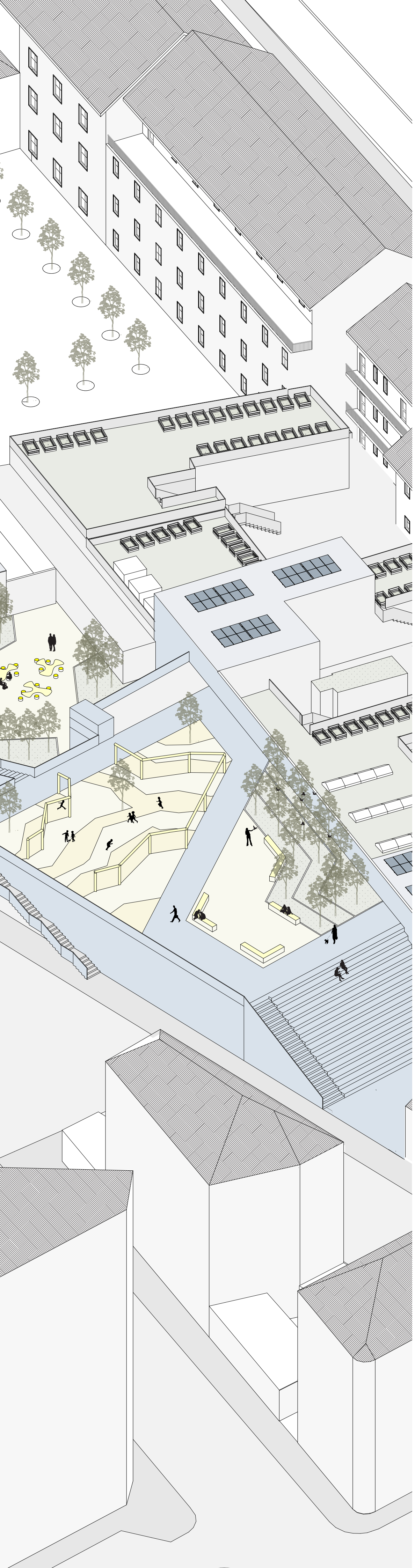

Rooftop Transformation

Transforming underutilized spaces into design opportunities

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ABSTRACT

Urban development presents significant environmental and social challenges, particularly in cities experiencing demographic decline and population aging. In many urban areas, ongoing land consumption coexists with a large number of underutilized built surfaces. This situation underscores the need for strategies that enhance urban resilience without further spatial growth. This thesis explores the transformation of underused rooftops of low-rise buildings into design opportunities, proposing rooftop activation as a form of regeneration of the urban fabric.

The research focuses on the city of Turin, particularly the San Paolo district, where low-rise buildings are interspersed among high-rise residential ones. Compact city theory is adopted as a theoretical framework to interpret density and proximity as qualitative spatial conditions, rather than quantitative measures of urban form. This approach is integrated with principles of inclusive urban design, adaptive reuse, urban comfort, and participatory processes, addressing the needs of an aging population and diverse urban users.

The methodology combines urban and morphological analysis, demographic evaluation, theoretical research, and investigation of international reference projects, including the experimental rooftop strategies developed by MVRDV. Rather than proposing a single definitive solution, the thesis develops a series of adaptable design strategies, including: energy-producing rooftops, community gardens, hybrid public spaces, and co-housing initiatives. These strategies demonstrate how existing rooftops can be reactivated as accessible public and collective space. The final strategy combines all of these strategies into a realistic and cohesive design tailored to the specific context of the selected urban block.

By reusing existing built surfaces, the thesis argues that cities like Turin can evolve through transformation, reducing land consumption while strengthening urban resilience, connectivity, and social participation without expanding their physical footprint.

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0.0. **INTRODUCTION**

Global sustainability challenges play a fundamental role in rethinking how to improve the quality of life in urban areas. The contemporary cities must rethink how to grow, adapt and regenerate within existing boundaries. Urban expansion has been occurred by land consumption and often at the expense of ecological balance and social inclusivity. In this era of demographic change, climate urgency and spatial inequality, the focus is shifting toward a more efficient, participatory and adaptive reuse of what already exist. Among these opportunities is the activation of underutilized surfaces. Rooftops, in particular, represent a vast and largely untapped resource within urban fabrics. They have potential to become dynamic spaces capable of hosting social, ecological and productive functions.

This thesis was developed during the author's internship at AOT Architectural Office in Turin, where they participated in a research initiative focused on urban-scale development through the expanding of Time to Imagine Turin II event. While this experience contributed to the initial research interests, the thesis is an independent academic investigation, with a distinct methodological framework, exploratory design phase, and site selection through research.

The city of Turin experienced a rapid expansion both in terms of construction and population, in period following Second World War. This produced several urban outcomes that were not always optimal in terms of the quality of the built environment. Today, however, Turin is experiencing a period of very limited expansion, but one that seeks to improve the quality of life, comfort accessibility, social inclusion, and public services for residents. This shift has redirected attention toward interventions on the existing built fabric, positioning urban regeneration and adaptive reuse as central strategies for contemporary development.

Turin, like many European cities, faces a paradox of urban and spatial expansion alongside population decline. In neighborhoods such as San Paolo, low-rise buildings are often in poor condition and nearly abandoned. However, they hold the potential to become amenities for the local community without increasing the land use. These conditions provide an ideal testing ground for exploring how rooftop activation can enhance urban quality. The rooftops could be transform into a new layer of accessible public, semi-public and collective spaces, offering facilities for the community.

Through a combination of urban analysis, environmental evaluation and design experimentation, this thesis explores a set of adaptable rooftop strategies aimed at reinforming social inclusion, ecological performance, and spatial connectivity to find different solutions for the block capable of responding to different urban needs. In doing so, it contributes to the broader discourse on sustainable urban regeneration, demonstrating how cities can evolve by transforming what already exist rather than expanding outward.

01

RESEARCH BACKGROUND

01.1. **Regional Context:** Piemonte and Turin

Land consumption is one of the most critical territorial challenges affecting the sustainability of Italian cities, leading to significant environmental, social and economic impacts. The land consumption refers to the conversion of the natural and agricultural lands into artificial and impermeable surfaces such as building, infrastructure, parking lots and paved areas (ISRPA, SNPA, 2024). This transformation results in the irreversible loss of ecological function and landscape continuity.

According to the Rapporto sul consumo di suolo 2024 published by ISPRA/SNPA, the Piemonte region continues to experience increase in artificial land cover. Between 2022 and 2023, there was an additional 380 hectares of consumed soil, confirming a trend of ongoing expansion despite demographic stagnation.(ISPRA/SNPA, 2024). Urbanized areas around the city of Turin such as Alessandria and Novara represents the most consolidated and continuously expanding parts of the region. The growth occurs particularly along infrastructure corridors and pre-urban areas. This regional trend is visually illustrated in Figure 1.1 which shows the distribution of land consumption across provinces of Piemonte and highlights the concentration of urbanized areas around Turin.

At the regional scale, ARPA Piemonte reports that approximately, 7.6% of Piemonte's total surface is already classified as artificial soil which is slightly above the natural average of 7.56%. (ARPA Piemonte, 2023). This increase in sealed surfaces reduces permeable land and increase flood risk and the urban heat island effect, and weakens ecological resilience. However, the variations at the Municipal level differ significantly. The metropolitan area of Turin stands out as one of the most urbanized territories in the entire region, having the highest level of soil sealing and significant annual increase based on ISPRA. Approximately 66.5% of the municipal area is classifies as consumed land (Figure1.2). Additionally, there is a structural imbalance between population and land consumption.

This paradox emphasizes the urgent need to shift from expansion to regeneration. European policy frameworks support this direction: The EU Soil Strategy for 2030 and the objective of zero land take by 2050 promote limiting urban use and maximizing the efficient circular use of already urbanized soil (European Commission 2021). Additionally, Italy's *Stop al Consumo di Suolo* initiatives translate this objective to local planning guidance and encourage the reuse and transformation instead of the use of new lands. Urban theory aligns with these policy directions. The compact city model developed by different authors such as Dantzig and Saaty (1973), Burton (2000) and supported by the OECD (2012). Based on this theory the higher density, mixed-use and transit orientation can decrease land consumption, energy demand and ecological impact. Contemporary interpretations emphasizes that compactness is effective only when integrated with green infrastructure, social inclusiveness, and climate-responsive design.

Despite a decline in population between 2012 and 2024, the metropolitan area continues to consume land, losing over 90 hectares to impermeable surfaces in recent years and a total of %66.53 of its territory is already sealed. (ISPRA, 2024). Whitin this framework the adaptive reuse of underutilized spaces is crucial and emerges as strategy for sustainable densification. Instead of expanding into agricultural land or natural areas, the city can evolve through the transformation of its existing layers. In the context of Turin the demographic change and dynamic student population provide new opportunities for this kind of urban evolution.

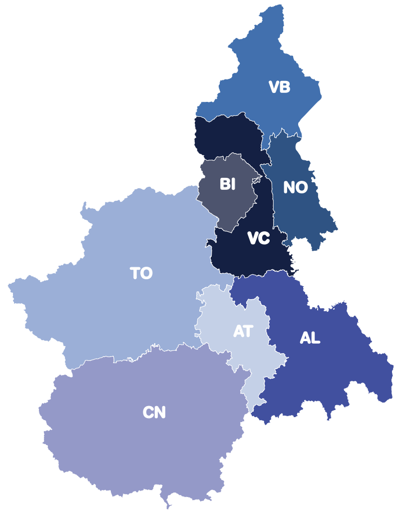


Figure.1.1.Provincial distribution of total land consumption (CSC) 2021
Source: elaboration by author based on ARPA Piemonte, and ISPRA/SNPA data 2021

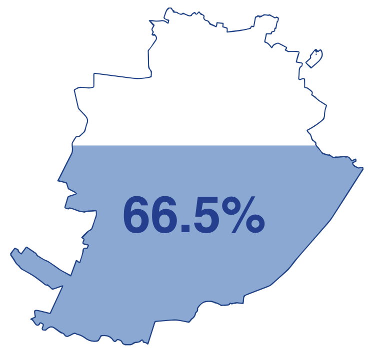


Figure.1.2.Proportion of land consumption within the municipal area of Turin
Source: elaboration by author based on ISPRA/ SNPA data 2024

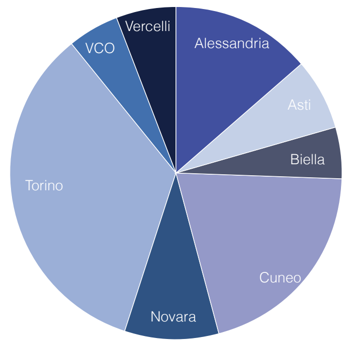


Figure.1.3.Provincial distribution of total land consumption (CSC) 2021
Source: elaboration by author based on ARPA Piemonte, and ISPRA/SNPA data 2021

01.2. **Demographic Trends in Turin**

Turin is the most populated and largest city in the Piemonte region. The demographic trends clearly reflect the broader aging patterns that are seen throughout the Piemonte region. According to the most recent municipal statistics published on 31 December 2024, the resident population of the municipality was 862.999 inhabitants. The population are distributed across the eight administrative districts, with 120.415 of which are in Circoscrizione 3. (commune di Torino,2024). At the reginal level, ISTAT (*Censimento permanente della popolazione*) reports that Piemonte had a population of 4,251,623 in 2023, a figure that has remained almost unchanged in recent years, indicating a condition of demographic stagnation (ISTAT, 2024). More than half of the region's population lives in the province of Turin, which remains the most densely populated area in Piemonte.

