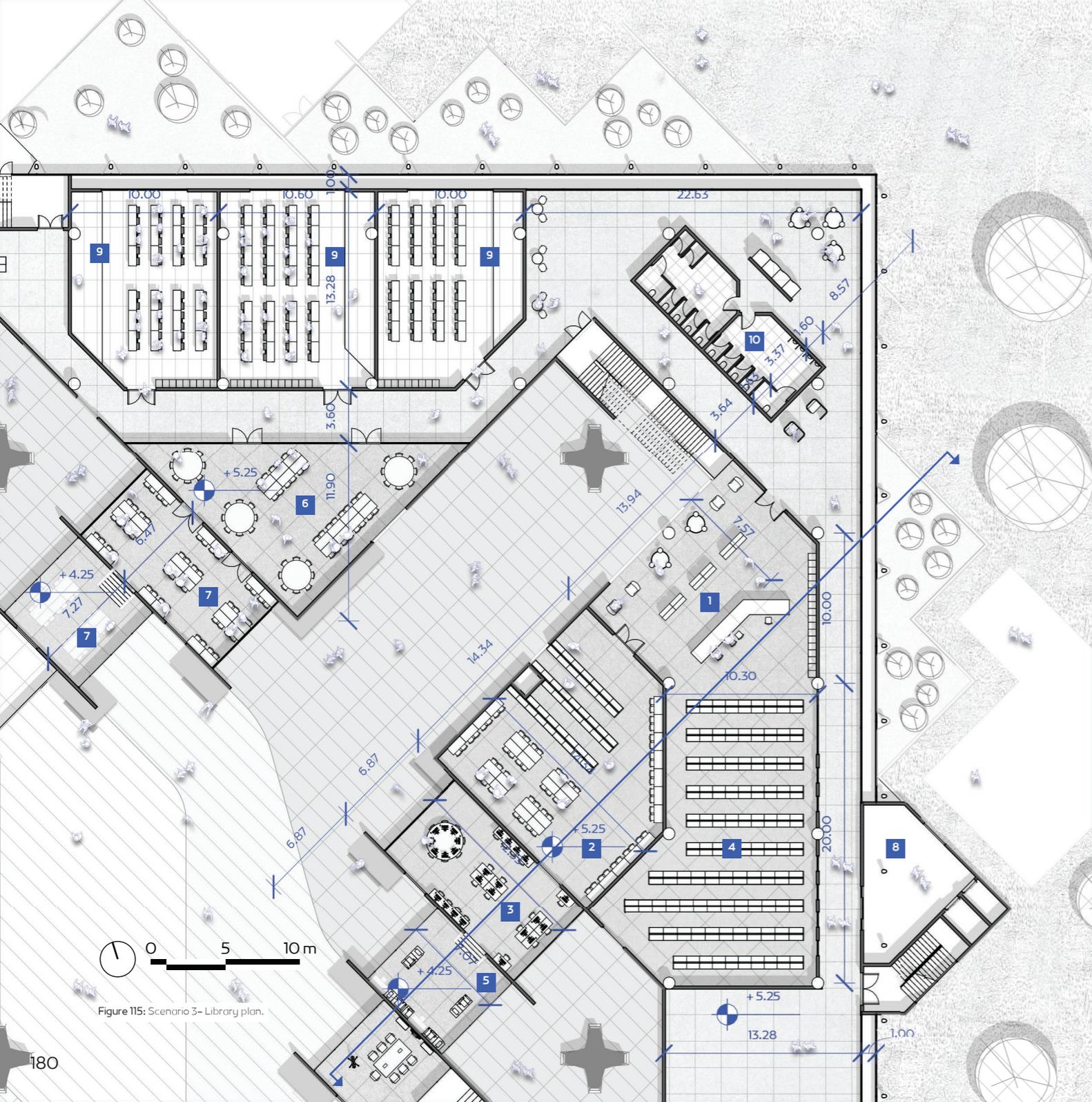


Figure 115: Scenario 3- Library plan.

LEARNING SPACES

The allocation of classrooms on the lateral floors of the first floor follows a strategic approach, ensuring proper views of the park and ample daylight for students. The incorporation of green balconies, serving as extensions of existing slabs, not only enhances the visual appeal but also fosters a connection between the building and the greenery of the park. Embracing the concept of biophilic design, this integration aims to positively impact students, creating an environment that harmonizes with nature.

In front of the classrooms, newly proposed slabs extend as study rooms, providing a diverse range of spaces, including silent study rooms. The use of structural walls plays a crucial role in creating privacy within the study rooms, effectively separating silent study areas from others. Simultaneously, the study rooms offer views that are less distracting for students, enhancing the overall focus and concentration within these spaces.

Between the classrooms and other functions, numerous in-between spaces are intentionally designed as student lounges, offering areas for relaxation. These spaces go beyond mere corridors for passing, incorporating essential amenities such as seating points, restrooms, and vending machines. Placed strategically on the corners of the building, these lounges provide students with a pleasant view outside the Palazzo del Lavoro.

The shared library, serving Politecnico di Torino, the University of Torino, co-working spaces, and the innovation hub, is situated on the newly added slabs. The design of the library is meticulous, utilizing different slabs separated by structural walls to delineate various internal sections. These sections encompass book stacks, a digital reading hub, and study rooms, offering a comprehensive and collaborative space for academic pursuits. This thoughtful integration of diverse functions within the university promotes an enriched and holistic learning environment.

Legend

- | | |
|------------------------------|---------------------------|
| 1 Library | 6 Study room |
| 2 Library study room | 7 Quiet Study Room |
| 3 Digital Reading Hub | 8 Vertical access |
| 4 Book stacks | 9 Classroom |
| 5 Print Station | 10 Services |

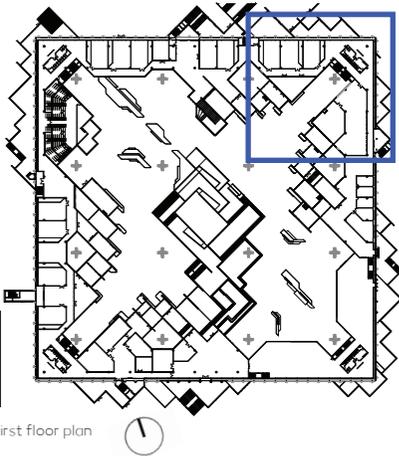




Figure 116: Scenario 3- Section perspective.



Figure 117: Scenario 3- Interior render from terraces.

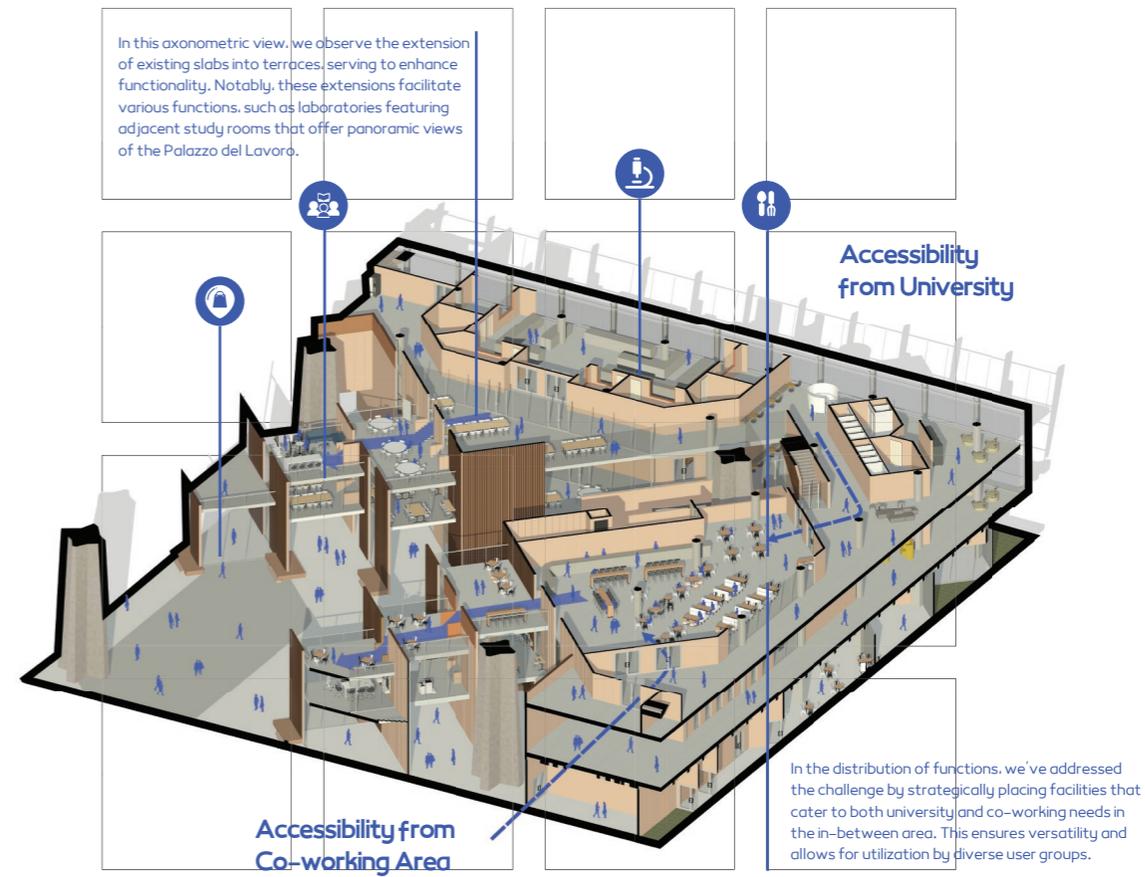


Figure 118: Scenario 3- University terraces axonometric view.



Figure 119: Scenario 3—Interior space render.

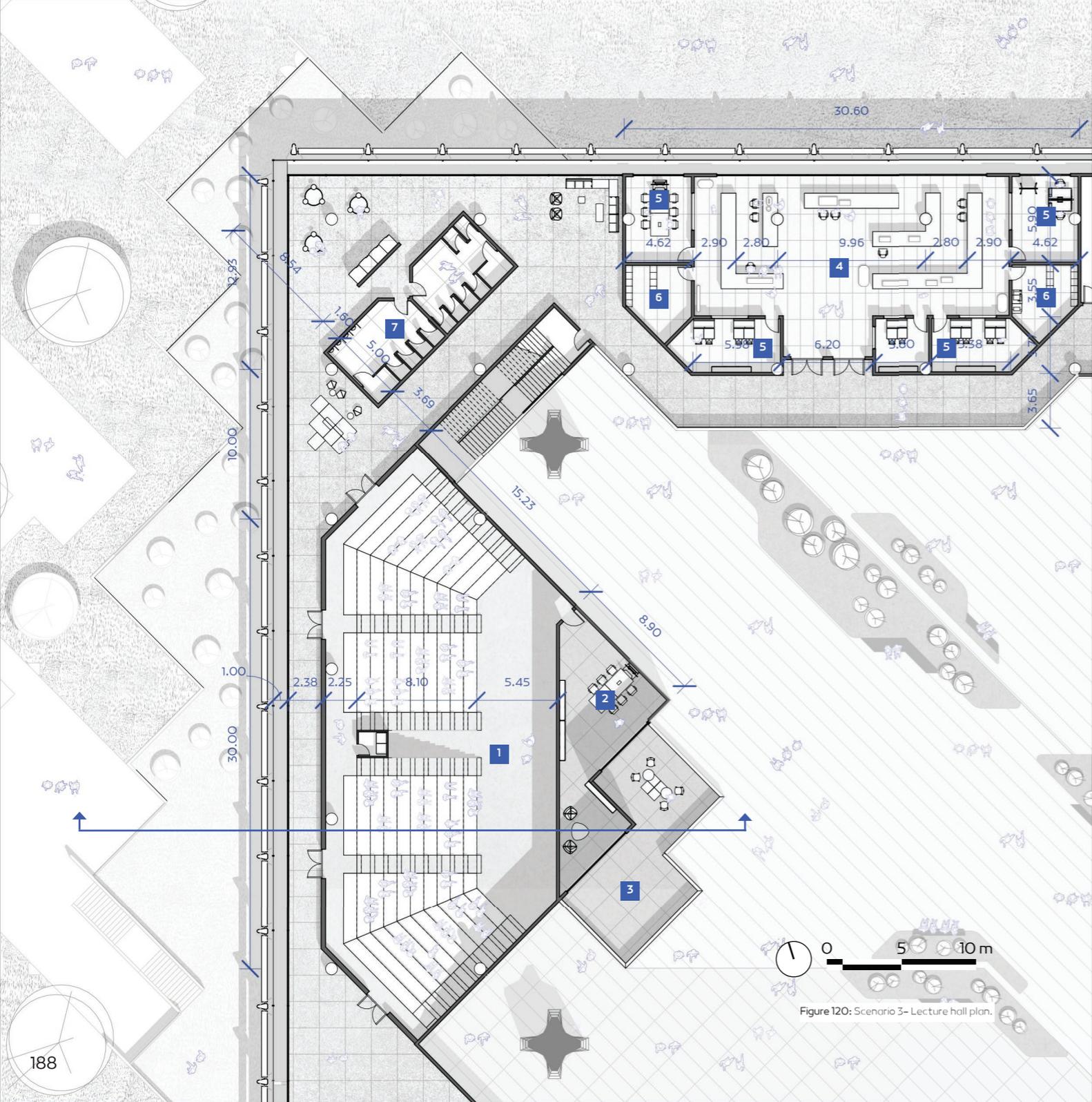
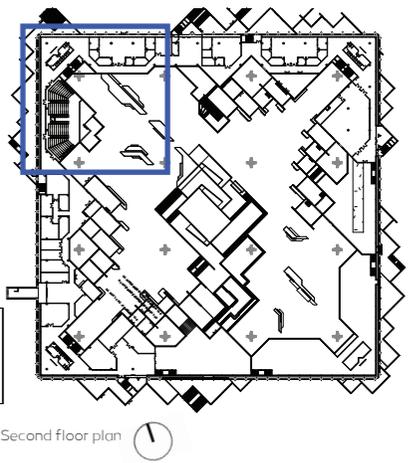


Figure 120: Scenario 3- Lecture hall plan.

LECTURE HALL

The design of the big lecture hall, a key advantage stemming from the integration of the universities, takes a prominent position within the proposal. With a seating capacity of 60 people, this lecture hall is envisioned as a double-height space. In alignment with the analysis and value assessments, which identified the second-floor slab as a non-original element, a proposal for partial demolition was put forth to achieve the desired double-height ceiling while remaining within the existing lateral slabs. This thoughtful intervention ensures an optimal use of space within the constraints of the Palazzo del Lavoro. To complement the lecture hall, backstage rooms are incorporated to accommodate professors or presenters, enhancing the functionality and versatility of the space for various events and presentations. On the northern side of the building, laboratories find their place, strategically positioned to offer views of the park while benefiting from ample daylight. These shared laboratories, serving both Politecnico di Torino and the University of Torino, as well as the innovation hub, are designed on a larger scale to encourage collaboration and resource-sharing. Offices and storage spaces for professors or laboratory responsables surround the interiors of the laboratories, creating a cohesive and efficient workspace that integrates both functionality and practicality.

- Legend
- 1 Lecture hall
 - 2 Backstage
 - 3 Terrace
 - 4 Laboratory
 - 5 Laboratory office
 - 6 Laboratory storage
 - 7 Services



Second floor plan



The drawing represents the relationship and transition between the exterior and interior environments. It highlights how pop-out volumes create dynamic spaces that blur the boundaries between inside and outside, enhancing the building's engagement with its urban context. Furthermore, the double-skin facade and distribution corridors within the university layers exemplify how the design navigates the balance between thermal performance, natural lighting, and spatial connectivity.

Central to this integration is the lecture hub, strategically positioned between the first and second floors, designed to leverage the collaborative potential of the universities. This hub is not only accessible from both levels but also fosters an academic crossroads, encouraging interaction and exchange among students and faculty from different disciplines. Directly beneath this congregational space, on the first floor, lies a dedicated study room for students, offering a quiet retreat for learning and contemplation.

Figure 121: Scenario 3- Section perspective.

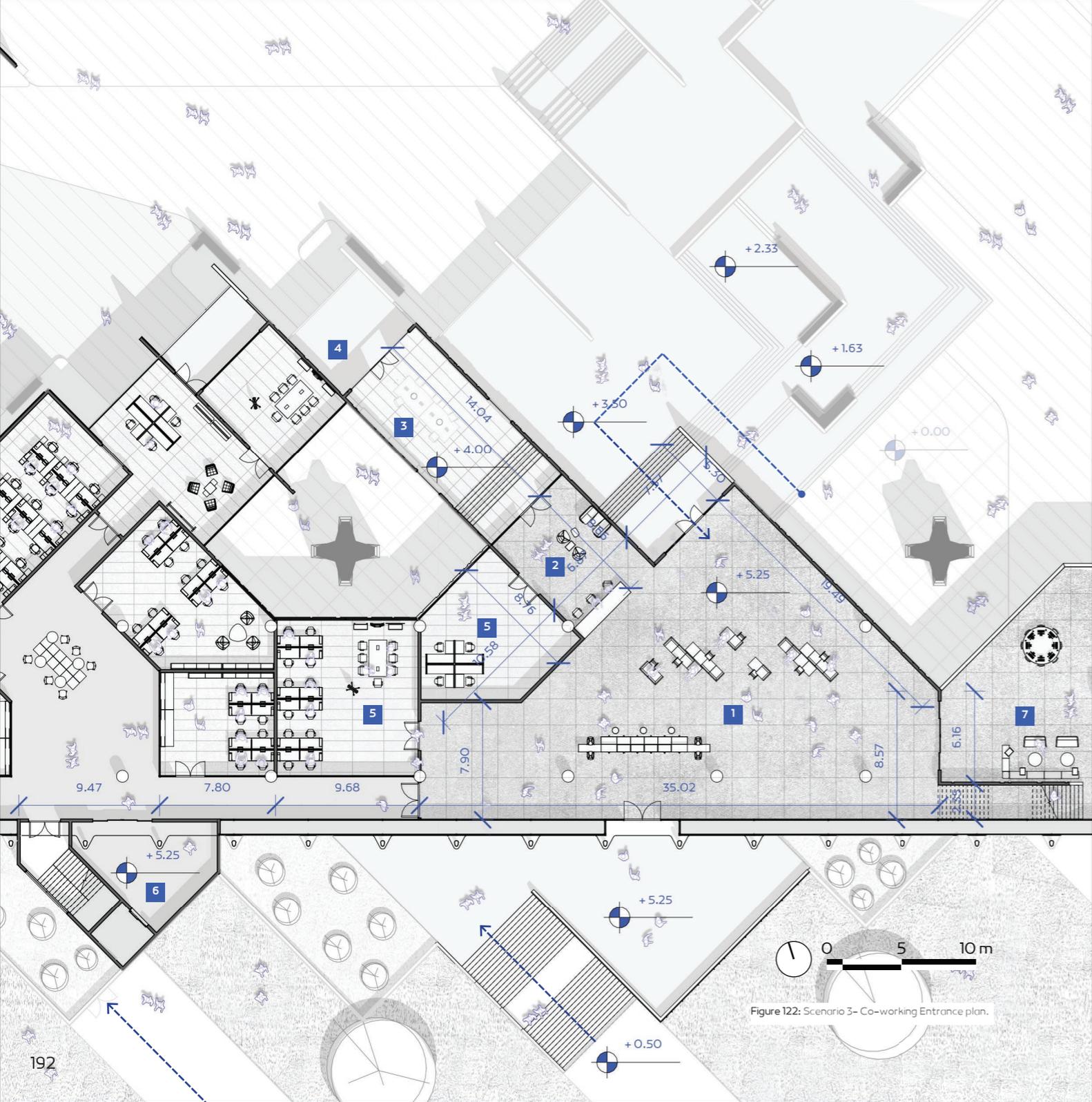


Figure 122: Scenario 3- Co-working Entrance plan.

CO-WORKING ENTRANCE

The main entrance to the co-working spaces is strategically located on the southern side of the first floor. Three distinct access points converge at a central hub, namely the lobby, equipped with a reception area and information services. This central hub serves a dual purpose—ensuring safety through reception control while providing essential information and services for co-working users.

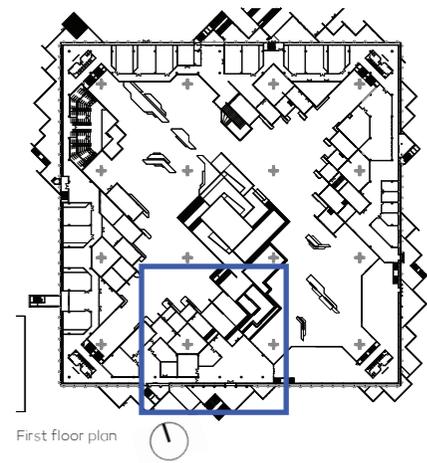
The first access point is through external staircases seamlessly integrated with the pop-out boxes. This direct access from the outside enhances the accessibility and visibility of the co-working spaces.

The second entrance is internal, accessible from the center of the project through a combination of ramps and staircases. This internal access not only connects the co-working spaces but also establishes a link to the adjacent Science Museum, fostering a sense of interconnectedness within the overall complex.

The third access is facilitated by an elevator, offering an inclusive means of entry that converges at the same central lobby. This variety of entrances, all leading to a common reception point, was a deliberate design choice. It ensures safety through controlled access while creating an open and border-less atmosphere within the public space.

Legend

- 1 Lobby
- 2 Reception
- 3 Meeting room
- 4 Terrace
- 5 Co-Workspace Management Center
- 6 Vertical access
- 7 Co-working (My Desk)



First floor plan



Figure 123: Interior render

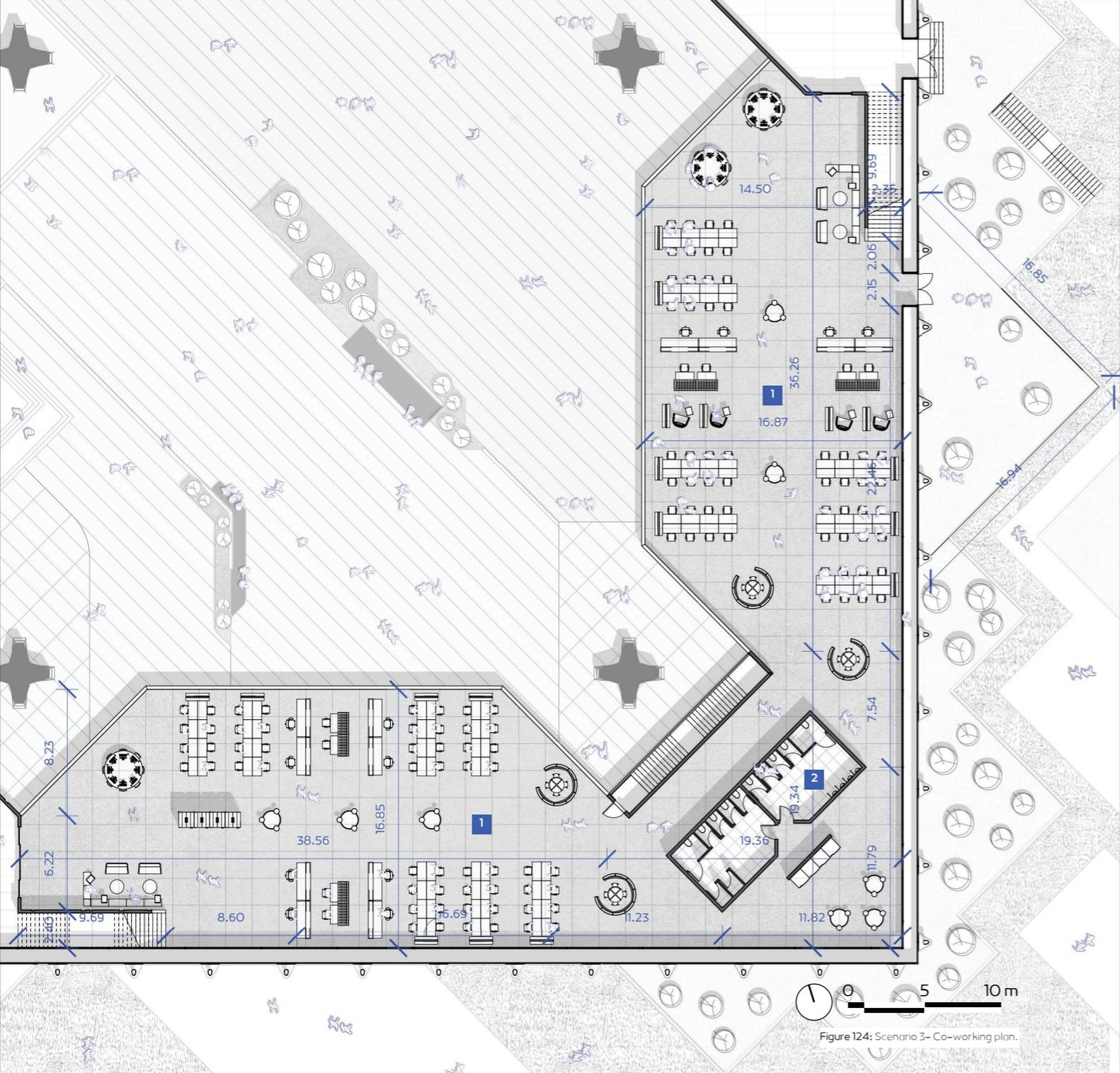


Figure 124: Scenario 3- Co-working plan.

CO-WORKING

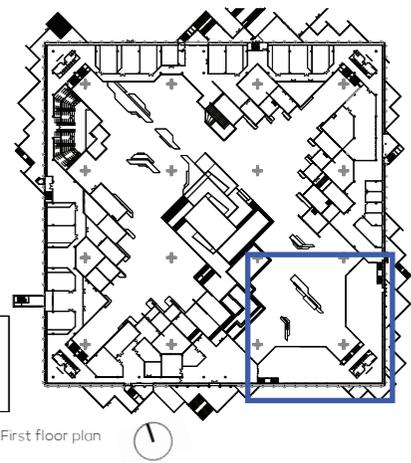
The co-working spaces, a pivotal aspect of the proposal, are strategically designed on different levels to cater to distinct types of co-working users. Positioned on semi-open terraces, these co-working areas offer panoramic views of the main space of the Palazzo del Lavoro (PL), seamlessly integrating with the primary environment rather than existing as isolated entities. This intentional design choice imparts a sense of public accessibility, inviting individuals to engage with these spaces as integral components of the PL. Each level of co-working is strategically placed on the lateral slabs, ensuring ample daylight exposure, and creating an optimal environment for studying and working. Additionally, the incorporation of green balconies on the roofs of the pop-out boxes provides a pleasant visual connection for co-working spaces, enhancing the overall experience and connection to the exterior surroundings.

The accessibility of the co-working spaces is carefully planned, with seamless connections to university classrooms, laboratories, and the innovation hub. Proposed staircases facilitate smooth transitions between different co-working levels, enhancing the overall connectivity and functionality of the spaces.

Internally, the co-working spaces are conceptualized with an open layout design, fostering flexibility and adaptability to cater to the diverse needs of various users. This approach not only accommodates different working styles but also encourages collaborative interactions within the co-working community. The thoughtful integration of these spaces within the Palazzo del Lavoro aligns with the project's broader objectives of creating dynamic, accessible, and interconnected environments for both academic and co-working purposes.

Legend

- 1 Co-Working (My Flex)
- 2 Services



First floor plan



Figure 125: Render of co-working spaces.

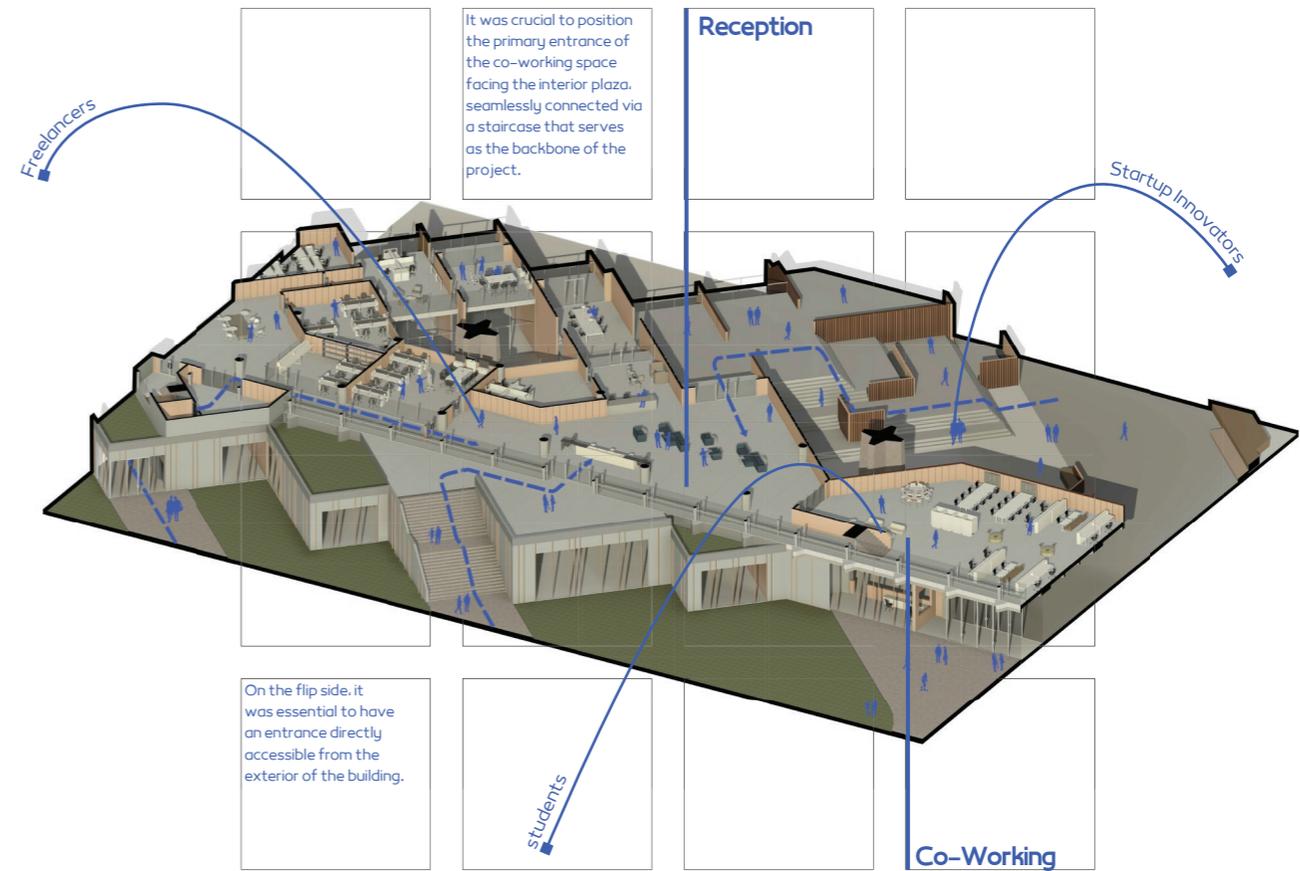


Figure 126: Scenario 3- Co-working entrance axonometric view.