At the metropolitan and the city level, long-term trends indicate to a gradual decline in the overall population and the continuous increase in the elderly population. The latest permanent census shows that around 26% of Turin's residents are aged 65 or more, while single-person households account for about 48% of all family units. This is one of the highest percentage among large Italian cities. (ISTAT, 2023, and Comune di Torino, 2023)

In addition to its resident population, the city of Turin hosts a large and dynamic community of university students, which significantly influences the city's demographic and social dynamics. With the presence of Politecnico di Torino and University of Turin, together enrolling over 120,000 students each year, the city attracts a substantial number of young people from all over Italian regions and also abroad. Many students live temporarily in the neighborhoods close to the major campuses, including San Paolo, which is directly connected to the Politecnico's main campus and facilities. The presence of these students contributes to the vibrancy of local services and the demand for housing increases. This influx of young people can help partially counterbalance the city's overall aging trends.

Moreover, the temporary nature of student population creates specific spatial needs including flexible housing, accessible public spaces and new forms of shared living. All of these are particularly relevant to the strategies of adaptive urban regeneration.

However, these conditions can also generate rising dependencies and new forms of social vulnerability. The combination of demographic change with land consumption and urban overheating , creates an urgent need for inclusive and adaptable urban strategies. In this context, reimagining new opportunities for enhancing accessible spaces for people and improving the comfort of residence without expanding the city's physical footprint is crucial.

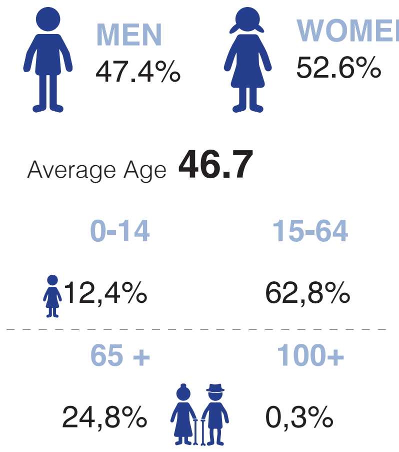


Figure 1.4 .Population variation and aging trends at the national level (Italy)
Source: elaboration by author based on Italy (ISTAT 2023)

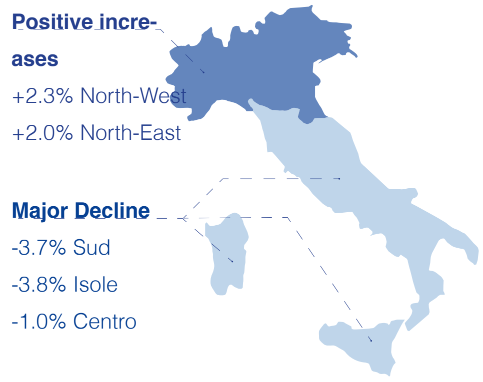


Figure.1.5.Population and housing indicators in 2023
Source: elaboration by author based on ISTAT(2024)

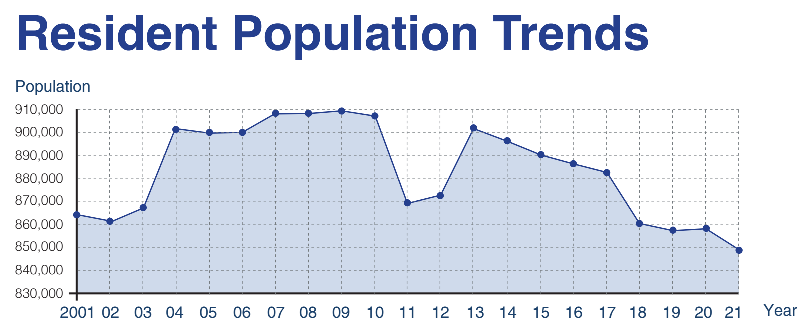


Figure1.6.The Municipality of Turin
Source: :ISTAT 2022

01.3. **Problem Statement**

Turin is facing a spatial and demographic paradox: while the city's population has been steadily declining, land consumption continues to grow, revealing structural inefficiencies in urban space usage and planning. This contradiction is particularly evident in neighborhoods such as San Paolo, characterized by high-rise residential building encircling clusters of low-rise structures. These low-rise buildings include former workshops, community facilities and aging buildings with limited contemporary use, which basically have poor architectural quality and are in a state of disrepair or poor maintenance, as they house ancillary services to main residential buildings. Consequently, these low-rise volumes create a continuous but largely overlooked rooftop landscape that remained empty despite its potential.

At ground level, the creation of new public spaces in Turin is increasingly constrained. The existing urban fabric is dense, available plots are scarce, and ground level interventions often involve high costs, complex regulations and challenge related to existing infrastructure. As a result, the possibility of expanding public space horizontally is limited. In contrast rooftops offer a built surface that are already integrated within the neighborhood, directly adjacent top residential units, and capable of accommodating new functions with minimal environment impact.

Despite their proximity and abundance, rooftops in San Paolo remain fragmented, inaccessible and functionally inactive. Their potential to serve as extensions of public space, ecological infrastructure, or social platforms is not yet recognized, within current planning practices. This represents a significant missed opportunity in a context where the city must adapt to demographic decline, improve environmental resilience and promote new forms of community life without increasing its footprint.

The central problem addressed in this thesis is therefore the underutilization of the existing rooftops in San Paolo and the absence of a strategic framework to transform these surfaces into a connected, multifunctional urban layer. The challenge lies in understanding how rooftops can support new forms of public life, ecological performance and neighborhood cohesion through vertical intensification and adaptive reuse. Reframing rooftops as a potential new layer of the city is essential for reimagining future development in a sustainable and resource efficient way.

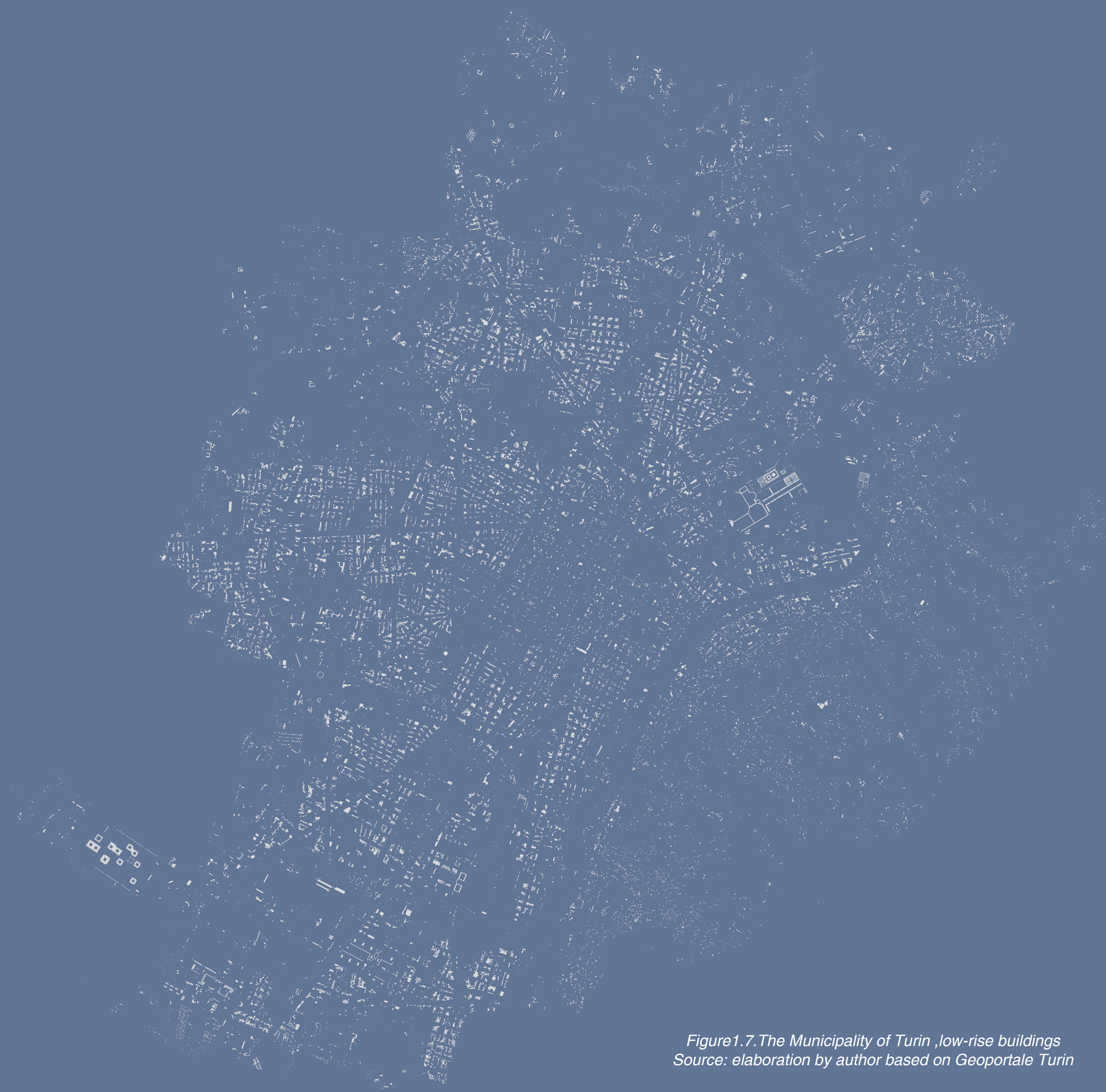


Figure1.7.The Municipality of Turin ,low-rise buildings
Source: elaboration by author based on Geoportale Turin

Piazza San Carlo: 12.768 m^2

X 595

Figure1.8.Source Data: Provided by AOT Architecture Studio, Turin

7.60 km^2

The area occupied by **low-rise buildings and flat roofs** in Turin is vast, a hidden resource with untapped potential. The real challenge lies in transforming these spaces into active, usable places through social, energy, residential, and commercial programs.

How can we make the most of these resource?

01.4. **Research Objectives and Questions**

Research objective

The general objective of this thesis is to explore how the underutilized rooftops of low-rise buildings in San Paolo, Turin, can be reactivated and connected to create a new ecological and social infrastructure. Through a research by design activity in which transformation scenarios are defined, the thesis allows for the exploration of possible alternatives for regeneration and improvement of the quality of life in the city. This infrastructure could enhance urban resilience, support community life, and contributes to the sustainable city transformation. By building on theories of metamorphic transformation, adaptive reuse and participation, the research seeks to establish a replicable method for rooftop-based regeneration in post-industrial contexts.

Specific Objectives

Objective 1: Identify and analyze the spatial, environmental, and social potential of the existing spaces in San Paolo
This includes mapping roof typologies, analyzing microclimate and environmental performance, and evaluating socio-demographic conditions to determine which blocks are more suitable for public, ecological or productive function

Objective 2: Develop a methodological framework for rooftop transformation informed by case studies
Drawing inspiration from examples such as Rotterdam Rooftop Catalogue, La Pista 500, De Groene Kaap, the High Line, Les Grands Voisins, and Rooftop Republic, the objective is to synthesize strategies of connectivity, green infrastructure, temporary use, community involvement, and multifunctionality.