Figure 128: Render of university corridors.



Figure 130: Scenario 3- Section of co-workings.



Figure 131: plan perspective of co-workings.

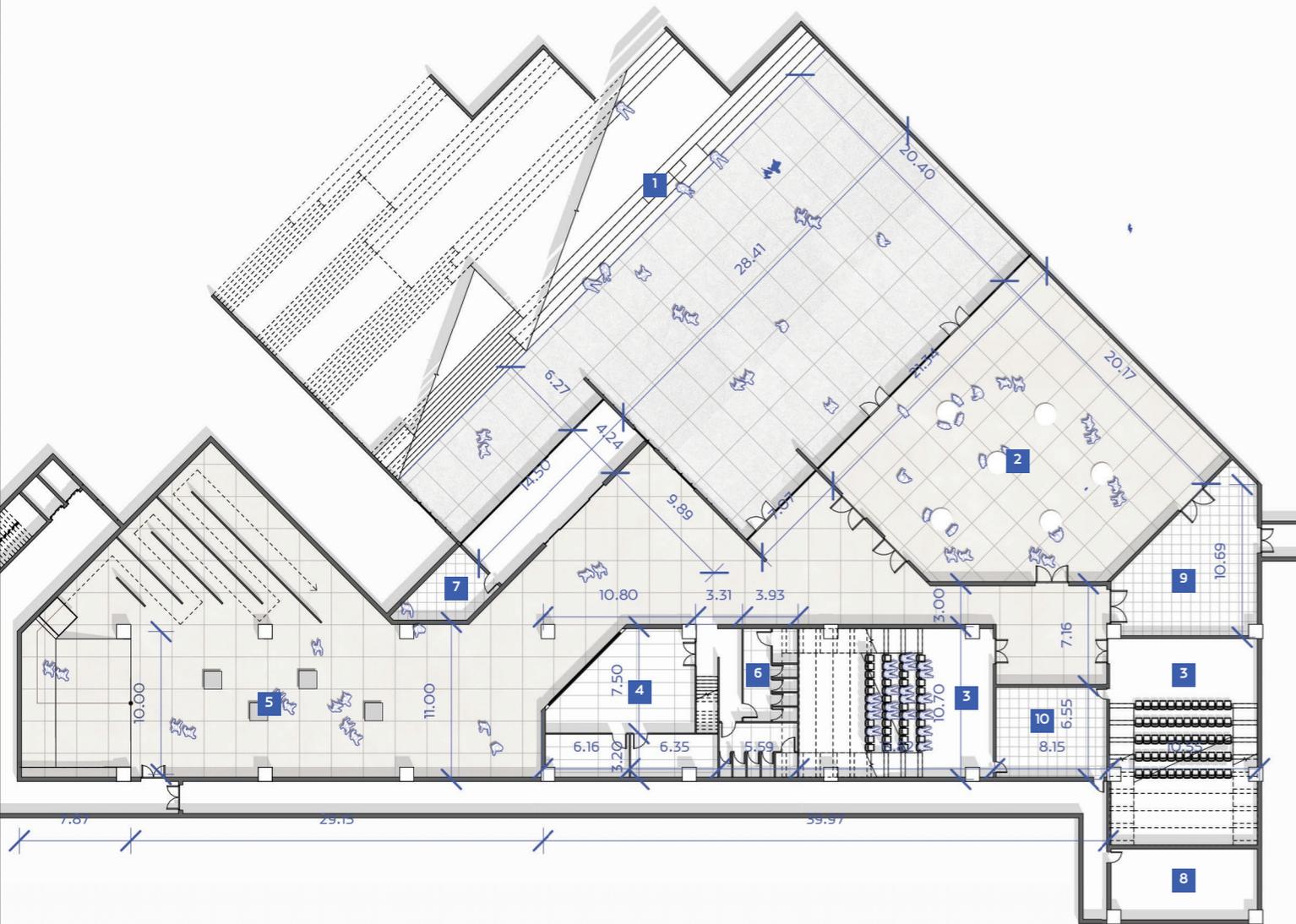


Figure 132: Scenario 3- Event center plan.

EVENT CENTER

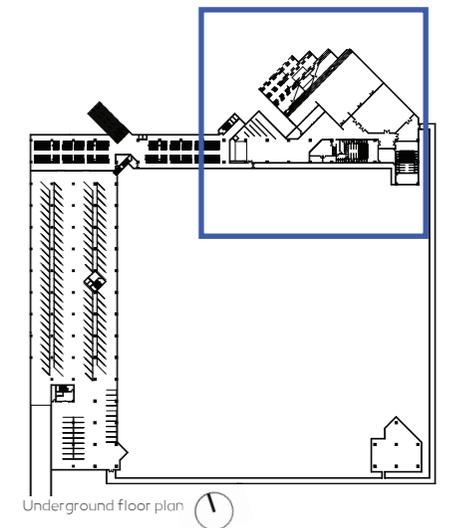
The event center, situated in the existing underground level of the Palazzo del Lavoro, is strategically placed on the northern side adjacent to the Italia '61 park. This positioning leverages the natural surroundings to enhance the connection between the building and its context. The design incorporates an outdoor plaza on the northern side, effectively bridging the interior and exterior environments. The plaza, carved out to extend down to the underground level, serves not only as an inviting entrance to the event center but also as a source of natural daylight, enriching the space below.

Accessibility is a key feature of the event center, with entrances available from both inside the Palazzo and directly from the outside. This dual access supports a versatile use of the space, accommodating activities and events related to the Palazzo's functions as well as hosting external events and gatherings. The design of the event center emphasizes flexibility and multi-functionality, catering to a wide range of events and audience needs.

The interior of the event center is divided into several key areas: a multifunctional banquet hall capable of hosting a variety of events, from formal dinners to conferences; two cinemas designed for film screenings and lectures; and a gallery space intended for exhibitions and smaller gatherings. This composition of spaces allows the event center to serve multiple community and cultural functions, enhancing the Palazzo's role as a dynamic and inclusive hub.

Legend

- 1 Amphitheater Seating Area
- 2 Banquet hall
- 3 Cinema
- 4 Event Center Administration Office
- 5 Gallery
- 6 Services
- 7 Information
- 8 Projection Room
- 9 Storage
- 10 Backstage



Underground floor plan

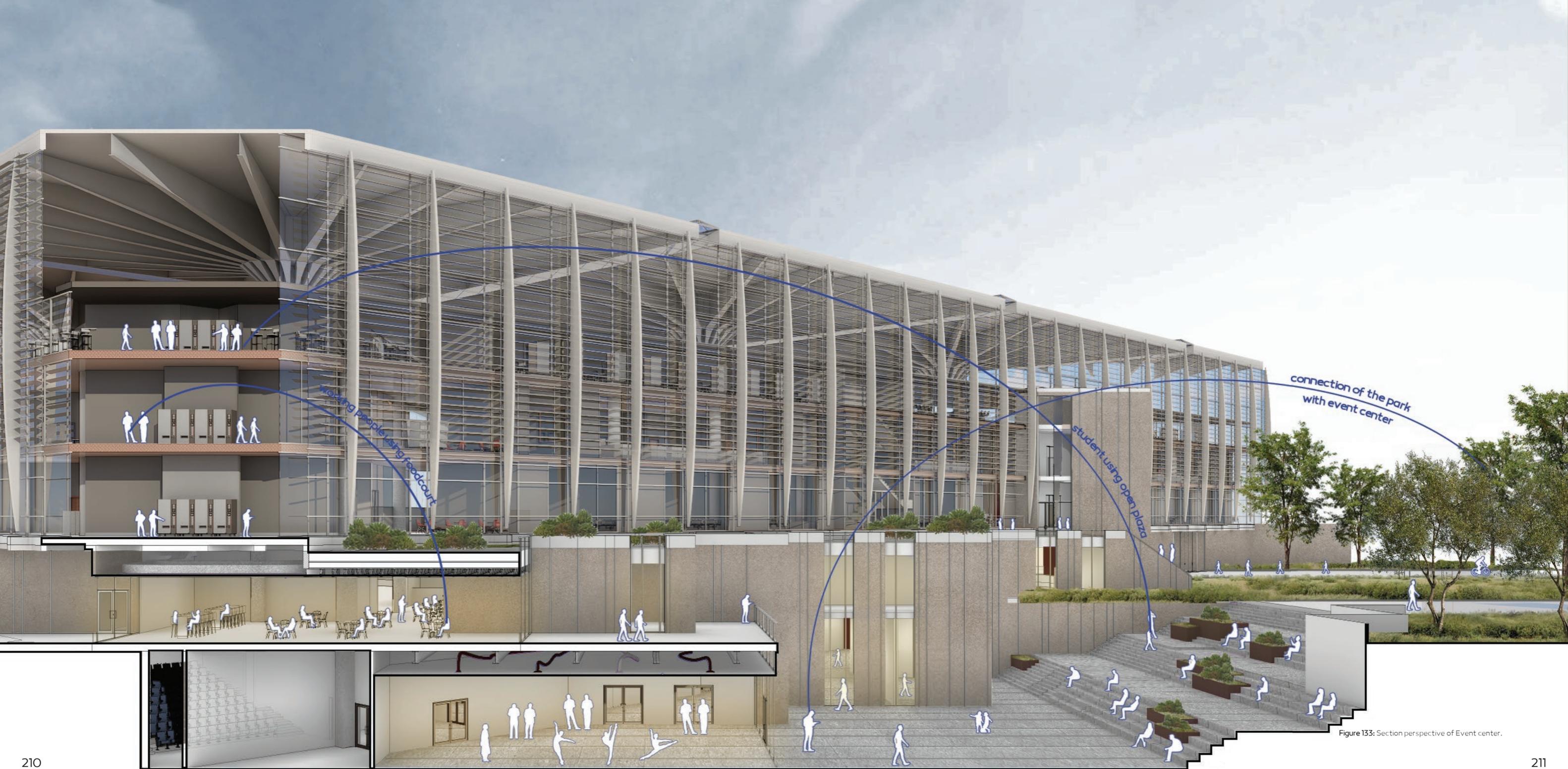


Figure 133: Section perspective of Event center.



Figure 134: Interior render of gallery.

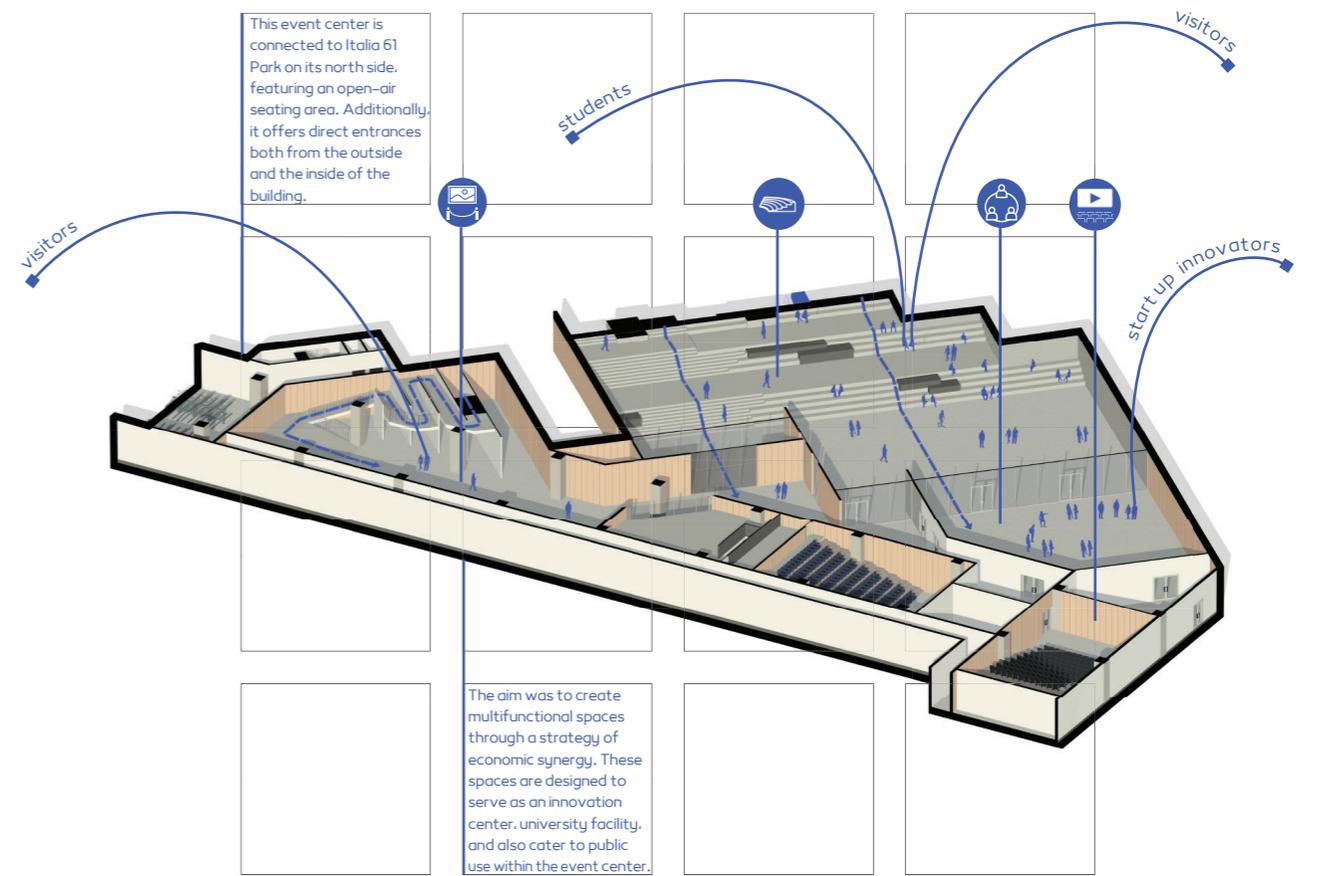
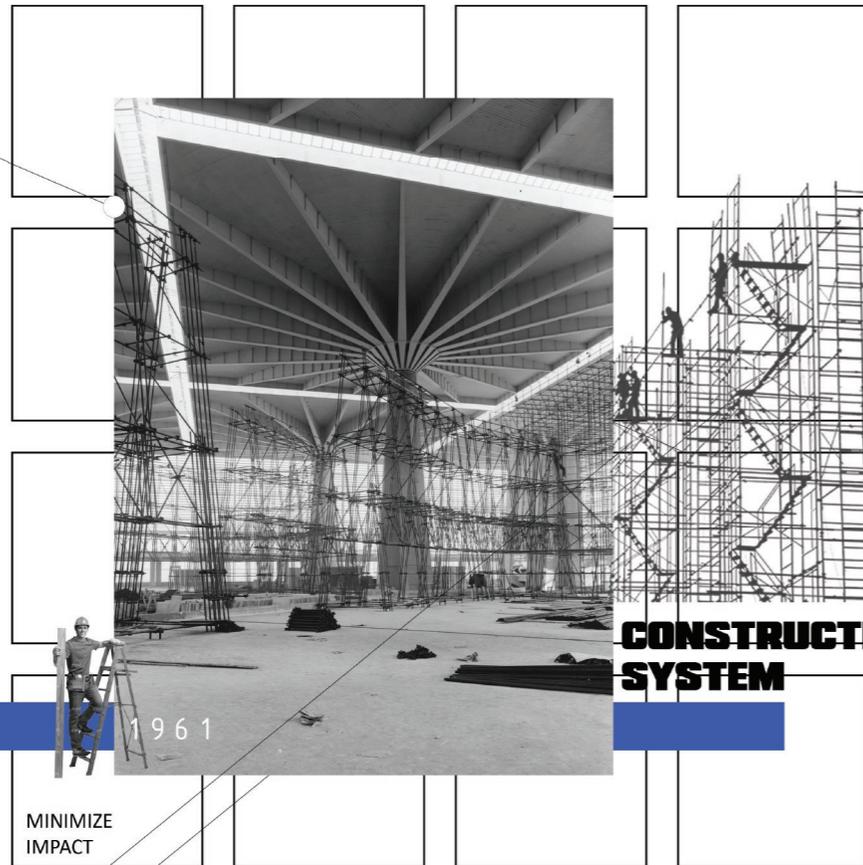


Figure 135: Scenario 3- Event Center Axonometric.



CONSTRUCTION SYSTEM

MINIMIZE IMPACT

1961

In addressing the construction system, a comprehensive analysis and value assessment highlighted the criticality of selecting a construction methodology that minimizes impact on the Palazzo del Lavoro. Emphasis was placed on utilizing structural walls to diminish the foundation size, aligning with the overarching goal of preserving the building's integrity. Concurrently, environmental sustainability emerged as a pivotal concern, advocating for the incorporation of eco-friendly systems. These systems are evaluated based on life cycle sustainability, recyclability, and their minimal ecological footprint.

An evaluation of the building's life cycle underscored the necessity for an adaptable construction approach. This adaptability ensures that any interventions remain reversible at the conclusion of the building's life cycle, thus safeguarding the environment. The proposed systems are designed for dry assembly, offering flexibility for future modifications and adaptations without compromising the original structure of the building. This consideration is paramount in preserving the historical value of the site.

The compatibility of finishing materials and insulation was deemed essential to cater to the varied functions within the project's spaces. Each space's unique requirements dictated the selection of materials that not only meet aesthetic and functional standards but also conform to sustainability criteria.

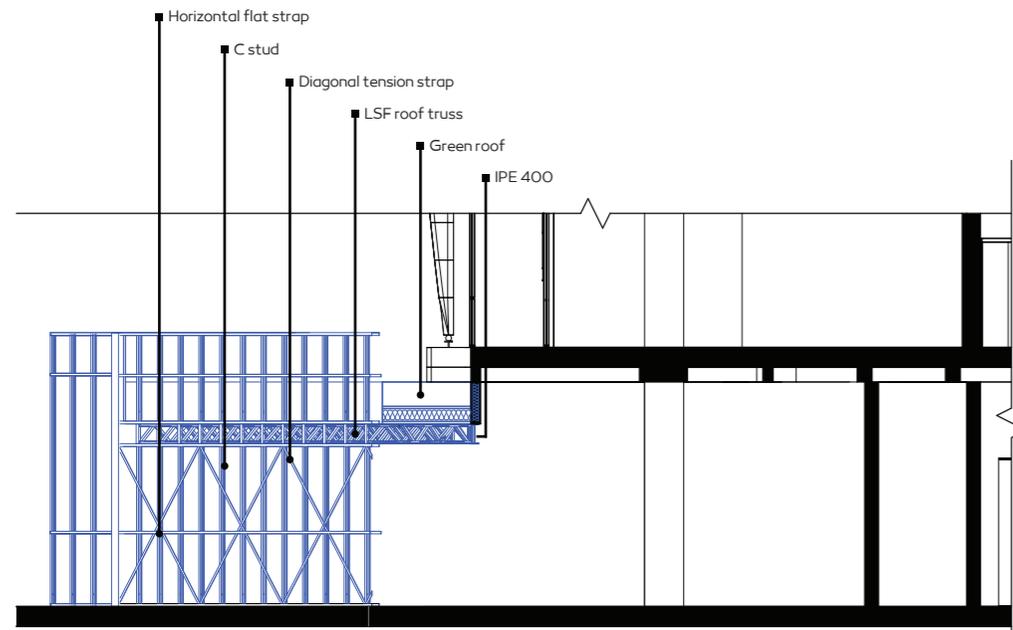
Furthermore, construction time emerged as a significant factor, with the aim of expediting the project's completion. The potential for prefabrication was identified as another aspect to enhance the efficiency. Prefabricated elements can significantly reduce on-site construction time, aligning with the project's objectives to minimize disruption and environmental impact.

CONSTRUCTION SYSTEM

The selected construction methodology, Lightweight Steel Framing (LSF), stands out for its minimal impact on foundational requirements⁴² and its pronounced eco-friendly attributes. LSF is recognized for its sustainability, chiefly due to the steel framing's complete recyclability⁴³. This system's ease of assembly and disassembly further elevates its suitability for the project, allowing for straightforward future modifications or adaptations without detriment to the original structure.

LSF's versatility is accommodating a wide range of paneling options that can be customized to meet the specific demands of each space within the PL. This adaptability ensures that the LSF system aligns with the evolving requirements of the project, facilitating efficient and environmentally responsible interventions at every stage of the building's life cycle.

Furthermore, the potential for prefabrication inherent in the LSF system significantly enhances the construction process. By allowing for components to be manufactured off-site, prefabrication reduces on-site construction time and complexity.



42. Rukavina, Marija & Skejic, Davor & Kralj, Anton & Scapec, Tomislav & Milovanovic, Bojan. (2022). Development of Lightweight Steel Framed Construction Systems for Nearly-Zero Energy Buildings. Buildings, 12. 929. 10.3390/buildings12070929.

43. Martins, Claudio & Santos, Paulo & Silva, Luis. (2013). Lightweight Steel Framed Construction System.

Figure 137: Scenario 3- Wall section with the pop-out volume structure.

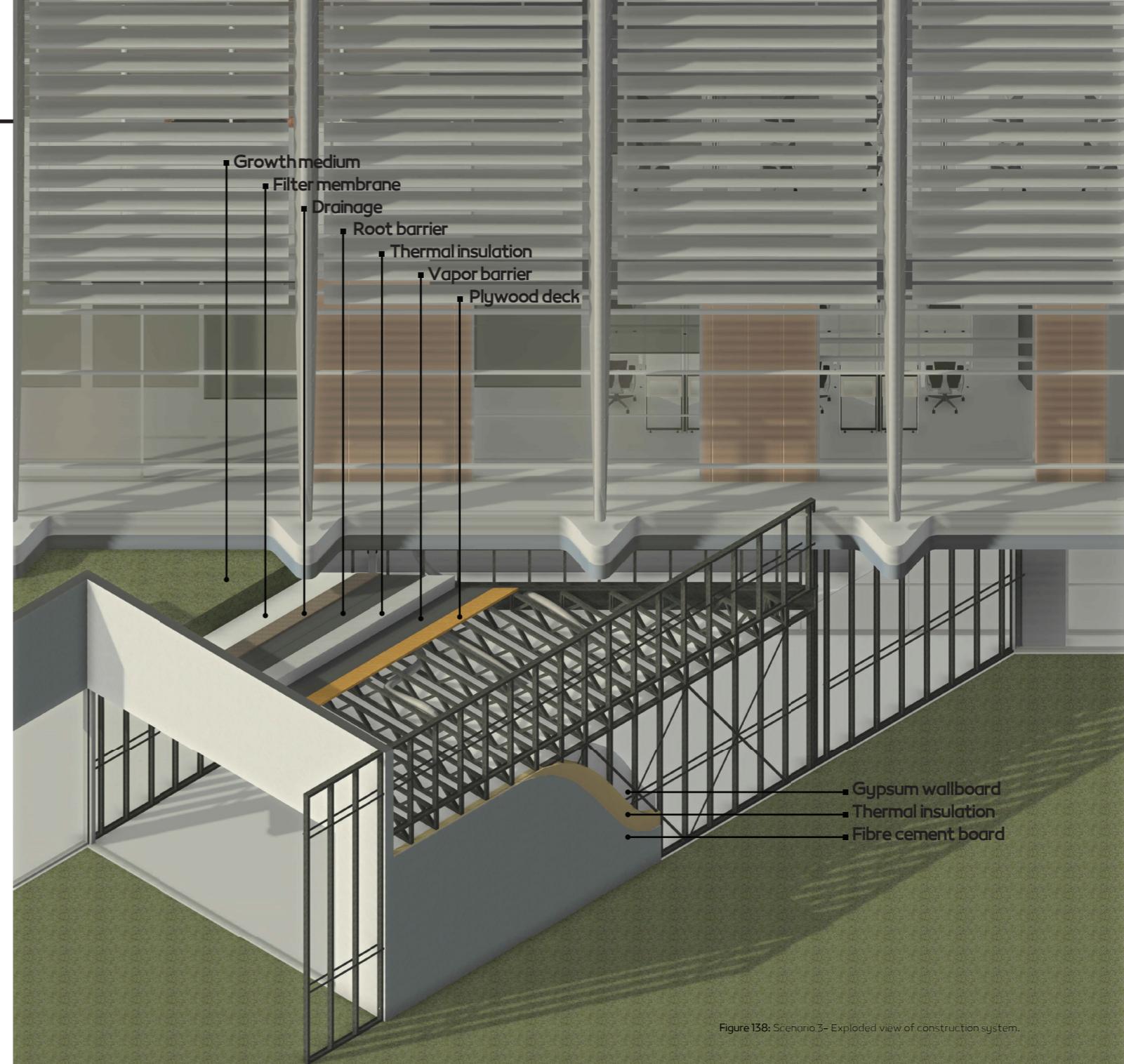
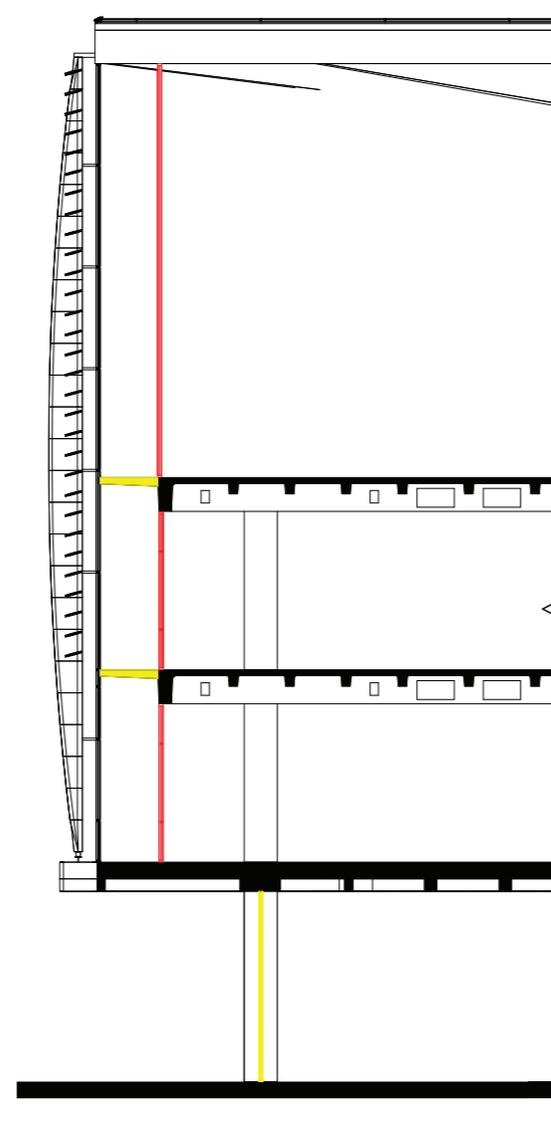
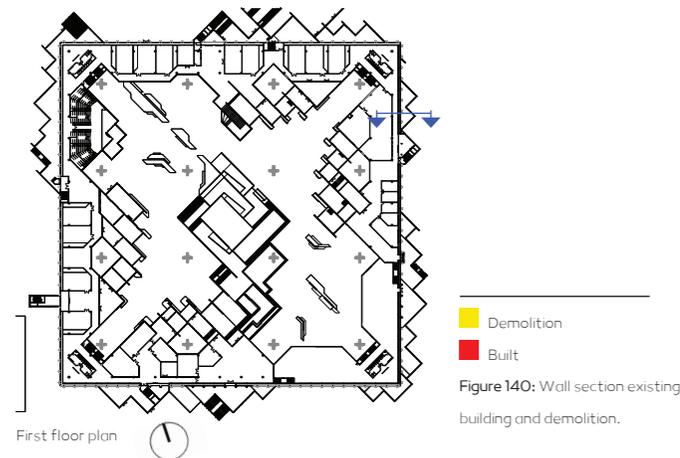


Figure 138: Scenario 3- Exploded view of construction system.

DOUBLE SKIN FACADE

In addressing the thermal challenges presented by the Palazzo del Lavoro's extensive glazed facades, encompassing approximately 13,000 square meters of transparent surfaces, a solution proposed to mitigate heat transfer and ensure indoor thermal comfort. Implementation of an internal double-skin facade was the proposal to enhance energy efficiency of the Palazzo del Lavoro without compromising the historical value of its facade. This solution not only respects the original facade but also maximizes its performance.

Further analysis of the building's structural components unveiled that the absence of structural beams at the edges of the lateral slabs presents an opportunity for selective demolition to create a vertical void behind the existing facade. This modification allows for additional vertical space within the double-skin facade system, enhancing its effectiveness, particularly during the summer months. The increased height of the double facade fosters a greater pressure differential across the facade, augmenting heat gain which, in turn, facilitates improved ventilation performance. This nuanced approach underscores a commitment to preserving the Palazzo's historic fabric while implementing contemporary solutions to meet modern performance standards.



The use of a double facade not only offers energetic benefits but also proves to be economically advantageous. The proposal suggests retaining the existing glazing without replacement, thereby eliminating the substantial costs associated with the installation of new, high performance glazing systems.

The decision to utilize the existing facade elements not only mitigates financial outlay but also contributes to the sustainability goals of the project by reducing material waste. This dual approach addresses the energy efficiency challenge and demonstrates a cost-effective and sustainable solution for the adaptive reuse of the Palazzo del Lavoro.



Figure 141: Renovated shading elements, 2023.



Figure 142: Existing lateral slabs, second floor.

The operational mechanism of the double-skin facade (DSF) with operable windows at the Palazzo del Lavoro is adeptly designed to adapt to seasonal thermal requirements, effectively mitigating the building's heat transfer challenges while enhancing indoor comfort. This adaptive strategy delineates distinct functionalities for summer and winter conditions, leveraging natural ventilation and heat recovery processes to optimize thermal performance.