Objective 3: Propose a design strategy that transforms selected rooftops into an interconnected ecological social layer
The strategy will integrate functions such as green roofs, community gardens, renewable energy systems, sport and leisure areas, and public gathering spaces, positioning rooftops as extensions of the urban ground.

Objective 4: Evaluate the feasibility of participation for implementation
This involves identifying the potential of the space for a participatory process that could support long-term stewardship.

Research questions

1-How can existing rooftops in Turin be reimagined as a new layer of urban public space without increasing land consumption?
2-What environmental and social benefits can emerge from creating a connected network?
3-How can adaptive reuse and participatory methods support the transformation?
4-What are the social, cultural, and environmental impacts of the rooftop transformation, and how can residents be encouraged to participate?

02

THEORETICAL FRAMEWORK

02.1. **Compact City Theory**

The compact city theory is a widely recognized model in contemporary urbanism. This strategy promotes dense, mixed-use, and human-scaled development. It aims to reduce urban sprawl by concentrating activities such as living, working, services, and recreation within walkable distances. This approach can reduce land consumption, support sustainable mobility, and strengthen social cohesion. According to Jenks and Burgess (2000) the compact city represents an urban form where spatial efficiency and proximity create ecological, economic, and social advantages.

Central to the compact city model is an efficient use of existing land. Burton (2000) emphasizes that compactness is not synonym with overcrowding. It is a strategic densification that supports vibrant public life and viability of public transport system. Higher densities can contribute to lower per capita energy consumption, reduce transport emissions, and more efficient infrastructure provision. (OECD,2012)
The compact city also promotes vertical connection and intensification, focusing on infill development, adaptive reuse and the activation of the underutilized spaces such as courtyards, terraces and rooftops. These overlooked areas can support ecological systems, renewable energy production, food cultivation, or new public and semi-public spaces. In this framework, density becomes not just a quantitative measure, but a qualitative transformation of existing urban fabrics.

Environmental sustainability is a key outcome of compactness. By preserving expansion, compact cities conserve agricultural lands, protect biodiversity, and reduce the ecological pressures that are associated by land sealing. Couch and Karecha (2006) show that compact urban forms typically result in lower greenhouse gas emissions and reduced infrastructure costs, while supporting climate adaption strategies like green roofs, tree shading and integrated water management.

Socially, the compact city model promotes proximity-based living, interaction and inclusivity. Mixed-use development break down monofunctional zoning, allowing diverse populations to share spaces and activities. As Burton (2000) notes, compact urban environment can improve access to services and strengthen community bonds. However, challenges such as rising land values and risk of gentrification must be addressed. These elements highlight the need for equitable housing policies and participatory planning.

For post-industrial cities like Turin, the compact city model is particularly relevant. Turin faces demographic decline high levels of land consumption and a large number of underused building and industrial spaces. In neighborhood such as San Paolo, characterized by low-rise residential blocks, former factories and fragmented green areas, compact city principles offer a framework for re-densification without land expansion into new lands. Adaptive reuse and vertical regeneration are vital strategies, with rooftop serving as a key spatial resources for ecological enhancement, social activation and distributed energy systems aligned with European land-use objectives.

Ultimately, the compact city frameworks can provide a powerful theoretical basis for strategies of using rooftops and improving connectivity, creating elevated public space and facilitating urban metamorphosis. It supports the idea of transforming consolidated neighborhood through the reuse of their existing morphological potential.

02.2. **Inclusive Urban Design**

Design must actively welcome and embrace cultural, social, economic, and physical diversity. Inclusivity goes beyond mere access; it is about designing spaces and programs that reflect and celebrate the multiplicity of users and their needs. This involves engaging communities throughout the design process and tailoring interventions to local contexts. (Manzini, 2015) .

An aging population should not be seen as a problem, rather, it requires more attention particularly regarding the accessibility of people in urban life. According to the World Health Organization (2007) population aging represents on of the most significant social transformations of the twenty-first century, with implications for mobility, housing, and the design of public space. In Europe, more than one in five residents is aged 65 or more (Eurostat, 2023), and in Turin elderly also represent about 25% of the total population. (Comune di Torino 2023).

The WHO global age-friendly cities guide (2007) identifies outdoor comfort, accessibility, and social participation as core criteria of an inclusive environment. These principles are echoed by Jan Gehl (2010), who emphasizes that livable cities depend on human-scaled design. Research on age-friendly cities (Buffel, Handler, and Philipson, 2018) shows that co-design and integrational participation are essential for developing socially resilient urban systems. Initiatives such as Barcelona Superblocks and Turin's GreenTo project demonstrate how adaptive, participatory regeneration can enhance environmental comfort while strengthening community cohesion.

In the context of Turin, an aging society becomes not only a design challenge but an opportunity for urban transformation, a process through which existing urban structure evolve to support new forms of social and ecological connectivity. Rooftops in this vision, are reimagined as accessible extensions of public life, serving as active spaces where inclusivity and sustainability converge.

02.3. **Urban Comfort and Green Infrastructure**

Urban environmental conditions of Turin are significantly affected by long-term patterns of soil sealing, land consumption and climate change. The metropolitan area of Turin has been identified as one of the regions in Italy with the highest intensity soil sealing, primarily because of ongoing densification, the expansion of transport infrastructure and built up areas. (ISPRA, 2024) Soil sealing significantly compromises ecosystem services, particularly rainwater infiltration, carbon sequestration, and the natural cooling functions of soils. According to ISPRA, the reduction in infiltration capacity can increase the flood risk and reduce groundwater recharge.(ISPRA, 2024)
The climate in Turin also have some changes over recent decades. According to the Arpa Piemonte Climate Report, the region has experienced statically significant warming trends. Summer temperatures have risen depending on altitude and urbanization level. (ARPA Piemonte,2023).

Urban comfort has become a key focus in modern urban design, as it directly affects well-being, public health, and the use of outdoor spaces. Scientific literature identifies Urban outdoor comfort as a combined result of climatic factors including air temperature, humidity, wind speed, solar radiation, shading, surface material and psychological adaptation. (Nikolopoulou and Steemers,2003; Erell, Pearlmutter, and Williamson,2011) These parameters significantly influence how urban environments respond to climate change, especially in European cities facing increasing heat stress and more frequent extreme temperature events.

Turin is located in the Po Valley, is particularly vulnerable to urban heat island (UHI) intensification due to its topography, compact urban form and limited natural ventilation. The San Paolo neighborhood, which is a dense residential and former industrial area, experiences elevated surface temperatures during summer, asphalted courtyard and lack of greenery. Studies on UHI in Turin show that compact districts with low vegetation have higher night time temperature, reduced wind flow, and prolonged heat retention. (Mutani and Todeschi,2020). These conditions decrease outdoor thermal comfort and increase the demand for cooling energy in residential buildings.

Green infrastructure (GI) provides solid and effective strategy to mitigate microclimate issues in urban life. GI includes vegetation systems such as trees, green roofs, green walls and permeable surfaces. These elements deliver valuable ecosystem services such as shading, evapotranspiration, stormwater regulation and noise reduction (Bowler,2010). Among the various GI solutions green roofs are particularly suitable for San Paolo, where available ground space for greenery is extremely limited. Rooftops can be transformed into parts of an ecological network.

Green roofs can help reduce microclimate impacts by reducing surface and air temperatures. Oberndorfer et al (2007) reported that vegetated roofs can lower rooftop surface temperatures by 40–20 °C under peak summer conditions. Although green roofs are initially more expensive to construct than conventional roofs, they can be more economical over the life span of the roof because of the energy saved and the longevity of roof membranes (Porsche and Köhler 2003). In a case study conducted in Turin, Mutani and Todeschi (2021) found that green roofs could reduce ambient air temperature by 6-2 degree Celsius, depending on factors such as substrate thickness, vegetation type and irrigation conditions. This reduction in temperature is particularly relevant in districts like San Paolo, where thermal discomfort tends to be concentrated in narrow streets and internal courtyards.

Research indicates that widespread adoption of green roofs in compact areas can lead to significant reductions in mean radiant temperature, improving Physiological Equivalent Temprature (PET) indices for pedestrians (Mutani and Yodeschi,2020). Green roof can also reduce cooling energy demand during the summer months, depending on building typology and climatic exposure (Berardi and Ghaffarianhoseini, 2014). Additionally green roofs delay and reduce stormwater runoff, with mitigate flood risk and eases pressure on drainage systems. This is an increasingly important function in the context of climate change.(Berardi and Ghaffarianhoseini, 2014)

Cool roofs which feature high-albedo surfaces, reflect a significant portion of solar radiation and significantly decrease rooftop temperature. Shading systems on rooftops such as pergolas or photovoltaic canopies also modify microclimatic conditions by creating ventilated shaded spaces that prevent direct heating of the roof surface.

Overall, rooftop green infrastructure is one of the most effective strategies for improving urban comfort, mitigating the urban heat island effect, enhancing air quality and supporting public health in densely populated cities. San Paolo's mix of low-rise and high-rise buildings create a patchwork of exposed roof that if transformed, could function as a continuous microclimate regulating layer.

02.4. **Adaptive Reuse and Participatory Regeneration Strategies**

In contemporary urban discourse, adaptive reuse and participatory regeneration have emerged as essential strategies for addressing the social environmental and spatial challenges facing European cities. As demographic decline, aging building stock, land consumption and climate pressures intensify, cities are increasingly turning to the existing built environment as a primary resources for sustainable transformation (Cangelli et al, 2021). Adaptive reuse understood as the transformation of existing buildings or urban element for new purposes, is widely recognized as an environmentally responsible and culturally sensitive approach. At the same time, participatory regeneration reframes urban change as a collaborative, community driven process in which residents, stakeholders, and local institutions co-produce visions and interventions. The dimensions of adaptive reuse and participation can form an integrated framework that supports more resilient inclusive and contextually rooted urban futures.

Adaptive reuse is increasingly valued as a central pillar of sustainable urban regeneration due to its ability to reduce environmental impact while preserving cultural identity. Compared to demolition and new construction, adaptive reuse can significantly lower carbon emissions by conserving embodied energy and reducing the extraction of raw materials and minimizing construction waste (Baeza and Troiani,2020). Based on this perspective, the existing city can be a resource of environmental capital embedded within structure, material and infrastructures. European policy frameworks, such as the European Green Deal and the New European Bauhaus, emphasizes these principles by framing adaptive reuse as essential to the transformation of urban systems. Beyond its ecological benefits, adaptive reuse can significantly impact cultural identity. In cities with long historical background like Turin, existing buildings hold great symbolic value and contribute to collective memory and identity. The Italian tradition emphasizes a dual nature of heritage: not only as something to be preserved, but as an active urban resources capable of evolving through new functions and meanings (Munarin and Tosi,2014). This approach also aligns with UNESCO's Historic Urban Landscape Principles, which position heritage not as a constraint but as a driver for a sustainable, place specific innovation.

Adaptive reuse also offers significant social and spatial benefits. Underutilized spaces, represents opportunities to introduce new activities. Transforming into not only an architectural practice but also a strategy that leverages structural permanence to enable functional adaptability overtime. Additionally, contemporary urban regeneration increasingly emphasizes community involvement and participatory processes. The evolution of collaborative planning theory (Healey,1997) and participatory urbanism has reshaped the dynamic by positioning the community not as passive recipients of design but as active co-authors of change. Participation contributes to more socially sustainable outcomes by ensuring that interventions respond to local needs and aspirations, incorporate lived lived experience, and build trust between citizens and institutions. (Faga ,2020). The sustainable design Goal 11 reinforces participation as a defining criterion for sustainable and inclusive cities. Participatory methods vary widely but generally include co-design workshops, digital platforms and temporary installations that allow for testing before implementation. These tools not only can bring people together but also can increase the sense of ownership and attachment.

Turin's Co-City initiative is an European urban program that demonstrates how municipalities can empower citizens to transform abandoned buildings and public spaces into socially innovative environments through shared governance. When communities are recognized as co-producers, adaptive reuse can lead to physical improvements and new forms of social and cultural activity.
The intersection of adaptive reuse and participatory approaches represents one of the most significant developments in contemporary regeneration. In Italian context, combining adaptive reuse with participation has proven to create innovative circular models that balance economic viability with social inclusivity. The CLIC project (Circular Models Leveraging Investment in Cultural Heritage Adaptive Reuse) has demonstrated how a participatory design making process can generate holistic view strategies that align with both community values and sustainability.

One notable example of participation is Open House, an architectural temporary event in Europe where significant buildings usually closed to the public, open their doors for a limited time. The concept originated in London 1992 with open houses London founded by Victoria Thornton (open house website). This initiative allows people to explore the city's most remarkable homes, architecture and landscape. Today open house events are held worldwide and in Italy. The city of Turin follows open house since 2017. According to the open house Torino website, open house Torino is completely free public event design to provide access to houses building and places of interest usually not accessible. Each year for a weekend, these spaces open their doors to visitors. The number of participants in the open house is increased over the years, even during the pandemic despite complex challenge.
This initiative demonstrate how people and private owners can be encouraged to allow access to their private spaces for public use. Open house demonstrates that when individuals recognize the cultural social or economic value of opening their spaces, they become more willing to participate.

Figure 2.1.Open House Events, Turin
Source: :https://www.openhousetorino.it/

Figure 2.2.Open House Events, Turin
Source: :https://www.openhousetorino.it/

Figure 2.3.Open House Events, Turin
Source: :https://www.openhousetorino.it/

Figure 2.4.Open House Events, Turin
Source: :https://www.openhousetorino.it/

Both adaptive reuse and participatory regeneration provide a comprehensive framework to address the complexities of modern urban challenges. Adaptive reuse can enhance cultural and physical characteristics embedded in existing structure, while participation can ensure that regeneration process is socially grounded inclusive and forward looking. The project can succeed by interwining material adaption with participatory governance. Allowing rooftops as a catalyst for public life social inclusion and environmental resilience.

02.5. **Rooftop Urbanism and Vertical Metamorphosis**

Rooftops are often considered as residual or unused spaces. In contrast they hold significant potential for urban reuse and transformation. In the book Towards an architecture, Le Corbusier (1923) emphasized the architectural and social value of the roof terraces, proposing that they could serve as gardens, sports areas and places for rest on the top of the buildings. Later, critics and historians referred to his concept of the roof as the fifth point of the building (1.Pilotis, 2. free designed of the ground plan, 3.horizontal windows, 4.free design of the façade, 5.Roof garden). This surface needed to be designed with the same care as any elevation. Decades later, Rem Koolhaas in the Elements of Architecture (2018, p. 420), reinterpreted this idea, describing the roof as the new urban ground, a space of opportunities and experimentation within the vertical city. Today rooftops are increasingly recognized as inhabitable surfaces: one of the last reserves of spatial potential in dense urban environments, capable of supporting ecological systems, social programs and renewable energy infrastructure (MVRDV, 2022)

With the emergence of rooftop urbanism, rooftops are no longer perceived as mere architectural components of individual buildings, they are key catalysts in the regeneration of the urban fabric. They have transformed from isolated and underused spaces into active potentials for ecological and social transformation. When integrated into broader ecological and social networks, rooftop can become a new layer of public life. Recent urban policies and experimental projects increasingly demonstrate how roofscapes can form distributed network of green, accessible and climate responsive public spaces. (Bellini and Mocchi, 2019).

From an environmental perspective, the UNEP Adaption Gap Report (2021) identifies rooftop greening and solar systems as cost-effective strategies for mitigating urban heat island effects and reducing building energy demand. Through such interventions, rooftops evolve from residual surfaces into productive landscapes, transforming the urban roofscape into an active agent of resilience and adaptation. The concept of metamorphosis provides a theoretical framework that connects rooftop reuse with adaptive urban regeneration. Derived from biological transformation, metamorphosis in architectural can be understood as a continuous process of adaption without destruction. It represents an evolution within the same material or structural system, preserving the identity of the existing fabric while unlocking new forms of performance and meaning. In Turin, the position of low-rise residential blocks and high-rise buildings creates a fragmented roofscape. The adaptive reuse of these roofs can generate intermediate landscape that bridges vertical and horizontal spaces, between private and public domains.

The metamorphosis proposed in this thesis does not aim to add on ground floor but rather to reprogram the existing urban fabric. The project is looking to use the hidden capacities of Turin's built environment. Rooftops are envisioned as connective infrastructure that reconciles density with livability, aging with accessibility and sustainability with memory. The concept of metamorphosis is rooted not only in architecture but also deeply embedded in the history of biology, art and perception. Metamorphosis is considered a biological reaction that transforms one body into another through different phases of change (Dewidar,2007). It can be understood as a gradual, layered transformation. For instance, the most famous example is a caterpillar that transforms into a butterfly. *What the caterpillar calls the end of the world, the master calls a butterfly.* (Richard Bach, 1977)

The artworks of M.C. Escher exemplify transforms through continuity where forms evolve tesselate, and merge into new configurations while maintaining geometric logic. In contrast, Salvador Dali's Metamorphosis of Narcissus (1937) which is a surrealist painting presents transformation as reflection, showcasing the coexists of two states one dissolving into one other. This visual transformation shifts from a man to a hand holding an egg, symbolizing rebirth and fragility.

Overall, the metamorphic transformation of Turin's rooftop embodies this artistic vision. The city's surfaces do not disappear or get replaced. In fact, they evolve within themselves, creating new forms of connection energy and life. The process emphasizes transformation rather than demolition, moving from inert to the active, from the obsolete to the generative, an architectural equivalent of Escher's infinite transition and Dali's mirrored rebirth.

In contemporary architecture several projects reflect this logic of metamorphosis by adapting existing roofs, structures or vertical layers into new ecological and social infrastructure like Lingotto FIAT Factory in Turin. The best practices presented in the next section will illustrate that rooftop transformation is not merely a typological variation but a systematic reconfiguration of the city itself. This process connects isolated surfaces into continuous networks that responds simultaneously to urban density, microclimate,

02.6. **Co-Housing**

Co-housing is a residential model that combines private living spaces with shared areas and collective governance. This design approach has gained significant attention in Italy as a response to demographic change, economic challenges, and the growing demand for socially supportive housing types, particularly for student life in cities like Turin. Turin has become one of the Italian cities that is experimenting with cooperative living models, especially in post-industrial districts where existing buildings are underutilized or can be adopted for new purposes.

The rise of co-housing in Turin is closely linked to the city's broader social and demographic dynamics. Turin has one of the oldest populations in Italy, a high proportion of single-person households, and numerous underutilized buildings that originate from its industrial past. (ISTAT, 2024). These conditions create fertile ground for housing solutions that promote shared resources, integrational support, and community-based living. Co-housing aligns with municipal strategies aimed at combating isolation, while offering more accessible living arrangements for students, young professionals, and migrants.

Several co-housing projects have already been implemented in Turin. These developments often emerge through public-private partnerships and social innovation programs supported by the municipality and various foundations. One notable example is Co-abitare Torino in the Mirafiori district, which transformed a former public housing block into a community-oriented residence with shared kitchens, gardens and spaces for cultural activities. Other examples, such as Casa nel Parco in Mirafiori Sud and community housing experience promoted by Fondazione di Comunità di Porta Palazzo, show how co-housing can be integrated into regeneration projects, fostering local participation and reinforcing neighborhood identity.

Turin's plan for co-housing is a part of a wider European movement that views collaborative housing as a tool for sustainable urban development. The co-housing model promotes resource efficiency through shared spaces and infrastructure, reduces the environmental footprint of housing, and create social network that support vulnerable populations. Studies on Italian and European co-housing shows that shared spaces, gardens, rooftops workshops, communal terraces can enhance social integration and provide flexible spaces adaptable to demographic change. (Tosi and Cremaschi, 2020).

In recent years, Turin has embraced its identity as a major university city with growing interest in co-housing and shared living models. The city hosts over 120,000 university students across institutions like Politecnico di Torino and University of Turin, but not all of the students have access to formal student housing options. This situation has led to exploration of alternative solutions that are both affordable and community-oriented.

The San Paolo neighborhood originally an industrial zone and located close to the main campus of Politecnico di Torino offers a particularly favorable context for student-centered co-housing. With its proximity to academic institutions and its mix of low-rise buildings and vacant rooftops, San Paolo has significant potential for incorporating co-housing into its urban environment. These living arrangements can be more affordable, sociable, and ecologically responsive, supporting a broader strategy for urban regeneration and social cohesion.

03

BEST PRACTICES

03.1. **Rooftop Trends Rotterdam (Connectivity)**

Rotterdam presents one of Europe's more advanced examples of how rooftops can serve as a strategic spatial-resources for contemporary urban challenges. Following the extensive destruction of the second world war, the city was reconstructed with a broad adaptable and engineerable urban fabric characterized by large flat roofs. Today, Rotterdam is leveraging this post-war layout to rethink land use, densification and enhance the public space provision. (Rotterdamse Dakendagen, 2021).

Figure 3.1. Rotterdom in the past
Source: https://rotterdamsedakendagen.nl/kijk-op-daken/

Figure 3.2. Rotterdom, Today
Source: https://rotterdamsedakendagen.nl/rotterdamro-oftopwalk/?lang=en

Since 2015, the Rotterdam Rooftop Days (Rotterdamse Dakendagen) has been an annual festival that opens normally inaccessible rooftops to the public, transforming them temporarily into cultural, social and environmental platforms. The event held during the first weekend of June, and it promotes a broader Urban vision called Rethink Rooftops, which advocates for rooftops as a safe, vibrant and multifunctional extensions of public space. The municipality collaborates with MVRDV, using a festival as a platform to explore new urban protypes and communicate the city's rooftop strategy. (Rotterdamse Dakendagen, 2023).

A central output of this collaboration is the Rooftop Catalogue by MVRDV, a comprehensive guide that proposes how the Rotterdam's 18 kilometers of flat rooftops can be activated. The catalogue argues that rooftops represent a hidden second layer of the city, capable of addressing critical issues such as climate adaptation, housing shortages, renewable energy generation, urban heat mitigation, and water management. (MVRDV and Rotterdamse Dakendagen, 2021). MVRDV suggests a stacking model in which water, greenery, energy systems, and population can coexist vertically, transforming rooftops into multifunctional infrastructure. Winny Mass emphasizes that this require updating structural and regularity frameworks so that buildings are designed or retrofitted to support additional weight and public functions (MVRDV,2022).