Summer Operation:

During summer, the DSF aims to prevent interior overheating through the strategic manipulation of airflow within the facade's cavity. Solar radiation heats the air trapped between the facade's two skins, causing it to become warmer and lighter than the external air. This phenomenon initiates a natural ventilation process.⁴⁴ Openings at the top and bottom of the facade facilitate a pressure equalization process, drawing cooler, heavier external air into the lower part of the cavity. This cooler air displaces the warmer air upwards, creating a convective air flow that ejects the heated air through the upper openings. This continuous cycle of air movement helps to dissipate heat, reducing solar gain and preventing the overheating of interior spaces.

Winter Operation:

In contrast, the DSF's winter mode capitalizes on heat recovery to bolster the building's insulation properties. With the operable windows closed, the cavity between the facade's layers acts as a preheated zone, capturing and retaining warmth. This process is akin to heat recovery, where hot waste air, instead of being expelled outdoors, transfers most of its heat to incoming air via a heat exchanger. The preheated air in the DSF cavity can be utilized to warm incoming air, contributing to the building's heating efficiency. This method of leveraging the double-skin facade as a thermal buffer significantly enhances the building's energy performance, reducing the need for active heating and contributing to a sustainable operational model.⁴⁵

The external shades complement this design idea, significantly improving the efficiency of the double facade.

These slanted shades effectively block solar radiation during the summer, preventing overheating, while their angled design ensures that they do not obstruct solar gain in the winter.

In the winter, the double facade functions as a preheated air layer, while in the summer, the chimney effect, facilitated by the external shades, aids in ventilation and cooling.

The integration of external shades with the DSF epitomizes a holistic approach to building envelope design. These external shades, characterized by their slanted design, serve a dual purpose, harmonizing with the seasonal operation of the DSF to optimize solar control and enhance the building's thermal comfort.

During the summer, the external shades are strategically angled to block direct solar radiation, reducing the amount of heat penetrating the building.⁴⁶ The presence of these shades works in tandem with the DSF's ventilation strategy, where the warmed air within the facade's cavity is expelled, thus reducing heat transfer to the interior. Meanwhile, the ground floor, devoid of external shading, receives necessary solar radiation, aiding in the activation of the solar chimney effect.⁴⁷

Conversely, in the winter, the angled design of the external shades allows low-angle winter sunlight to penetrate the facade, and ensure that the DSF cavity can still absorb and retain solar heat. This passive solar heating, combined with the DSF's heat retention capabilities, creates a buffer zone that contributes to the building's thermal insulation. The angled shades facilitate the entry of solar radiation during the colder months, ensuring that the building benefits from natural warmth and light.

44. Gratia, E., & De Herde, A. (2004). Natural ventilation in a double-skin facade. *Energy and Buildings*, 36(2), 137-146. <https://doi.org/10.1016/j.enbuild.2003.10.008>
 45. Bielek, Boris & Klem, Josip & Macak, Marek. (2019). Physical Cavity of a Double Skin Facade as a Source of Pre-Heated Air in the Winter Season for the Heat Recovery Unit of a Facade. *Slovak Journal of Civil Engineering*, 27, 7-10. 10.2478/sjce-2019-0025.
 46. Gratia, E., & De Herde, A. (2007). The most efficient position of shading devices in a double-skin facade. *Energy and Buildings*, 39(3), 364-373. <https://doi.org/10.1016/j.enbuild.2006.09.001>
 47. Matour, S., Garcia-Hansen, V., Omrani, S., Hassanli, S., & Drogemuller, R. (2022). Thermal performance and airflow analysis of a new type of Double Skin Facade for warm climates: An experimental study. *Journal of Building Engineering*, 62, 105323. <https://doi.org/10.1016/j.jobe.2022.105323>

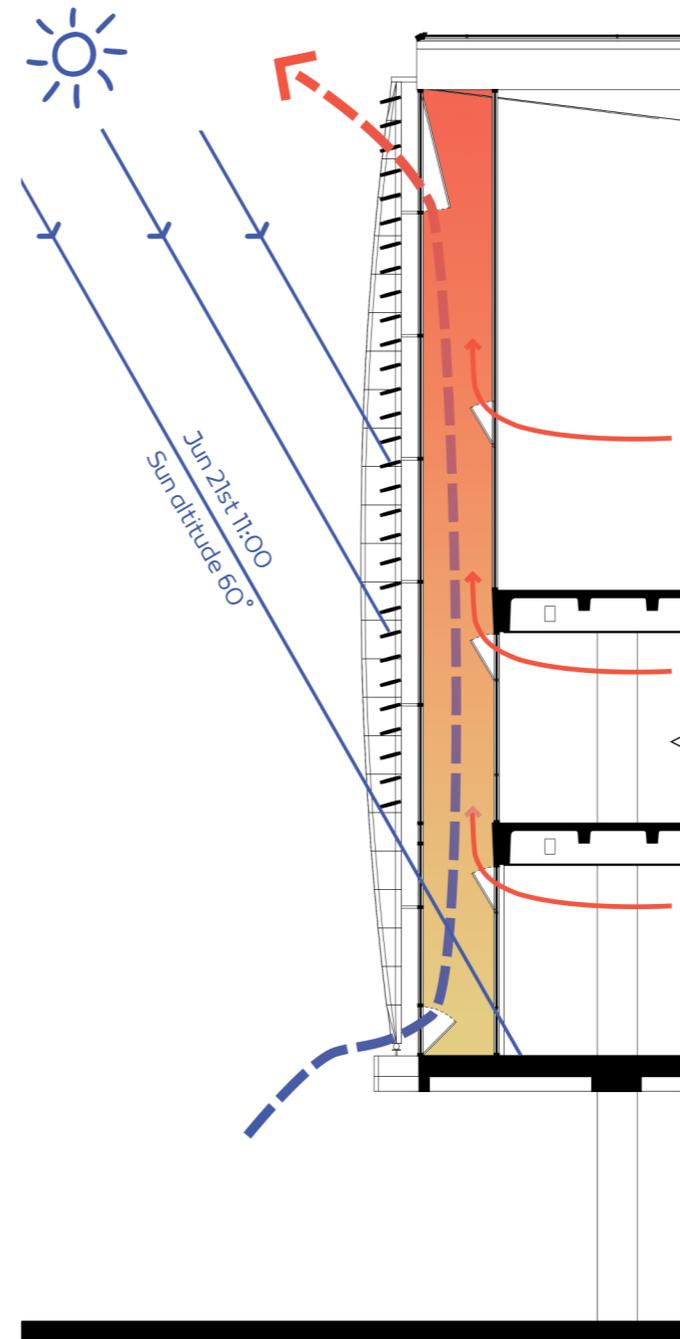


Figure 143: Double-skin facade performance during summer.

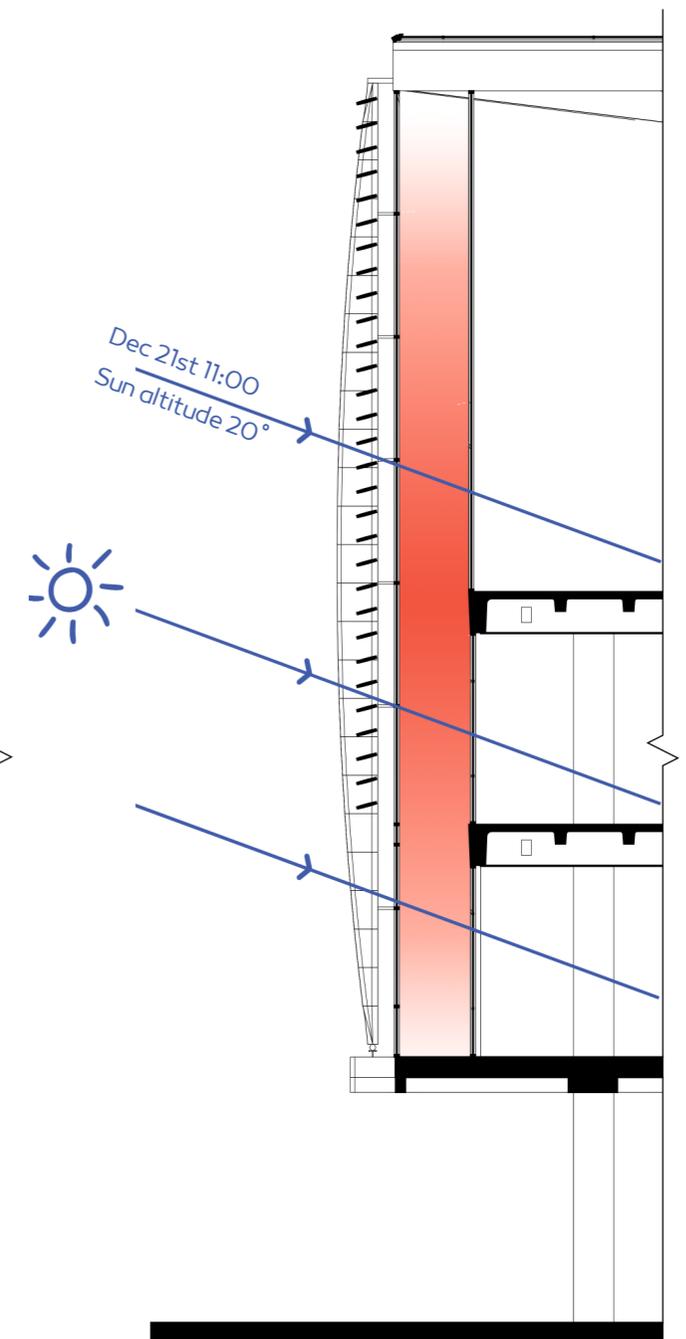


Figure 144: Double-skin facade performance during winter.

Green balconies

The incorporation of pop-out designs emerges as a crucial design solution contributing to the control of the internal comfort temperature within the shops. Specifically, the green roofs of these pop-outs serve a dual purpose by acting as green balconies and enhancing the building's thermal performance.⁴⁸ Beyond their aesthetic and biophilic benefits, these green roofs play a significant role in increasing the mass of the roof structure. This increase in mass enhances the thermal insulation of the roof, effectively mitigating overheating within the interior spaces of the shops.

In addition to thermal benefits, the vegetation layer atop the pop-out volumes addresses acoustic comfort by acting as a natural sound barrier. Positioned adjacent to busy streets, these green roofs help in attenuating traffic noise, thus providing a quieter interior space. This feature is especially beneficial for areas designated as classrooms and workspaces within the building, where a reduction in external noise intrusion is crucial for concentration and productivity.⁴⁹

The placement of green balconies just outside the double skin facade also enhance the performance of it. In the summer, the double facade relies on the principle of natural convection, exploiting pressure differentials to facilitate ventilation. The green balconies situated at the lower part of this facade system contribute to this process by modulating the pressure at the facade's base. This modulation amplifies the pressure differential, thereby enhancing the upward movement of air within the facade cavity and improving the overall ventilation performance.

48. Li, H., Zhao, Y., Sutzl, B., Kubilay, A., & Carmeliet, J. (2022). Impact of green walls on ventilation and heat removal from street canyons: Coupling of thermal and aerodynamic resistance. *Building and Environment*, 214, 108945. <https://doi.org/10.1016/j.buildenv.2022.108945>

49. Kalansuriya, C.M & Pannila, Ananda & Sonnadara, Upul. (2009). Effect of roadside vegetation on reduction of traffic noise levels.

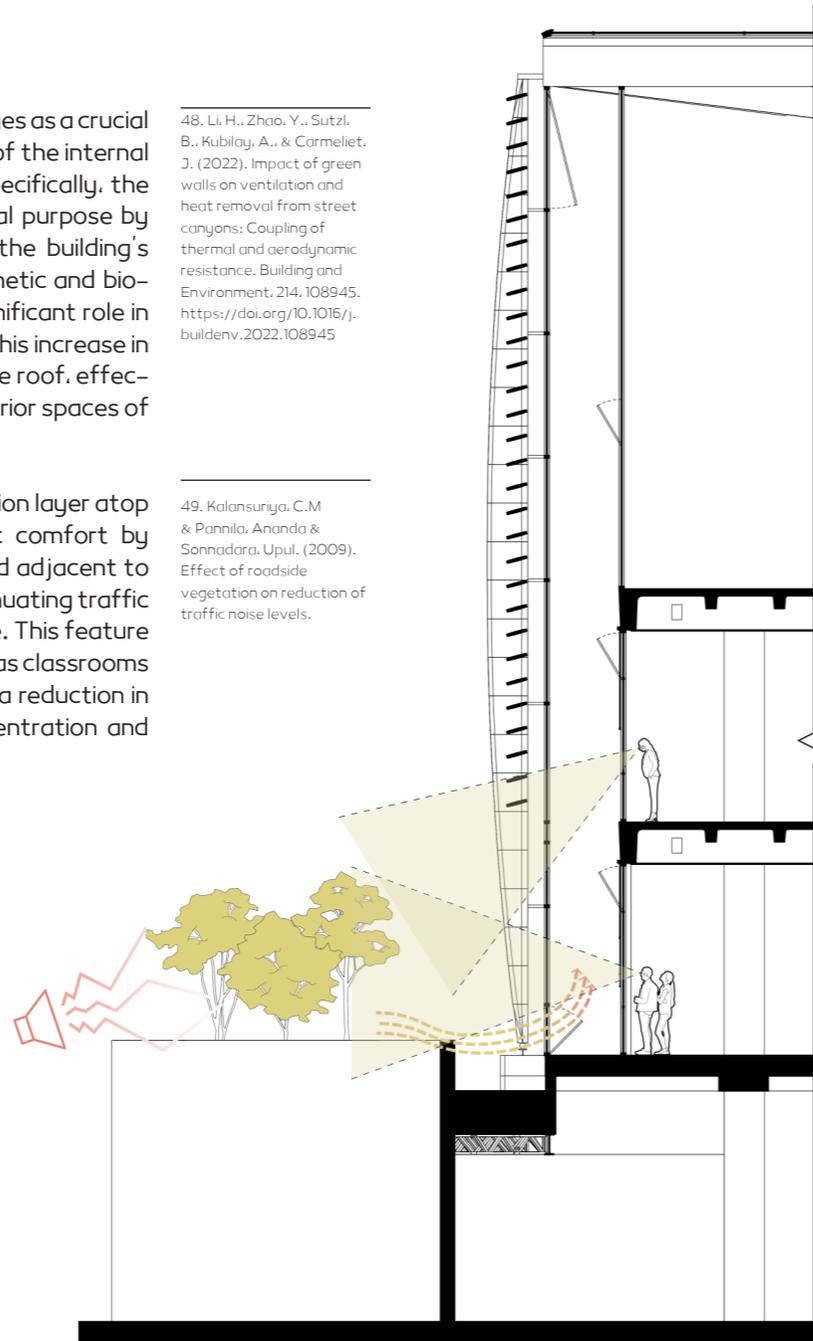


Figure 145: Green balconies diagram.

The structural analysis of the building's upper levels reveals a thoughtful consideration of its original design features, specifically the presence of voids within the existing beams. These voids are strategically utilized for the distribution of HVAC ducts, catering to both supply and return air flow.⁵⁰ This solution demonstrates a seamless integration of modern technical requirements with the building's structural elements, ensuring that the ventilation needs of spaces designated for educational functions are met efficiently. This approach not only maintains the architectural integrity of the building but also optimizes the functional adaptability of these spaces for contemporary use.