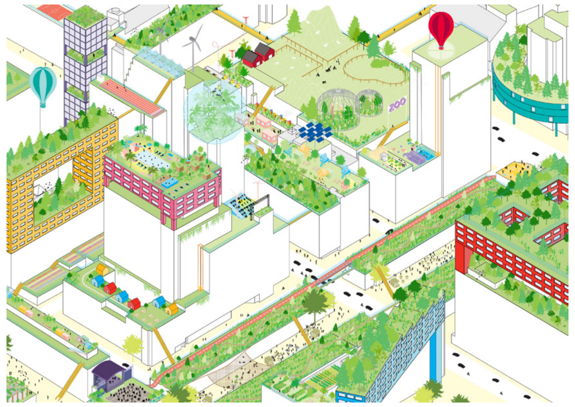


Figure 3.3. Rooftop Catalouge MVRDV
Source:https://mvrdv.com/publications/4081/rooftop-catalogue

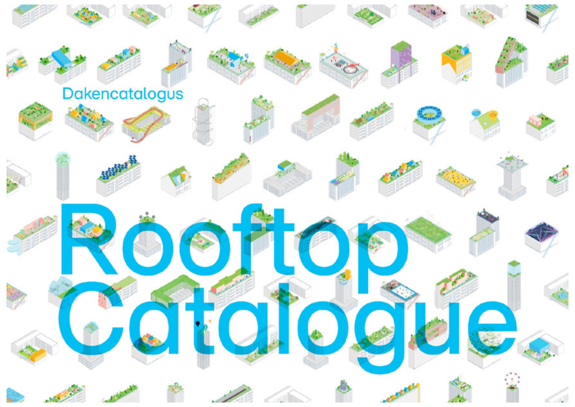


Figure 3.4. Rooftop Catalouge MVRDV, Cover
Source: https://mvrdv.com/publications/4081/rooftop-catalogue

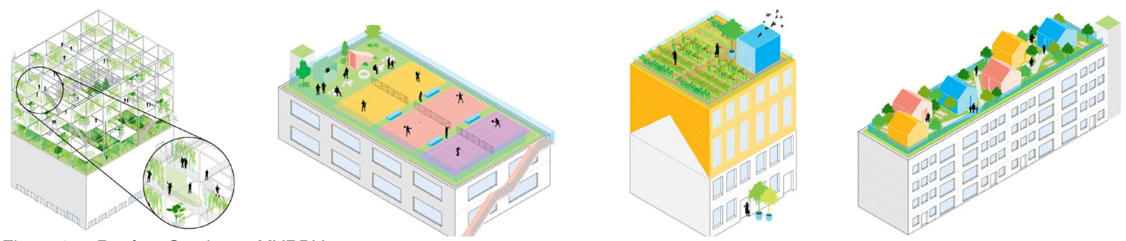


Figure 3.5. Rooftop Catalouge MVRDV
Source:https://mvrdv.com/publications/4081/rooftop-catalogue

In 2022, MVRDV realized a temporary built demonstration called the Rotterdam Rooftop Walk. Starting from the Koopgoot shopping street, a bright orange temporary structure lifted visitors into interconnected rooftops(MVRDV, 2022). The installation offered continuous terraces and bridges where NGOs and companies exhibited protypes for green roofs, solar systems, biodiversity solutions, and water-retention technologies. (Dezeen, 2022). For one month, thousands of visitors could literally walk above the city, experiencing rooftops not as isolated technical surfaces but as a connected public realm.

Figure 3.6. Rotterdom Rooftop walk by MVRDV
Source: https://mvrdv.com/projects/857/rotterdam-rooftop-walk

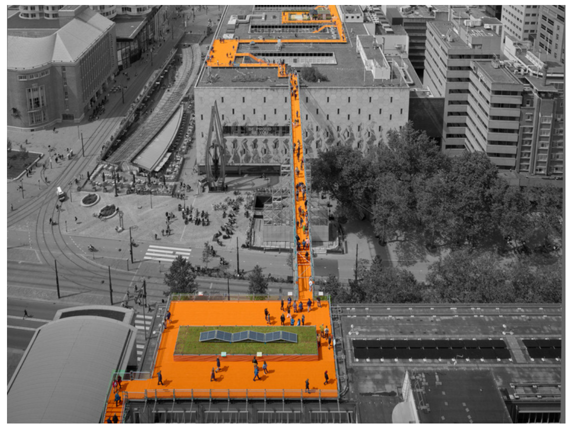


Figure 3.7. Rotterdom Rooftop walk by MVRDV
Source: https://mvrdv.com/projects/857/rotterdam-rooftop-walk

This intervention serves as an example of urban metamorphosis, the emergence of a new urban layer generated by the incremental transformation of many individual rooftops. While the rooftop walk itself was temporary, it demonstrated how physical connections between roofs could create new spatial logics and social opportunities. Without consuming new land or disturbing street level infrastructure. In this sense, Rotterdam illustrates how rooftop retrofits can serve as adaptive, low-footprint strategies to respond the climate challenges, promote ecological performance and provide new forms of public life in dense cities.

The case of Rotterdam is particularly relevant for cities like Turin, where existing low rise buildings represent large, underutilized surfaces. Rotterdam's approach shows that through catalogue, experimental project and temporary public activations, rooftops can become catalyst of environmental resilience, social inclusion and urban regeneration.

Figure 3.8. Rotterdom Rooftop walk by MVRDV, The Podium
Source: https://www.mvrdv.com/projects/878/the-podium

Figure 3.9. Rotterdom Rooftop walk by MVRDV, The Podium
Source: https://www.mvrdv.com/projects/878/the-podium

03.2.**De Groene Kaap Rotterdam (Connectivity)**

De Groene Kaap Rotterdam
Architects: LOLA, Landscape Architects
Location: Rotterdam, The Netherlands
Year: 2017-2021
Area: < 1ha
Rooftop landscape, Courtyards

De Groene Kaap is a nature-inclusive stepping stone within the urban nature network of Rotterdam designed by landscape architecture group called LOLA. The project includes approximately 450 homes distributed among four residential blocks and five towers, which are linked through an integrated green system. Focused on creating a nature-based city, LOLA landscape architects designed a series of courtyards and rooftop gardens that serve as thriving habitats for people, animals and plants. Their approach to the built environment emphasizes the importance of integrating nature into urban living.

A variety of semi- permeable surfaces are incorporated throughout the project, contributing to its ecological performance. A bridge that rises 30 meters high connects all four residential blocks and courtyards, providing an ideal upper-city ambiance. Strategically placed planters between the individual terraces offer privacy, while the courtyard plant areas bring the community closer together.
The rooftop landscape of De Groene Kaap starts at ground level and gradually ascends to its highest viewpoint. A continuous pedestrian route extend across the rooftops and courtyards, forming a loops that connects all four blocks. This blue metal line functions as both a pathway and a bench, as well as playful furniture, enhancing the overall experience of residents and visitors.

The project shows the interconnected rooftop landscapes and bridges between buildings, demonstrating how these connections help to make a better atmosphere for the residents. This project creates a continuous public route in the sky, resembling an elevated street that illustrates how connectivity is feasible and can support a new layer of urban life. Additionally, transformation of this project revitalizes a harbor area through architectural intervention, turning isolated blocks into a cohesive urban space. Furthermore, it features shared roof gardens accessible to residents, promoting inclusion and community resilience.

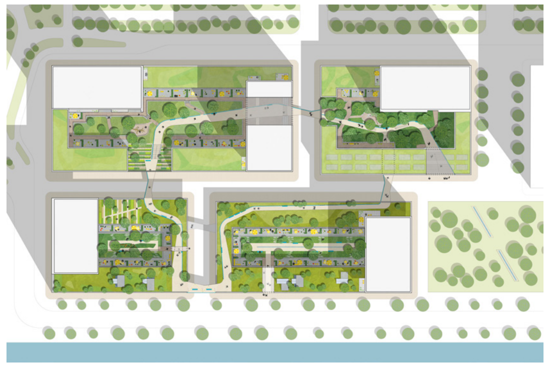


Figure3.10.Site plan De Groene Kaap by LOLA
Source: https://urbangreenbluegrids.com/projects/de-groene-kaap-rotterdam-the-netherlands/

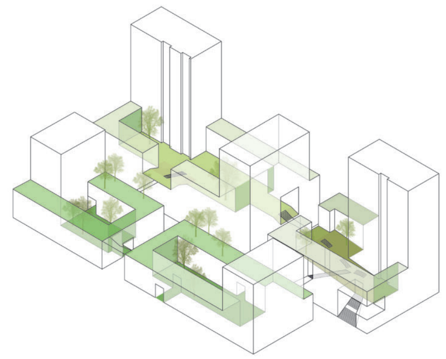


Figure3.11.Diagram De Groene Kaap by LOLA
Source: https://urbangreenbluegrids.com/projects/de-groene-kaap-rotterdam-the-netherlands/

Figure 3.12.De Groene Kaap by LOLA
Source: https://lola.land/project/de-groene-kaap/

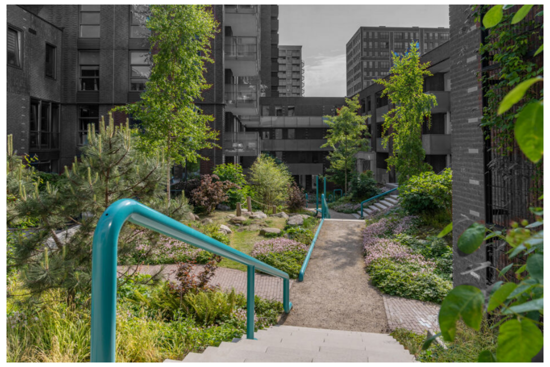


Figure 3.13.De Groene Kaap by LOLA
Source: https://lola.land/project/de-groene-kaap/

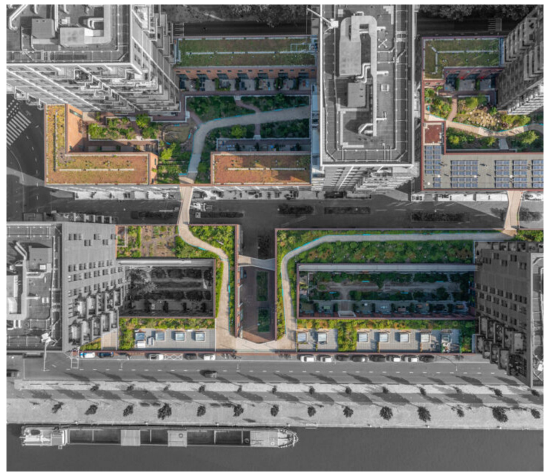


Figure 3.14.De Groene Kaap by LOLA
Source: https://lola.land/project/de-groene-kaap/

Figure 3.15.De Groene Kaap by LOLA
Source: https://urbangreenbluegrids.com/projects/de-groene-kaap-rotterdam-the-netherlands/

03.3. **Rooftop Republic- Hong Kong**

Rooftop Republic
Architects: Andrew Tsui, Michelle Hong
Location: HongKong
Year: 2015
Local food, and Communities

The Rooftop Republic was founded with a passion for introducing others to the joys of urban farming and cultivating a greater awareness of sustainable living practices. The organization empower community to grow food in various spaces, from small residential balconies to large commercial areas.
According to their website, the founders, established Rooftop Republic in 2015. They provide high-quality farm setup and management services, engaging the community through interactive events and workshops. Their innovative approach focuses on producing food that is both healthy for people to eat and for the planet to grow.

Rooftop Republic's concept in Hong Kong revolves around transforming spaces into lush green farm and engaging communities in joy of growing their own food. In fact, this is a participatory method fosters interaction and a sense of attachment among participants.
The process begins with a site assessment, where they evaluate the location's potential. In the second phase, which is consultation, they try to have a discussion with the owner to understand their goals and visions. Following this, they move on to the design, developing a plan based on their analysis and the owner's needs. The planting phase then brings the design to life. Finally, in the engagement phase, they provide technical support and help transform the urban farm into a long-term platform for interaction with stakeholders, whether employees, students, families or the broader community. There are also workshops and events to raise awareness about the importance of collaboration in urban farming.

Rooftop Republic transforms underutilized rooftops into productive green spaces and engages local communities, schools and business in maintaining and benefiting from rooftop farms. Furthermore, Rooftop Republic contributes to urban culture, food security and educating people to be more in tune with the nature.

Figure 3.16.Rooftop republic Hong Kong
Source: https://rooftoprepublic.com/

Figure 3.17.Stamford International School
Source: https://rooftoprepublic.com/

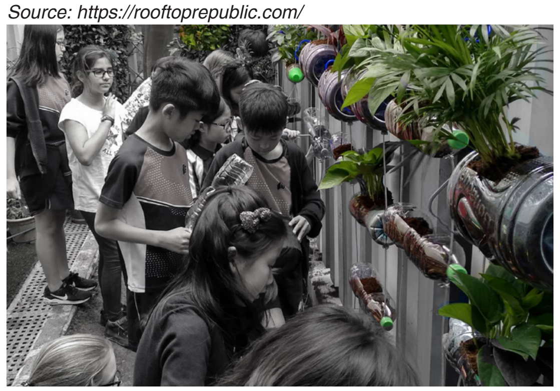


Figure 3.18.Stamford International School
Source: https://rooftoprepublic.com/

03.4. **High Line New York (Economic Value)**

The High-Line New York
Architects: James Corner Field Operations with Diller Scofidio + Renfro
Location: Manhattan, New York, U.S
Year: 2009
Area: 1.5 miles
Public Space, Pedestrian Bridge

The highline is a 1.5 mile public park built on an abandoned elevated railroad. The project is designed through a strategy of agri-tecture, which combines elements of agriculture and architecture. The surface of the High Line is divided into discrete units of paving and planting, arranged along its length with various gradients resulting in richly vegetated biotopes. This transformed freight rail line now serves as a public park of Manhattan's West Side.

The High Line is owned by the city of New York and is maintained and operated by Friends of the High Line, a non-profit organization founded in 1999 by community residents. Friends of the High Line fought to preserve and transform the historic structure when it was threatened with demolition. The organization collaborate with NYC Parks to ensure that the High Line remains as an extraordinary public space for all visitors to enjoy. In addition to overseeing maintenance and operations, Friends of the High Line raises funds from both private and public sources to support the parks and its programs.

The High Line represents a metamorphosis from industrial infrastructure to a green, walkable and socially active urban area. This transformation is similar to reimagining of unused rooftops into interconnected public space, showcasing adaptive reuse and the revitalization of urban voids. Furthermore, the project integrates green infrastructure and native plants, promoting urban biodiversity in the line with goals of this thesis.

The High Line was shaped by a bottom-up initiative that involved community participation. This engagement demonstrates the participatory transformation strategy. This engagement allows local actors to witness the impact of reusing rooftops, fostering a sense of attachment to their spaces, and increasing their economic value through redesign and activation. This strategy encourages people to utilize their rooftops and raises awareness about the benefits of such changes.

Figure 3.19.The High Line NY, Top view, linear park
Source: https://www.archdaily.com/24362/the-new-york-high-line-officially-open

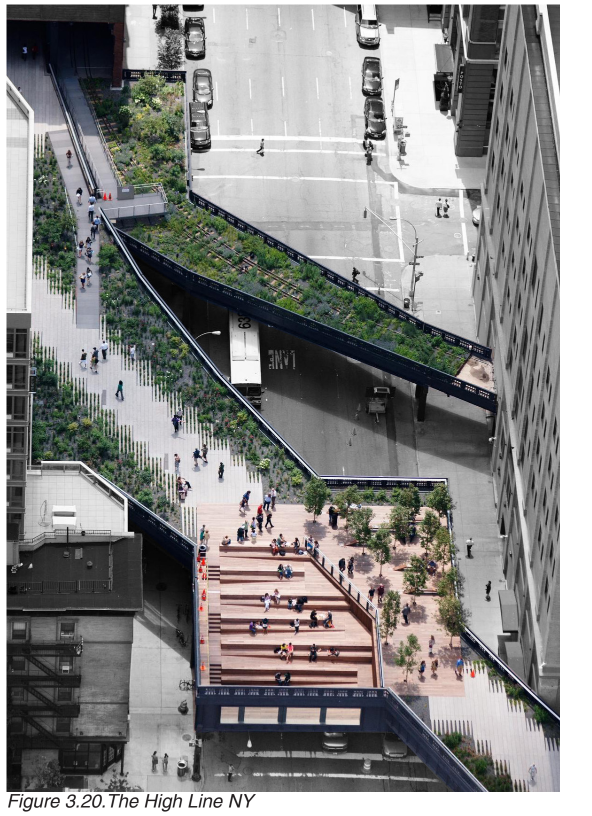


Figure 3.20.The High Line NY
Source: https://www.archdaily.com/24362/the-new-york-high-line-officially-open

Figure 3.21.The High Line NY,Seating area
Source: https://www.archdaily.com/24362/the-new-york-high-line-officially-open

Figure 3.22.The High Line NY, Greenery and Seating area
Source: https://www.archdaily.com/24362/the-new-york-high-line-officially-open

03.5. **Les Grands Voisins (Flexibility)**

Designers: Yes We Camp, Plateau Urbain, Aurore
Location: Former hospital Saint Vincent de Paul, Paris
Year: 2020-2015
Area: 10225 m²
Transitional Urbanism

In 2015, an event titled "Opening a Temporary Vacant Space with Audacity and Generosity" took place, laying a foundation for a bold and inclusive urban experiment. The vision behind this initiative was built on two key ideas "Grands", symbolizing the ambition to promote hospitality and generosity, and "Voisins" (Neighbors), representing a space for exchange, social interaction and real-time experimentation with solidarity and coexistence.

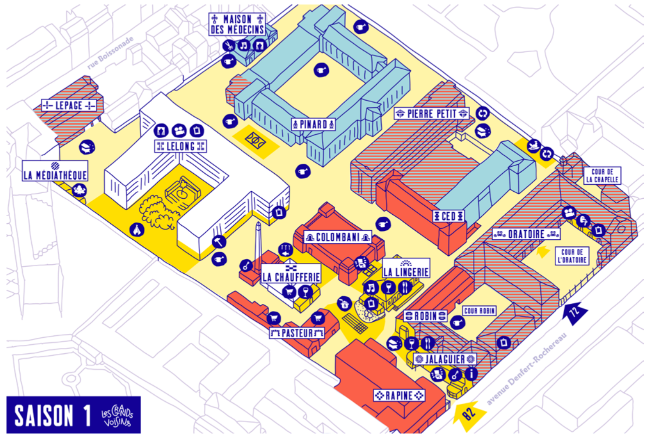


Figure 3.23.Programmatic organization of Les Grands Voisins, Season 1
Source: https://lesgrandsvoisins.org/

Five years later, following the site's closure, the organizers reflected on the impact of the project, recognizing both its achievements and the ongoing efforts needed to foster similar initiatives elsewhere. While the experience was imperfect, it remains a continuously evolving process that extends beyond a single location. True to their visions, they provided flexible, adaptive spaces designed to enhance community engagement. These areas were not meant to be permanent but rather fluid and responsive to changing needs, ensuring that the project remained dynamic and relevant over time.
Les Grandes Voisins transformed the former Saint Vincent de Paul in Paris into a hybrid urban village. The Project combining housing, workshops, gardens and public spaces. Moreover, although it was a temporary, tactical occupation such as reuse of materials and buildings instead of demolition, its impact is shaping long-term visions for the site. This project created a cultural identity transforming perception of the once-forgotten area while bringing together various activities such as bakery, urban gardens, cafés and shared tools.

The aim of this thesis closely aligns with that of Les Grands Voisins, focusing on the metamorphosis of the area into a cultural identity and encouraging participation in diverse activities. As its cores Les Grandes Voisins emphasized social diversity, it brought together various groups such as refugees, artist, local entrepreneurs, in one shared space.
The initiative is particularly valuable as it aims to serve different demographics including youth spaces, community gardens, playgrounds for children, artist studios, small houses designated for students.

Figure 3.24.between Denfert-Rochereau and Port-Royal
Source: https://www.abitare.it/it/habitat/urban-design/2018/01/07/parigi-les-grands-voisins-bene-comune/

Figure 3.25.between Denfert-Rochereau and Port-Royal
Source: https://www.abitare.it/it/habitat/urban-design/2018/01/07/parigi-les-grands-voisins-bene-comune/

03.6. **Lingotto FIAT Factory, Turin (Transformation)**

Designers: Benedetto Camerana, Renzo Piano Studio
Location: Turin, Piemonte, Italy
Year: 1989-2002
Area: 27,000 m^2
Adaptive Reuse

The FIAT Lingotto Factory represents one of the best examples of architectural transformation in Italy and an influential example for adaptive reuse in post-industrial cities. Constructed between 1916 and 1923, the building was designed by Giacomo Matté-Turcco as an innovative five-story automative manufacturing plant, complete with a rooftop test track*(Figure 3.26)* that symbolized the industrial ambitions of early twentieth-century Turin (Piano,1997). When FIAT discontinued production in the early 1980s, the complex was at risk of abandonment, a fate common to much of Turin's declining industrial landscape.

Instead of demolition, the Lingotto underwent a significant transformation led by Renzo Piano Building Workshop (RPBW), starting in the late 1980s. Piano's strategy was to preserve the monumental industrial structure while reprogramming it as a multifunctional center. This included integrating commercial spaces, cultural venues, a hotel and educational facilities such as the Architecture Faculty of Poltecnico di Torino (RPBW, 1994). This approach positioned the building as a catalyst for the broader regeneration of the southern part of the city, aligning with Turin's transition from a manufacturing-based economy to one focused on culture, innovation and education(Bagnasco and Le Gales, 2000)

A further transformation occured in 2021 with the opening of La Pista 500, a large-scale rooftop project developed by FIAT and RPBW. This intervention converted the historic racetrack into an elevated public garden featuring more than 40,000 plants, open air art, installations and space for leisure, fitness and cultural activities (FIAT,2021). The design maintains the recognizable elliptical form of the rooftop circuit, allowing visitors to perceive the continuity between past and present. This embodies the concept of metamorphosis, where the original architectural structure persist, while evolving into a new spatial form, an urban landscape layer that did not previously exist but emerges from the transformation of the existing built fabric.

From a sustainability perspective, the project demonstrates how industrial heritage can support ecological and social functions through adaptive reuse. By integrating vegetation, public programming and new cultural infrastructure, the rooftops of Lingotto contributes to improved microclimatic conditions, increased public accessibility, and enhanced social interaction. Lingotto exemplifies how transformation at building scale can contribute to the post industrial redefinition of Turin's urban identity. This approach adds new public spaces without additional land consumption and reinforcing the city's shift toward a greener and more resilient urban fabric.