On the ground floor, the challenge intensifies with the need to preserve the visibility and integrity of the historically significant isostatic ribbed ceiling, a characteristic element of the building's architectural identity. The proposed solution to this constraint involves the strategic placement of HVAC ducts along the lateral edges of the ceiling. This method preserves the aesthetic and historical value of the ceiling while ensuring functional distribution of the HVAC system for the ground floor shops.

Also, the pop-out volumes serve as integrated spaces for housing HVAC ducts. The integration between the pop-out and the existing building, facilitates the duct distribution strategy.

50. Wargocki, Pawel & Wyon, David. (2005). Effects of HVAC on student performance. *ASHRAE Journal*, 48, 22-28.

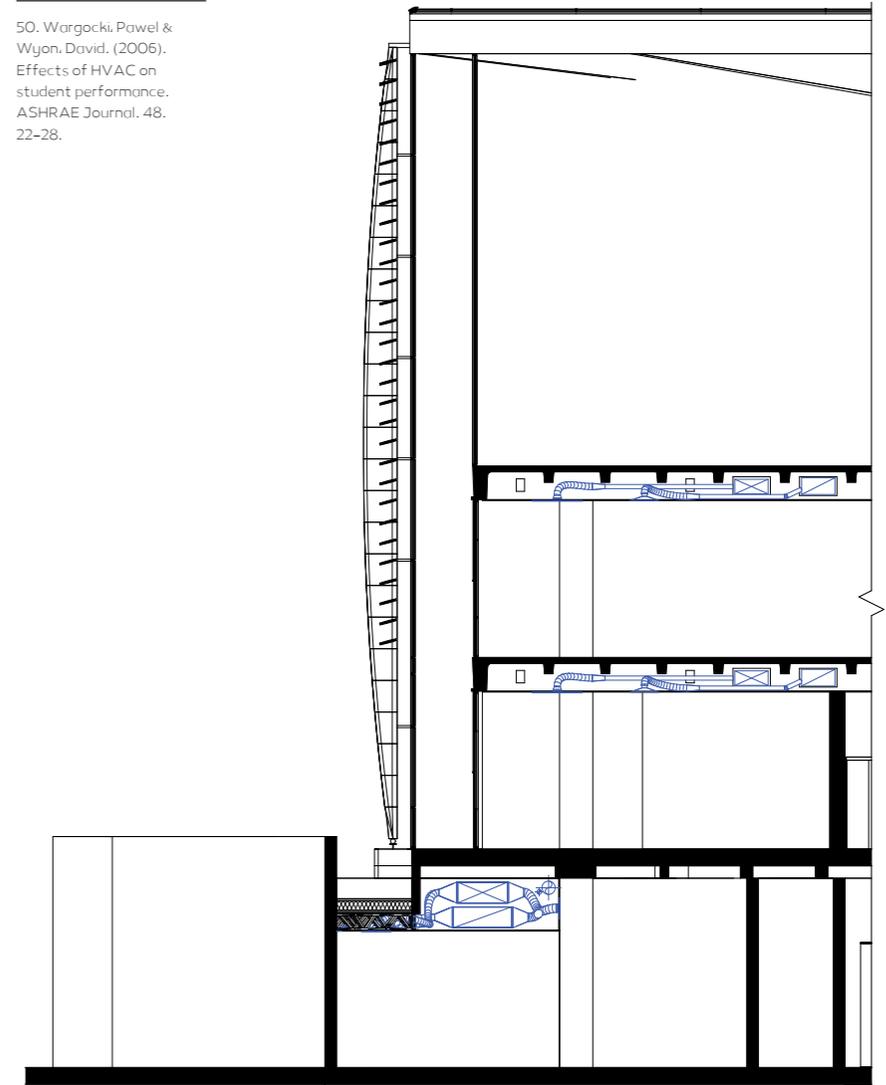


Figure 146: Wall section - HVAC ductwork.



Figure 147: Technical axonometric view.



Figure 148: East External Render.

ROOF INTERVENTION

For the roof, the expansive flat surface area necessitated an intervention to mitigate heat transfer. The proposed solution involves the installation of a standing seam metal roof system, selected for its compatibility with the existing structure, enabling a retrofit with minimal impact.⁵¹ This roofing system is known for its durability, weather resistance, and thermal reflectivity, which can significantly reduce heat gain.

Also integrating solar panels into the standing seam metal roof system aligns with sustainable design principles and addresses energy consumption concerns. The implementation of solar panels on the standing seam metal roof is facilitated by the system's structural characteristics, which allow for straightforward mounting of photovoltaic modules.

51. Scrinzi, G., Mazzucchelli, E. S., Stefanazzi, A., & Lucchini, A. (2022). Technological refurbishment and energy retrofit of large, flat roofs by using metal sheet systems: The case study of a multifunctional building. Retrieved from <https://hdl.handle.net/11311/1220538>

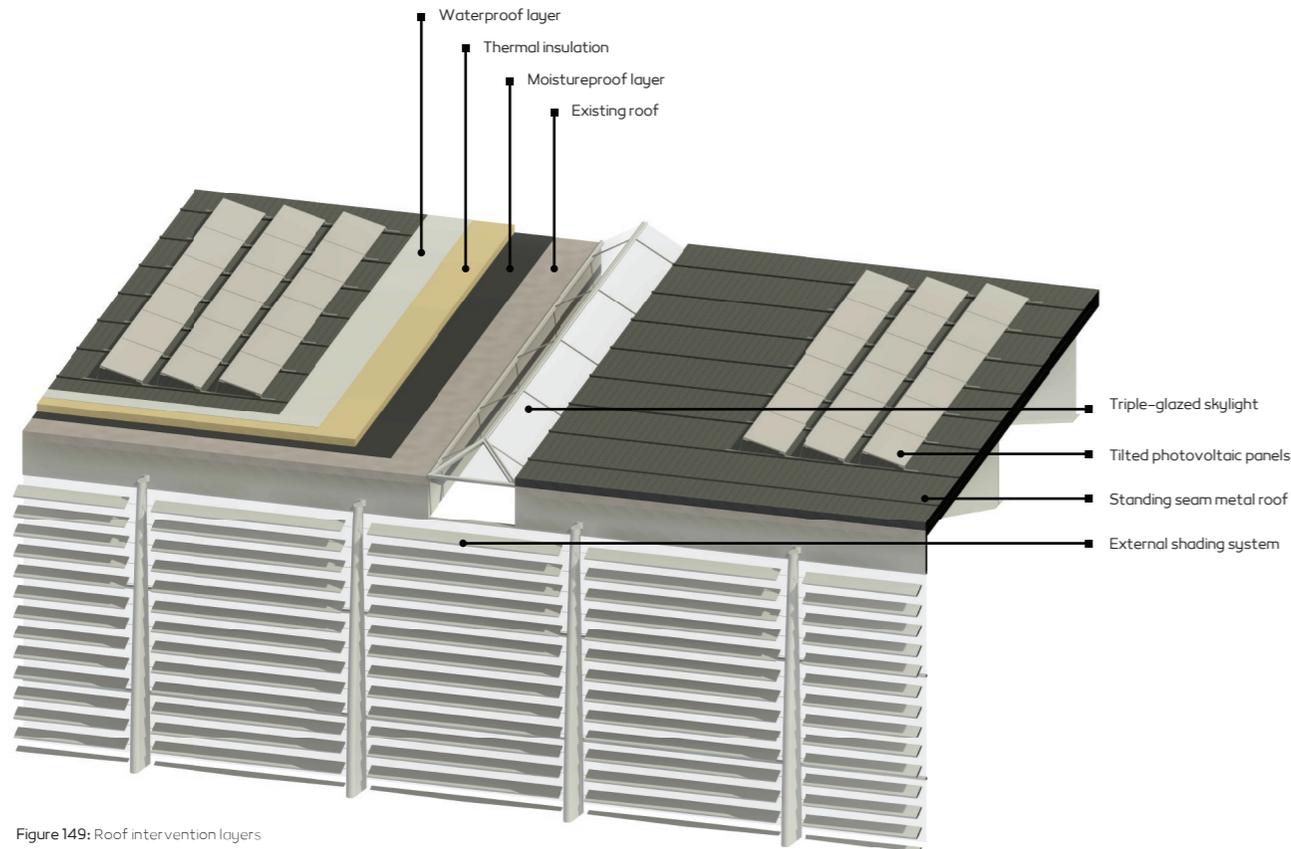


Figure 149: Roof intervention layers

HEATING SYSTEM

Heating system typologies

The proposal for the heating, cooling, and ventilation (HVAC) system within the Palazzo del Lavoro is a comprehensive approach, considering Italian regulations and the specific needs of different functions within the complex.

For functions with longer usage times, such as classrooms, canteens, and shops, where proper ventilation is required by Italian rules, a HVAC system is proposed. However, due to the high ceiling of the Palazzo del Lavoro, this system isn't suitable for semi-open and open spaces. In these semi-open and open spaces like co-working areas and balconies, a flooring radiant heating system is proposed. This approach addresses the challenges posed by the high ceiling while ensuring efficient heating in these specific areas. For more central spaces with challenges in designing HVAC ducts, a fan coil system is proposed. This system offers flexibility and efficiency in spaces where traditional duct distribution might be challenging.

Legend

- HVAC
- Fancoil
- Radiant Heating

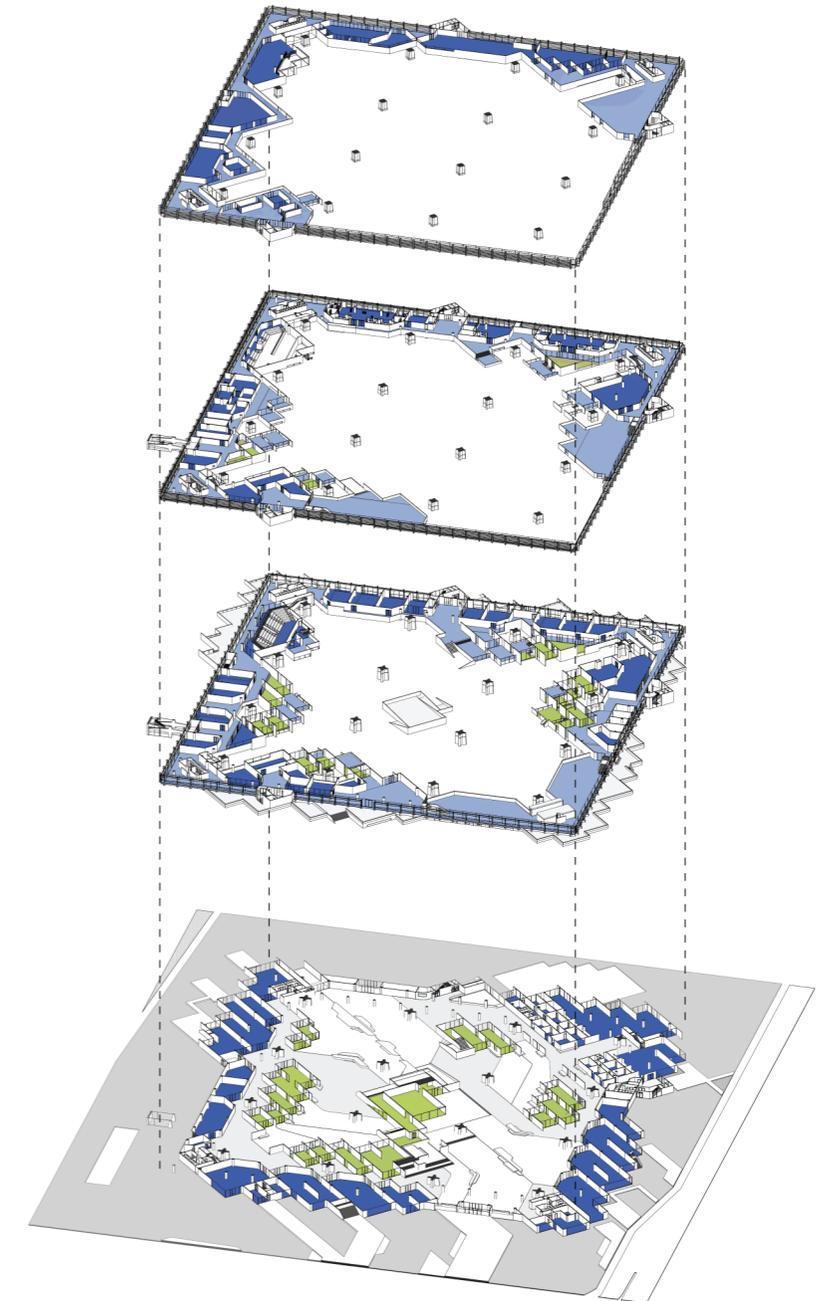


Figure 150: Exploded diagram - Type of heating systems.

HVAC duct design

To facilitate the distribution of the HVAC ductwork throughout the project, the design includes the strategic placement of mechanical rooms housing the air handling units (AHU) on each floor.

This configuration aims to minimize the size of the ductwork and simplify its distribution across the building. By situating AHUs at different corners of the building, it ensured that each unit can effectively serve one of the building's edges, thereby optimizing the reach and efficiency of the system.

The mechanical rooms are intentionally located on the periphery of the building to allow for the intake of fresh air, which is crucial for the optimal performance of the HVAC system. This thoughtful placement supports our goal of creating a comfortable and sustainable environment within the Palazzo del Lavoro, adhering to both regulatory demands and the specific needs of its occupants.

Legend

- Supply air duct
- Return air duct
- AHU mechanical room

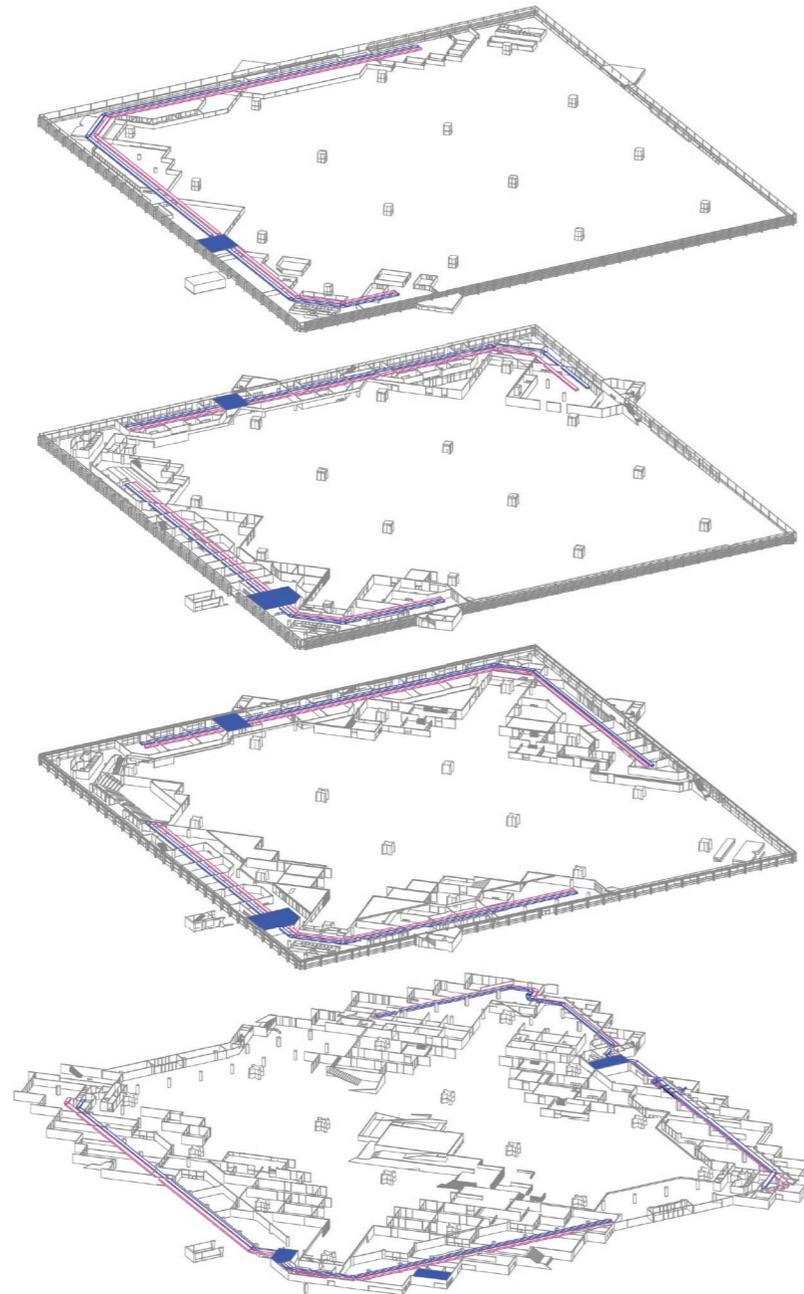


Figure 151: Exploded diagram - HVAC Duct distribution.