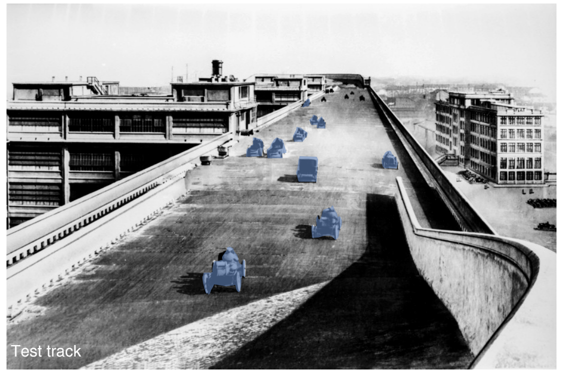


Figure 3.26. Rooftop, Test race track FIAT Lingotto factory
Source: https://thecharnelhouse.org/2013/05/01/a-rooftop-race-track-the-fiat-lingotto-factory-in-turin-italy-1923/

Figure 3.27. Rooftop, Lingotto, La Pista 500
Source: https://www.designboom.com/architecture/benedetto-ca-merana-la-pista500-europes-biggest-roof-garden-06-23-2022/


Figure 3.28. Rooftop, Test race track FIAT Lingotto factory
Source: https://gucki.it/art-design/a-torino-sulla-pista-del-lingotto-per-il-salone-del-libro/


Figure 3.29. Rooftop, Lingotto, La Pista 500
Source: https://gucki.it/art-design/a-torino-sulla-pista-del-lingotto-per-il-salone-del-libro/

03.7.**Conclusion**

The analysis of the selected best practices shows that activating rooftop and creating elevated public spaces can provide a wide range of benefits related to the economy, society, the environment, and governance. These insights are crucial for encouraging private property owners to consider their rooftops as shared or multifunctional spaces. By examining successful international examples, such as the Rotterdam rooftops, High Line in New York, Rooftop Republic in Hong Kong, Les Grandes Voisins in Paris and the Lingotto rooftop in Turin, it becomes clear that transforming rooftop can positively impact both private interests and the overall wellbeing of urban communities.

1-Economic Benefits: Increased Property value and new Revenue opportunities

The case study of the High Line demonstrates that the introduction of elevated public space can significantly enhance surrounding property values. Following the Park's completion, real-estate prices in the adjacent areas rose by approximately 10-15% (Friends of the High Line, 2011). Features such as rooftop connections and accessible terraces can make building more desirable for tenants and investors. Moreover, new business models such as co-working platforms, events and cultural installations can create additional revenues streams for property owners, further enhancing the neighborhood's appeal.

2-Social Benefits: Community, Safety, and Activation of Underused Spaces

Case studies shows that elevated public spaces promote community interaction and enhance neighborhood safety. Projects like the High Line and De Groene Kaap demonstrate that increased foot traffic, visual presence and social programming reduce the isolation of elevated infrastructure and transforming previously disconnected or unused areas into vibrant social environments. Rooftop networks provide opportunities for residents to meet, gather and engage in cultural activities, ultimately contributing to stronger sense of community identity and improved perceptions of safety.

3-Environmental Benefits: Green Infrastructure and Energy Efficiency

Examples such as Rooftop Republic demonstrate that unused rooftop areas can be retrofitted for urban agriculture, contributing to improved air quality, local food production and heat reduction in densely populated areas (Rooftop Republic, 2020). For private property owners, sustainable rooftop interventions, including green roofs, photovoltaic systems, and rainwater harvesting, result in long-term economic savings and enhanced public performance.

4-Temporary use and Legal Flexibility

The temporary occupation model used in Les Grands Voisins shows that public uses can be introduced into private or semi-public spaces without requiring irreversible commitments. (Association Aurore,2017). For rooftop strategies, this suggests a feasibility of Pilot projects, seasonal installations or reversible lightweight structures that allowing property owners to experiment with new uses before making long term decisions. Temporary agreements reduce perceived risks and encourage more open collaboration.

5-Partnership models and Funding Mechanisms

Several best practices highlight the importance of hybrid financing tools. Public-private partnerships, municipal grants, cultural programs, sponsorships and even crowdfunding can support the creation and maintenance of rooftop public spaces. These mechanisms reduce the financial burden on private owners while promoting civic engagement and shared responsibility. Additionally, branding opportunities or cultural partnerships may further incentivize owners, positioning rooftops as platforms for innovation and identity creation.

The best practices confirm that integrating rooftops into the public realm can align private interests with broader urban agendas such as sustainability, resilience, and social cohesion. The documented economic, social and environmental benefits demonstrate that transforming rooftops is not merely a design gesture, it is strategic tool for urban regeneration. These examples support the main argument of this thesis that is activating the rooftops of low rise building in San Paolo, Turin, can create a new urban layer that is ecological, accessible and socially productive, while also providing tangible advantages for private stakeholders.

04

CONTEXT ANALYSIS

04.1.**Transformations Over Time**

Borgo San Paolo emerged as one of Turin's most working-class neighborhoods through a gradual urbanization process linked to industrial expansion between the late nineteenth and twentieth centuries. Until the second half of the nineteenth century, the area was predominantly agricultural and situated outside the historical city boundaries. Its transformation began with the construction of the church of San Bernardino in 1891, followed by the establishment of small workshops and early industrial activities around Piazza Sabotino, which attracted workers seeking employment and lower living costs beyond the city's traditional walls (Museo Torino).

Urban development was significantly influenced by Turin's expansion plan of 1901, which also included the nearby areas of Barriera di Francia, Cenisia, and Campidoglio. This plan defined the urban structure of San Paolo and established the main corridors for development along Corso Racconigi and Corso Svizzera, consolidating the neighborhood's spatial organization (Museo Torino).

Between the first and second World Wars, San Paolo's industrial vocation intensified greatly. Major automotive and mechanical industries, including *Officine Lancia*, railway workshops, and associated production facilities, settled in and around the neighborhood, accelerating population growth and reinforcing its role as a key industrial and residential area for Turin's working class. During this period, the neighborhood developed a strong social and political identity rooted in labor organization, socialist movements, and the collective forms of everyday life typical of industrial areas (Calosso and Ordazzo, 2009).

Following the Second World War, San Paolo experienced further demographic growth driven by internal migration, particularly from Southern Italy, which consolidated its dense residential character. However, from the 1960s onward, progressive deindustrialization led to the closure or relocation of most factories, resulting in significant urban and social transformations. Many former industrial sites became underused or abandoned, creating a fragmented post-industrial landscape embedded within the residential fabric (Calosso and Ordazzo, 2009).

Rather than undergoing large-scale demolition, the neighborhood experienced selective regeneration, with several industrial buildings being adapted for new civic, cultural, and social uses. From the post-war period onwards, the neighborhood underwent a gradual but profound transformation. Rapid industrial growth and demographic expansion generated new housing demands, leading to the insertion of mid- and high-rise residential blocks within the already established low-rise fabric. Instead of replacing existing structures, this process produced a diverse urban morphology in which former industrial and service buildings remained interspersed between taller residential volumes—a condition that continues to define the spatial character of Borgo San Paolo today (Comune di Torino, Geoportale Torino).

Figure 4.1, Historical photograph of Piazza Sabotino
Source: https://www.facebook.com/TorinoPiemonteVintage/photos/a.1511442105807240/2848584605426310/?id=1508927032725414

Figure 4.2, Historical photograph of La piazza e la chiesa di San Bernardino
Source: https://it.wikipedia.org/wiki/Borgo_San_Paolo

Figure 4.3, Historical photograph of Corso Racconigi da Corso peschiera
Source: https://www.facebook.com/photo/?fbid=3396688083949290&set=a.1511442105807240

Figure 4.4, Historical photograph of Lancia
Source: https://www.facebook.com/TorinoPiemonteVintage/photos/a.1511442105807240/2848584605426310/?id=1508927032725414

04.2.**Urban structure and connectivity**

The Borgo San Paolo neighborhood of Turin is well connected to the urban system of the city through a network of main roads. The street borders are defined by Via Frejus, Corso Vittorio Emanuele II, Corso Castelfidardo, Corso Lione, Via Tirreno, and Corso Trapani. Inside the district, mobility is supported by important street such as Corso Ferucci, Corso Peschiera, Corso Rosselli and Corso Racconigi. These streets function as a district's primary commercial and transportation corridors. Piazza Sabotino, Piazza Robilant, and Piazza Marmolada are urban nodes that help to organize traffic and public life. (Geoprtale Città di Torino, Figure)

Beyond its infrastructural framework, the Borgo San Paolo, the area offers a well distributed system of green spaces, social facilities and neighborhood amenities. However, these facilities are not easily accessible for all the residents in terms of scale and convenience. The main public park in the area, Parco Ruffini, is located on Corso Trapani and hosts various activities. There are also some smaller green areas such as the garden along Via Braccini, that is embedded between urban blocks and provide informal social interactions. Due to its proximity to Politecnico di Torino main campus, the area is really well-connected and the demographic composition and needs are positively affected. The pedestrian zone near Piazza Sabotino and in Via Nanni is widely perceived as vibrant, affordable and socially inclusive, promoting informal interactions among residents.

The urban blocks are characterized by low-rise buildings surrounded by high-rise structures, creating a distinct urban form. Most of the high-rise buildings are residential, while the low-rise structures are often underused or inaccessible.

Despite the abundance of public and social facilities, the compact block structure, traffic corridors and limited pedestrian permeability, make access to green areas and public spaces challenging for many people. In response to the urban conditions, this thesis proposes a strategy transforming the rooftops of low-rise buildings to address existing spatial fragmentation and introducing new accessibility options. By utilizing rooftops as amenities for residence, this project aims to enhance quality of living and improve connectivity within the district.