Fancoil system

For central zones within the Palazzo del Lavoro, where the installation of HVAC ducts presents challenges, a fan coil system is proposed. This system, requiring only the supply of hot and cold water, circumvents the complexities associated with duct distribution. The integration of this system with LSF walls further optimizes space utilization by utilizing service holes in the walls for pipe distribution, effectively marrying efficient climate control with innovative architectural solutions.

Radiant underfloor heating

In addressing the challenge of heating semi-open spaces like terraces and co-working areas within the Palazzo del Lavoro, where high ceilings impede the effectiveness of traditional HVAC systems, an underfloor radiant heating solution is proposed. This system, installed beneath raised flooring, offers an efficient method to ensure thermal comfort in these areas without compromising the architectural integrity of the space.

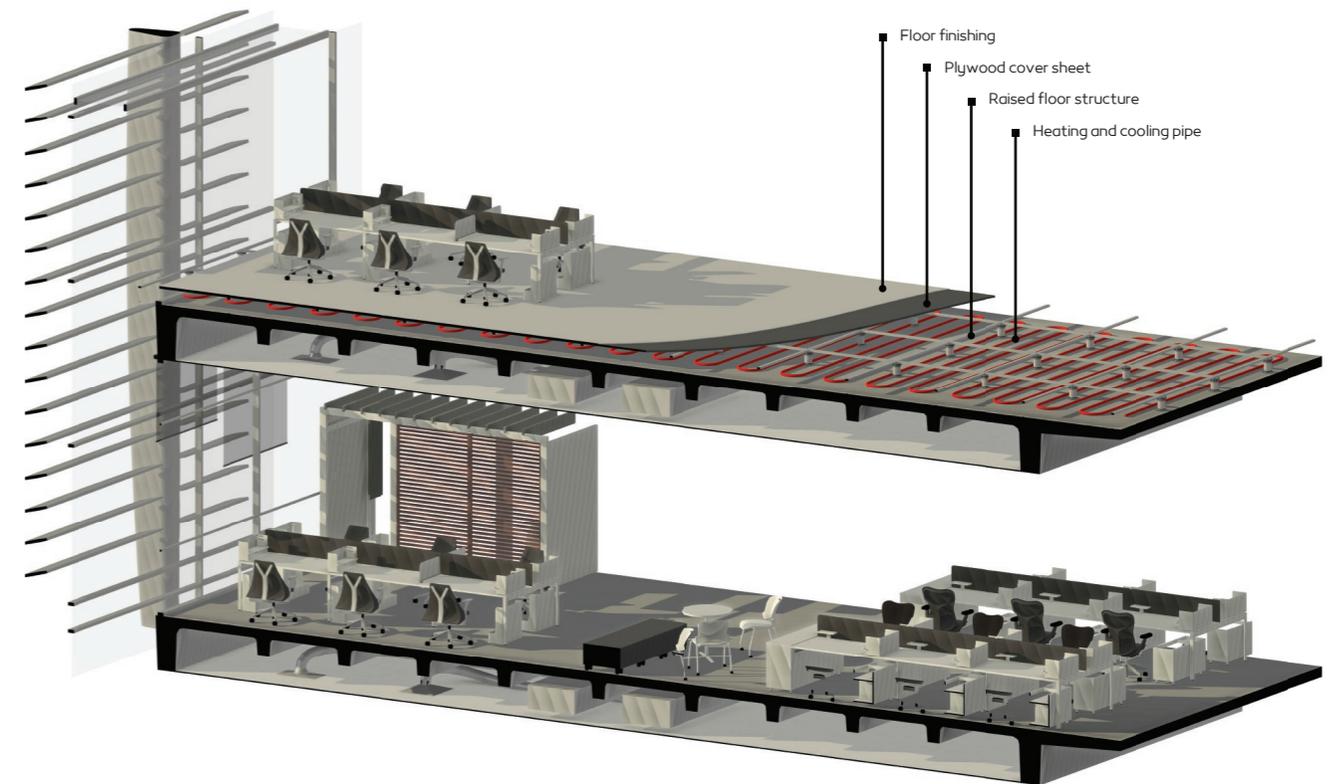
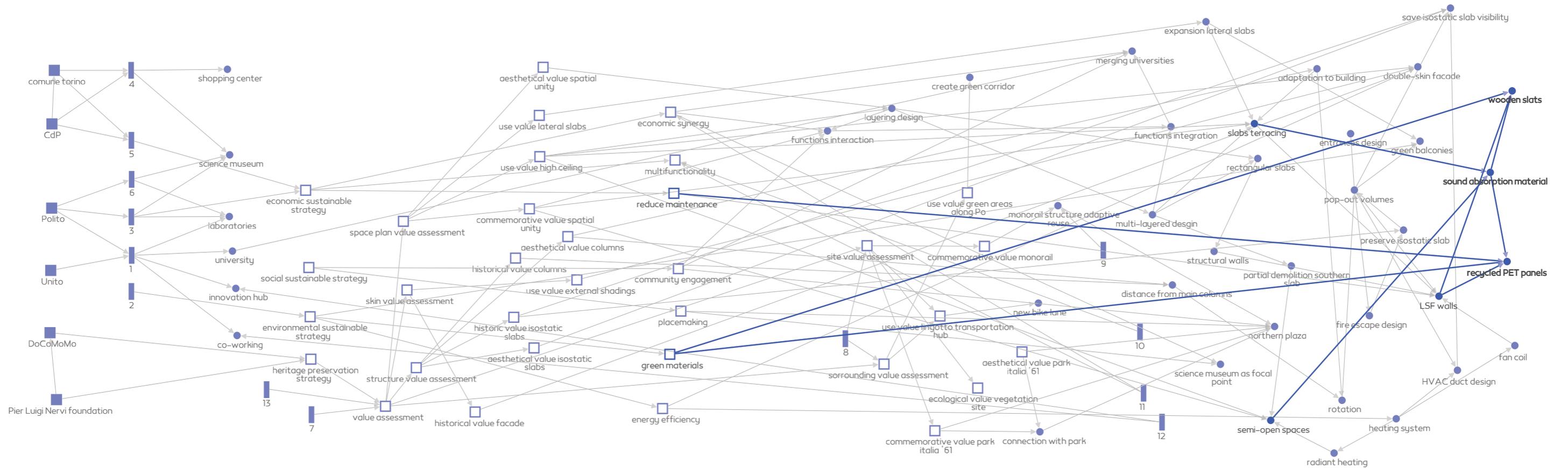


Figure 152: Technical axonometric view - Radiant heating.



Legend

- Human Actors
- Non human Actors
- Documents
- Design Actions
- New instances**

Figure 153: Project process mapping, 14 November 2023.

14 November
2023

As our project approached its culmination, the selection of materials for both the interior and exterior became paramount. We sought materials that not only aligned with our design and sustainability criteria but also enhanced the spatial experience, contributing to the overall narrative and emotional resonance of the space. This phase emphasized the importance of materiality in achieving our project's multifaceted goals.

MATERIALIZATION

The approach to materialization within the adaptive reuse project of the Palazzo del Lavoro emphasizes the importance of acoustic comfort alongside environmental sustainability. Given the architectural arrangement that includes terracing designs and semi-open spaces, such as the bustling ground floor shopping center and the tranquil first-floor co-working areas, the selection of materials was meticulously considered to meet the dual objectives of acoustic management and ecological responsibility.

The foundation of the acoustic strategy is based on the selection of materials that are not only aesthetically pleasing but also functionally adept at enhancing acoustic comfort. The design incorporates a combination of wooden slats and recycled PET panels, each selected for their distinctive colors, textures, and sound-absorbing capabilities. The use of a lightweight steel framing construction system facilitates the integration of these materials, providing a flexible framework that accommodates a variety of paneling options.

Wooden slats, characterized by their darker hue and textured surface, not only add a visual contrast to the interior spaces but also serve a practical purpose in acoustic management. The texture and material properties of wood contribute to dampening noise levels, reducing sound reflection, and thus enhancing the auditory experience within the space.

Recycled PET panels, chosen for their lighter color and versatility, offer an additional layer of sound absorption. Their easy assembly and disassembly capabilities not only aid in the adaptability and maintenance of the acoustic solutions but also support a quick response to changing needs within the space. The choice of recycled PETs not only addresses acoustic challenges but also embodies a commitment to sustainability.⁵²

The environmental dimension of the material selection process is a testament to the project's alignment with sustainable design principles. Wooden slats are sourced from responsibly managed forests, ensuring that their use contributes to a cycle of renewal rather than depletion. This choice underscores a commitment to minimizing the environmental footprint by relying on renewable resources.

52. Buratti, Cinzia & Belloni, Elisa & Lascaro, Elisa & Lopez, Giovanna. (2016). Sustainable Panels with Recycled Materials for Building Applications: Environmental and Acoustic Characterization. *Energy Procedia*. 101. 972-979. 10.1016/j.egypro.2016.11.123.

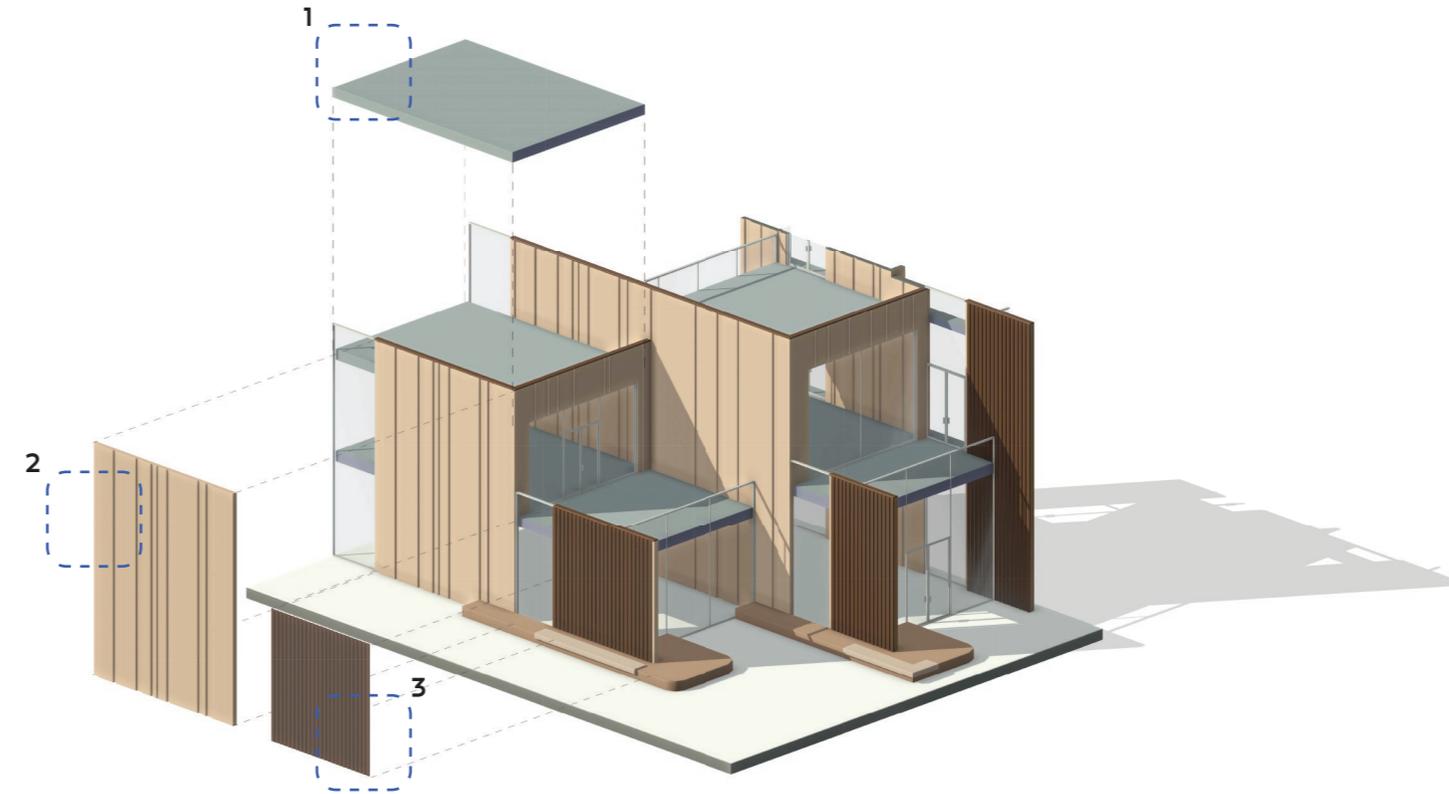


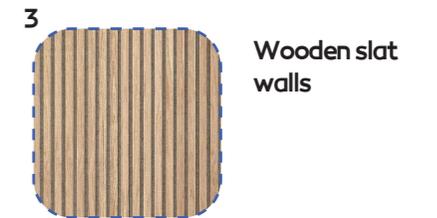
Figure 154: Materialization diagram.



Rubber flooring is highly durable and well-suited for high-traffic areas. Its softer composition helps reduce noise levels, making it ideal for spaces where sound absorption is important, such as large open areas prone to echoes.



Recycled PET panels optimize sound absorption across various frequencies. By incorporating specific reveals, these panels excel in improving acoustic performance, making them suitable for a range of environments.



Wooden slat walls feature hollowed-out sections that help dampen noise and improve acoustic quality in a space. They add visual interest while contributing to a quieter environment by absorbing and dispersing sound waves effectively.



Figure 155: Interior render.

The proposed materials were selected with an emphasis on compatibility and contrast, ensuring that the new additions are distinguishable yet complementary to the existing structure. This careful balance is achieved through a thoughtful consideration of texture, color, and material properties.

The use of modern materials such as recycled PET panels and wooden slats is intentionally contrasted against the building's original concrete and glass elements. This contrast is not merely visual but also tactile and functional, bringing forth a layered architectural narrative that respects the past while embracing the future.

SOUTH ELEVATION

The integration of staircases within the pop-out volumes on the south facade enhances accessibility to the first-floor co-working spaces. So they are accessible both internally from within the building and externally via the staircases. Such a configuration introduces a dynamic circulation pattern for users, promoting an interactive and flexible use of space.

An indentation, enhanced by pop-out volumes, was introduced on the south facade, creating a clear and inviting entrance. This design solution effectively addresses the building's previous lack of identifiable entrances, guiding visitors towards the main access and improving the building's interaction with its environment.



Figure 156: South elevation.



Figure 157: External render of Main Entrance



Figure 158: External render of Main Entrance

NORTH ELEVATION

The integration of pop-out volumes on the northern side is creating a multifaceted northern plaza, which connects directly to the underground event center. This architectural design introduces a dynamic layering of activities: students engaging on the first-floor balconies, patrons enjoying the ground-floor food court, and visitors traversing the plaza to access the event center below. This layered approach effectively activates the plaza, transforming it into a lively hub of interaction that complements the building's overall functionality and enhances its connection to the urban fabric.

On the northern facade, a dedicated entrance for university users is integrated with the adjacent park, enhancing accessibility and connectivity. This decision is influenced by the proximity to public transportation hubs, bike lanes, and pedestrian pathways within the park, ensuring ease of access for students and faculty.

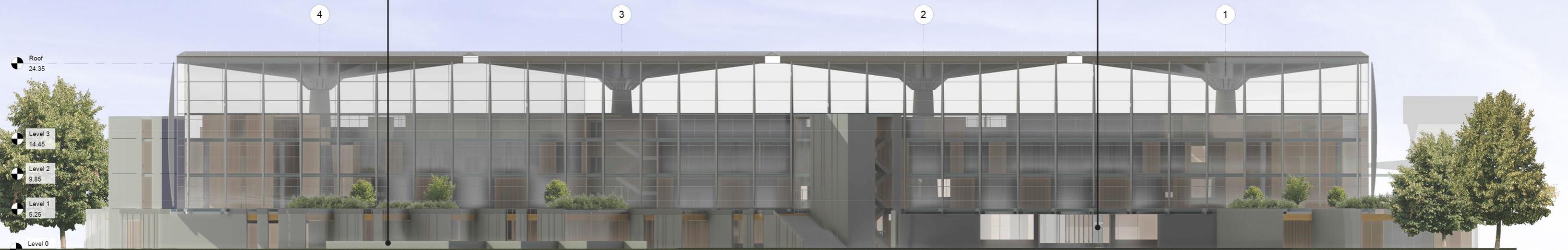


Figure 159: North elevation.

EAST ELEVATION

On the eastern side, adjacent to the main street and positioned prominently as the building faces Torino's primary southern entrance, the pop-out volumes dedicated to retail shops play a crucial role in drawing people towards the Palazzo del Lavoro. The strategic elevation of the building's site, approximately one meter higher than the street level, ensures that the shops' lighting is distinctly visible from the main thoroughfare. This visibility not only enhances the allure of the building but also leverages the retail spaces as an inviting beacon, encouraging engagement and interaction from passersby and effectively integrating the Palazzo into the urban and social fabric of Torino.

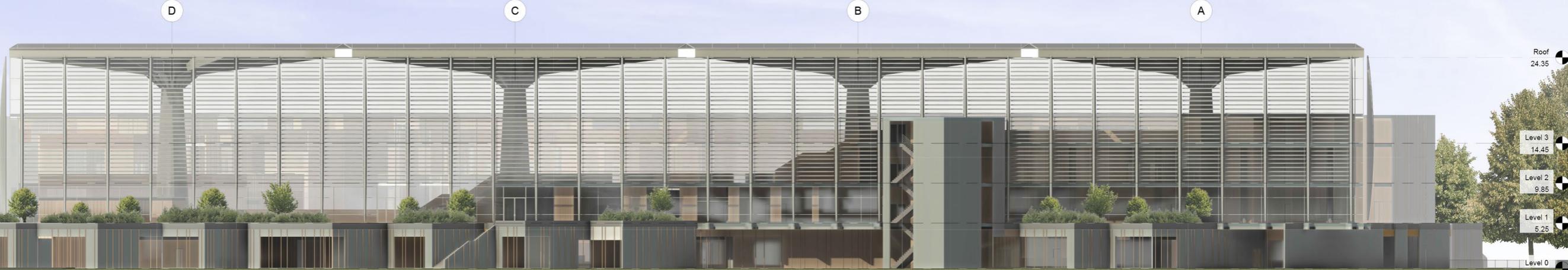


Figure 160: East elevation.



Figure 161: East External Render.

WEST ELEVATION

The west facade, situated in proximity to a residential neighborhood, is thoughtfully designated for functions that cater primarily to the local community, such as child-care and a supermarket. This strategic positioning allows these services to be accessible not only from within the building but also directly from the neighborhood. By allocating services that meet the everyday needs of the local population to this side of the building, the design fosters a symbiotic relationship between the Palazzo and the community, ensuring that the structure serves as a valuable and accessible resource for residents.

A

B

C

D

Roof	24.35
Level 3	14.45
Level 2	9.85
Level 1	5.25
Level 0	0.00

Figure 162: West elevation.

CONCLUSION

In this thesis project, the significance of conducting thorough analyses cannot be overstated, given the complexities of the Palazzo del Lavoro adaptive reuse. Real-time and in-depth analyses were imperative, encompassing a dual approach: continuous monitoring of stakeholders and project-related developments, and a comprehensive examination of the building's context and historical background. Employing frameworks from both Polito and TU Delft, the analyses were instrumental in formulating a viable proposal for the adaptive reuse of the Palazzo.

The stakeholder and heritage value analyses were systematically approached, involving mapping of information and implementing a value assessment matrix. These analytical methodologies laid the groundwork for the development of key strategies to address the building's challenges and meet stakeholder needs. The project's core strategies revolved around sustainability in social, economic, and environmental facets, emphasizing a profound respect for the building's historical significance.

In alignment with these strategies, the project's design incorporates a shopping center as the economic anchor, while universities and an innovation hub find their place on upper levels, interconnected by strategically positioned co-working spaces. These spaces act as a conceptual bridge, seamlessly linking work and study. At the heart of the project lies the terraced design, symbolizing unity under the same roof, with all functions converging to the ground floor, culminating in the Science Museum as the emblem of science. The overarching idea of this adaptive reuse project is encapsulated in the theme of being "united under the same roof," emphasizing the harmonious coexistence of diverse functions within the re-imagined Palazzo del Lavoro.

BIBLIOGRAPHY

Books:

- Armando, A., Cesareo, F., Della Scala, V., Durbiano, G., Listo, T., & Todella, E. (2022). *The Form of the Action*. Dom Publisher.
- Bonino, M., & Bruno, E. (2022). *The Story of a Section: Designing the Shougang Oxygen Factory*. ORO Editions.
- Chiorino, C., Pace, S., & Rosso, M. (2005). *Italia' 61: la nazione in scena. Identita e miti nelle celebrazioni per il centenario dell'Unita d'Italia*. Torino: Umberto Allemandi & C.
- Fregonese, E., Quaglio, C., & Todella, E. (2020). *Sintesi. Disegnare l'azione: metodi e strumenti*. Milano – Torino: Pearson Italia.
- Kuipers, M., & de Jonge, W. (2017). *Designing from Heritage: Strategies for Conservation and Conversion* (p. 87). Delft University of Technology.
- National Committee for the Celebration of the First Centenary of Italian Unity. (1961). *The Celebration of the First Centenary of Italian Unity*. Turin.
- Nervi, P. L. (2018). *Aesthetics and Technology in Building: The Twenty-First Century Edition*. Urbana: University of Illinois Press.
- Olmo, C., & Chiorino, C. (2010). *PIER LUIGI NERVI l'architettura come sfida*. SilvanaEditoriale.

Newspaper Articles:

- Anon. (2021, February 8). *Italia' 61 Monorail like New York's High Line*. Torino Oggi.

- Anon. (2022, August 12). *Palazzo del Lavoro: works for redevelopment have started*. Moleventiquattro.
- Anon. (2023, September 20). *The future of Palazzo del Lavoro*. Mazzoleni: "A mix of broad functions that sustains itself economically."
- Caracciolo, P. (2023, March 29). *Countdown for Palazzo del Lavoro: construction site to finish in 2024 after 10 years of abandonment*. La Stampa.
- Caracciolo, P., & Molino, D. (2022, August 12). *The long-awaited restoration: the construction site for Palazzo del Lavoro is open*. La Stampa.
- Caracciolo, P. F. (2023, June 8). *New drug trafficking base around the construction site of Palazzo del Lavoro*. La Stampa.
- DoCoMoMo Italia. (2016). *Together with the Pier Luigi Nervi project*. DoCoMoMo Italia wrote to the Mayor of Turin asking to study a strategy for the transformation of the Palazzo del Lavoro. PLN Project Website.
- D'Arcangelo, A. (2023, January 17). *Palazzo del Lavoro: the Polytechnic University of Turin proposes new solutions*. Moleventiquattro.
- Gatti, C., & Sciuolo, M. (2023, May 6). *Palazzo del Lavoro: while imagining a future, degradation reigns in the Nervi jewel*. Torino Oggi.
- Guccione, G. (2023, June 7). *The future of Pala Nervi following the Ogr model*. Mayor Lo Russo's idea "a hub for start-ups". Corriere della Sera.
- Indemini, L. (2016, January 18). *The thousand lives of Palazzo Nervi, from Italia' 61 to the new*

redevelopment plan. Torino Storia.

- International Labor Organization (ILO) website. (n.d.). Retrieved from <https://www.ilo.org/about/history>
- La Stampa. (2022, August 14). *The proposal of the rector of the Polytechnic: "Let's name a Museum of Innovation after Piero Angela"*.
- Longhin, D. (2021, April 7). *Nizza Millefonti, the laboratory of the city projecting into the future but fearing the unfinished*. La Repubblica.
- Longhin, D. (2023, January 17). *"Research laboratories and Piero Angela Museum inside Palazzo del Lavoro," the challenge of the Polytechnic of Turin*. La Repubblica.
- Luise, C. (2023, February 10). *Palazzo del Lavoro, finally the turning point: Hub for innovation and technology*. La Stampa.
- Luise, C. (2023, January). *Healthcare: the Polytechnic doesn't wait, laboratories in Palazzo del Lavoro*. La Stampa.
- Luise, C. (2023, March 9). *An innovation citadel in the future of Palazzo del Lavoro*. La Stampa.
- Luise, C. (2023, October 24). *This is how Palazzo del Lavoro will be reborn: University, startups, and culture*. La Stampa.
- Minello, B., & Minucci, E. (2008, May 30). *Harrods in Turin: Palazzo del Lavoro will become a mega shopping gallery*. La Stampa.
- Molino, D. (2022, June 17). *Palazzo del Lavoro, the*

revival starts with the restoration of the facades. Tenders in summer. La Stampa.

- Molino, D. (2022, October 28). *From Shopping Gallery and Museum: This is how Palazzo del Lavoro is being reborn*. La Stampa.
- Versienti, P. (2023, October 17). *The walkway and the cable car: those projects that never started to relaunch Italia' 61*. TorinoCronaca.
- Varetto, P. (2023, September 21). *Paolo Mezzolini: A Versatile Hub for Diverse Service Activities*. La Stampa.

Journals

- Bielek, B., Klem, J., & Macak, M. (2019). *Physical Cavity of a Double Skin Facade as a Source of Pre-Heated Air in the Winter Season for the Heat Recovery Unit of a Facade*. Slovak Journal of Civil Engineering, 27, 7–10. DOI: 10.2478/sjce-2019-0025
- Buratti, C., Belloni, E., Lascaro, E., & Lopez, G. (2016). *Sustainable Panels with Recycled Materials for Building Applications: Environmental and Acoustic Characterization*. Energy Procedia, 101, 972–979. DOI: 10.1016/j.egypro.2016.11.123
- Chiorino, C. (2014). *Problems and strategies for conservation of Pier Luigi Nervi's heritage*. Journal of the International Association for Shell and Spatial Structures.
- Chiorino, C. (2020). *Subtle Fusion of Structure and Space: Construction, Life, and Reuse of the Palazzo del Lavoro*. Turin. EPFL Press.

- Gratia, E., & De Herde, A. (2004). Natural ventilation in a double-skin facade. *Energy and Buildings*, 36(2), 137–146. DOI: 10.1016/j.enbuild.2003.10.008
- Kalansuriya, C. M., Pannila, A., & Sonnadara, U. (2009). Effect of roadside vegetation on reduction of traffic noise levels.
- Li, H., Zhao, Y., Sutzl, B., Kubilay, A., & Carmeliet, J. (2022). Impact of green walls on ventilation and heat removal from street canyons: Coupling of thermal and aerodynamic resistance. *Building and Environment*, 214, 108945. DOI: 10.1016/j.buildenv.2022.108945
- Martins, C., Santos, P., & Silva, L. (2013). Light-weight Steel Framed Construction System.
- Matour, S., Garcia-Hansen, V., Omrani, S., Hassanli, S., & Drogemuller, R. (2022). Thermal performance and airflow analysis of a new type of Double Skin Facade for warm climates: An experimental study. *Journal of Building Engineering*, 62, 105323.
- Rukavina, M., Skejic, D., Kralj, A., Scapec, T., & Milovanovic, B. (2022). Development of Lightweight Steel Framed Construction Systems for Nearly-Zero Energy Buildings. *Buildings*, 12, 929. DOI: 10.3390/buildings12070929
- Scrinzi, G., Mazzucchelli, E. S., Stefanazzi, A., & Lucchini, A. (2022). Technological refurbishment and energy retrofit of large, flat roofs by using metal sheet systems: The case study of a multifunctional building. Retrieved from <https://hdl.handle.net/11311/1220538>

- Wargocki, P., & Wyon, D. (2006). Effects of HVAC on student performance. *ASHRAE Journal*, 48, 22–28.

Websites

- ArchDaily. (2019, January 16). Lochal Library. ArchDaily. Retrieved from <https://www.archdaily.com/909540/lochal-library-mecanoo-plus-civic-architects-plus-braaksma-and-roos-architectenbureau>
- Archivio storico Fondazione 1563. <https://walks-of-change.fondazione1563.it/progetto/>
- Archivio storico Intesa San Paolo. <https://asisp.intesasanpaolo.com/publifoto/detail/IT-PF-FT001-003958/italia-61>
- Associazione Amici di Italia 61. <https://www.italia61.org/palazzo-del-lavoro>
- AtlasFor. Palazzo del Lavoro Torino. <https://atlas.landscapefor.eu/category/secxx/poi/6497-palazzo-del-lavoro/>
- DoCoMoMo. <https://www.docomoitalia.it/wp-content/uploads/2021/01/Lettera-Palazzodel-Lavoro.pdf>
- Gio Ponti Archives. https://www.gioponti.org/it/archivio/scheda-dell-opera/dd_161_6136/
- Museo Torino. Palazzo del Lavoro. <https://www.museotorino.it/view/s/71cbc60171324892aa88b8b61a5e728a>
- MuseoTorino. Parco Italia' 61. <https://www.museotorino.it>

- PLN project, palazzo del lavoro. <https://pierluiginervi.org/palazzodelavoro/>
- Nrp Vernieuwend in het bestaande. (n.d.). Lochal. nrp Vernieuwend in het bestaande. Retrieved from <https://nrp.nl/projecten/lochal-tilburg/>



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