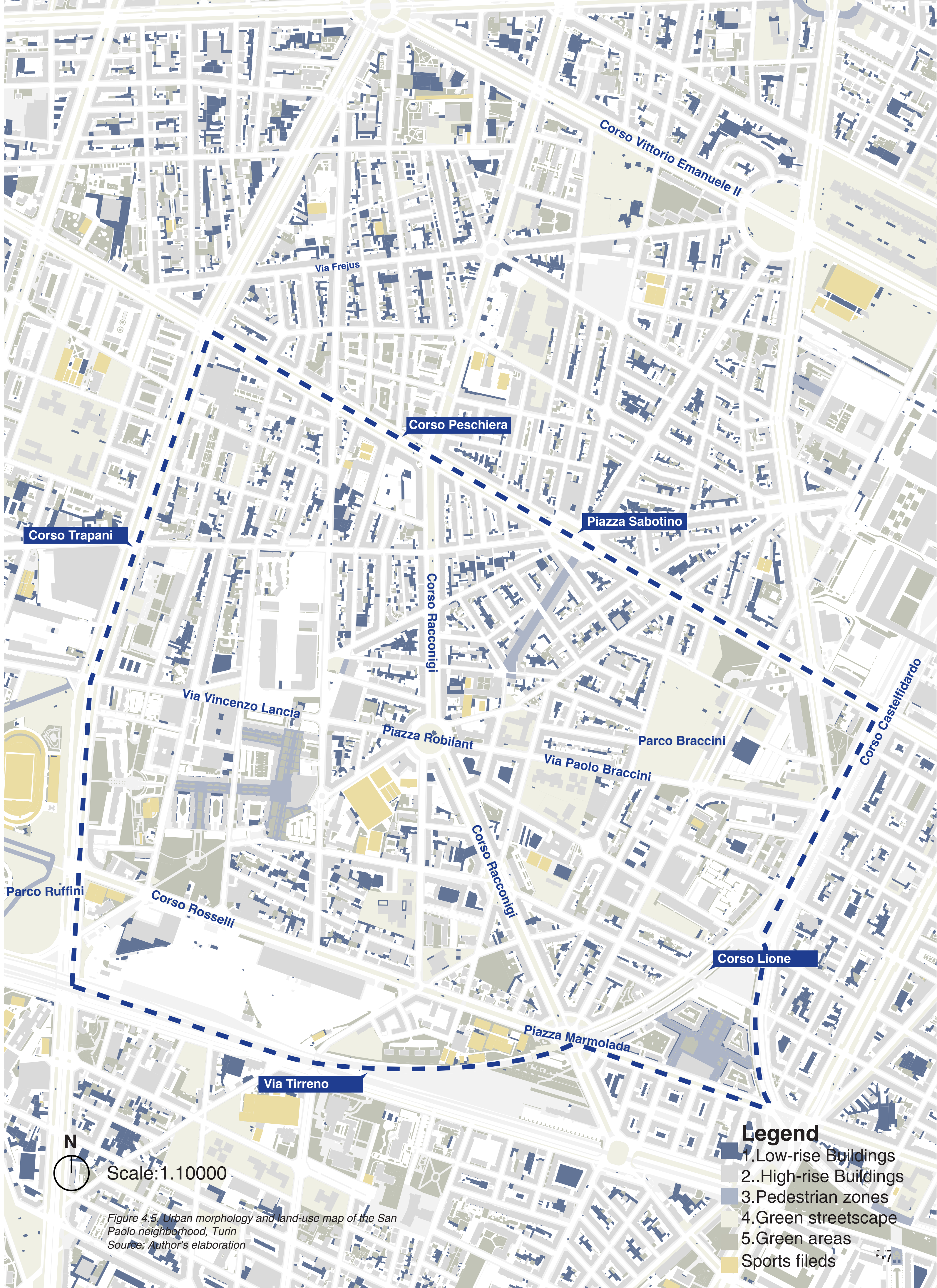


Figure 4.5. Urban morphology and land-use map of the San Paolo neighborhood, Turin
Source: Author's elaboration

04.3.**Demographic framework of San Paolo**

As of December 31st, 2023, Circoscrizione 3 of Turin, which encompasses the neighborhoods of San Paolo, Cenisia, Cit Turin, and Pozzo Strada, has an estimated population of approximately 120,415 inhabitants, according to the latest municipal demographic data (Comune di Torino, 2024). The population can be broadly divided into three age groups: 0-14 years (13,127 residents), 15-64 years (74,432 residents), and 65 years and over (31,862 residents), indicating a significant aging population. Specifically, the San Paolo neighborhood comprises 32,586 residents, based on the most current validated municipal statistics published in 2024 by the Comune di Torino and Ufficio Statistica.

Demographic trends in this district reveal an aging process, that this pattern observed at both the municipal and metropolitan levels. Urban Lab Torino's *Piano Famiglie-Dossier 2024* notes that Turin's average age has reached approximately 47 years , this positions the city among those with the oldest urban populations in Europe. In neighborhoods like San Paolo, more than a quarter of residents are aged 65 years or older, confirming that this is a structural aging issue rather than a temporary demographic fluctuation (Urban Lab Torino, 2024).

At the same time, San Paolo's demographic profile is not uniform. The presence of the Politecnico di Torino contributes a significant population of students and young adults who reside temporarily in the neighborhood. This coexistence of an aging permanent population and a younger, mobile population creates a dual demographic situation, increasing the demand for inclusive and accessible services.

The age distribution in the area results in a high aging index, reflecting the district›s demographic vulnerability in the context of population stagnation and decline. However, as emphasized by Urban Lab Torino (2024), this situation also presents an opportunity to implement inclusive urban strategies that promote accessibility, proximity, and social interaction among different generations. This approach is particularly relevant in established neighborhoods like San Paolo, where the goal is to enhance the quality of life for all residents while welcoming new social groups.

04.4.**Building typologies and block selection in Borgo San Paolo**

The urban fabric of Borgo San Paolo reflects its complex historical development and is primarily characterized by a predominance of low-rise residential blocks with post-war buildings and infrastructural elements. The residential structures from the early twentieth century typically consist of three to four-storey perimeter blocks that are organized around internal courtyards. These courtyards historically served as shared semi-private spaces for domestic activities, social interaction, and community life. The layout of these blocks creates a dense and continuous urban environment, especially in the interior areas of the neighborhood, while larger elements and mobility corridors define its boundaries.

This thesis examines the urban fabric of Borgo San Paolo by analyzing seven distinct block typologies, which are identified based on their spatial configuration, functional mix, and level of openness to the surrounding public realm. These typologies, presented in a Table 4.1, reveal significant differences in the relationships between blocks, streets, open spaces, and neighboring functions.

To clarify these differences, the blocks are interpreted through the conceptual distinction between introverted and extroverted configurations. Introverted blocks are characterized by a strong inward orientation, featuring courtyards and amenities that are almost exclusively reserved for residents, with limited physical or visual connections to the surrounding streets. These blocks tend to function as closed systems, prioritizing privacy and internal use over urban permeability. In contrast, extroverted blocks foster stronger relationships with the public realm, often incorporating ground-floor commercial spaces, educational facilities, or semi-public areas, which facilitate interaction between residents and the wider neighborhood.

The analysed blocks are mostly located in the northern portion of Borgo San Paolo, where variations in building typology and functional composition are most evident. Some blocks are entirely introverted, functioning as self-contained residential with minimal engagement beyond their boundaries. In these cases, amenities are designed solely for residents, limiting their potential contribution to neighbourhood-scale social life. Conversely, other blocks display a hybrid condition, combining residential functions with schools, local commerce, and public or semi-public facilities.

Figure 4.6. Location of selected urban block typologies within the San Paolo neighborhood, corresponding to the typological classification presented in Table 4.1
Source: Author's elaboration

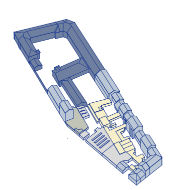
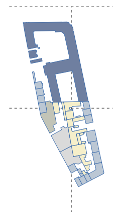
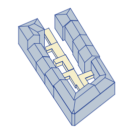
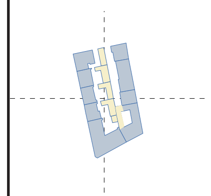
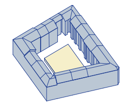
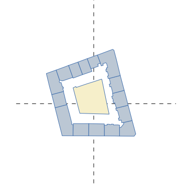
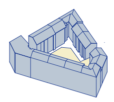
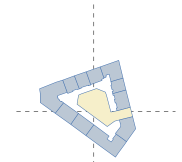
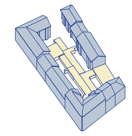
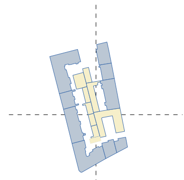
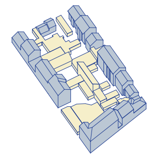
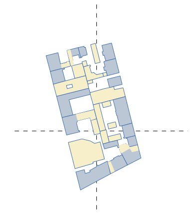
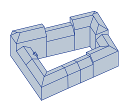
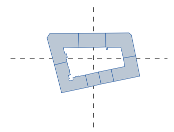
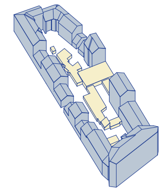
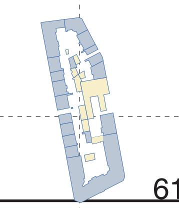
	Typology/ Character	Analysis	Potential	Model	Plan
1	Typology:**L-shaped + inner fragments** Character**: Extroverted / porous**	A very open layout with inner fragmentation, allowing multiple entries, views, and access points. This likely fosters a strong relationship with the public, making it suitable for hybrid-use developments.	Strong candidate for vertical layering and modular rooftop interventions.		
2	Typology: **Repetitive row with linear void** Character: **Introverted but rhythmically open**	Long and narrow block with an internal spine, possibly a gallery or courtyard corridor. The repetition implies residential use with limited access. The rhythm offers a chance to break the monotony via roof-level interaction.	Potential: Linear rooftop connections, shading structures, or green buffers.		
3	Typology: **Perimeter block with void** Character: **Introverted with some permeability**	Totally intovert block shows enclosed nature but with internal geometry, almost symmetrical The form suggests controlled access and possibly communal use. This is a semi-public typology use	Potential: Could function as a shared community core with green or hybrid rooftop uses.		
4	Typology: **Linear open block** Character: **Extroverted**	minimal enclosure, the courtyard is exposed and the mass is broken This block suggests openness, access, and potential for street interaction.	Highly adaptable for public rooftop layers, vertical circulation, or even landscape extensions.		
5	Typology: **Compact courtyard** Character: **Introverted**	-encloses and defined courtyard with minimal permeability. The solid mass of high-rise buildings around the open space, suggesting a more private, introvert character. -This provides opportunities for interaction happens within the block, not with the street.	Internal courtyard programming or rooftop connections that helps to overcome with visual sepration.		
6	Typology: **Fragmented and mixed mass** Character: **Extroverted / Hybrid**	Highly fragmented with multiple internal courtyards and irregular voids This block is more porous and adaptable. It may allow visual and physical permeability, representing a shift toward mixed-use or adaptive reuse logic.	Ideal for experimenting with rooftop activation, public-private gradients, and participatory design.		
7	Typology: **Triangular void** Character: **Introverted but geometrically expressive**	A defined triangular form enclosing a central courtyard and inward-looking. There may be symbolic or formal spatial qualities, but it likely has limited access	Could use its geometry for staged rooftop platforms or light-infused courtyard activations.		
8	Typology:**Dense with inner courtyard** Character: **Introverted**	A semi-closed form A strong courtyard presence, but no public connection from the outside. there is potential to invert its character.	Rooftop paths or community gardens can flip the introversion into openness.		

Table 4.1. Building Typologies and Block Selection in San Paolo
Source: Author

The block selected for the design proposal belongs to the latter category. It is neither fully introvert nor fully extroverted, but instead presents a mixed-use configuration that includes residential buildings, a school, and commercial activities. This functional diversity generates greater opportunities for interaction with the surrounding streets and for the integration of amenities that can serve not only residents but also the local community. For this reason, the block demonstrates a higher potential for spatial reconnection and social activation at both the block and neighbourhood scale.

The selected block, number 1, is located between Corso Peschiera and Via Campiglione. Corso Peschiera acts as a major east–west urban corridor, characterized by higher traffic flows, commercial activities, and strong connectivity to the wider city. In contrast, Via Campiglione functions as a secondary residential street, supporting slower mobility patterns and everyday neighbourhood interactions. The block's position between these two axes places it in a transitional condition, mediating between metropolitan infrastructure and local residential life.

From a programmatic point of view, the block presents a mixed-use configuration composed of residential buildings, an educational facility (school), ground-floor commercial activities and larger workshop and high-rise structures embedded within the block perimeter. This combination generates a continuous daily presence of diverse users, including residents, students, workers, and visitors, distinguishing the block from purely residential or entirely introverted typologies. The presence of the school, in particular, introduces rhythms and shared temporal patterns that reinforce the block's role as a local point of reference within the neighbourhood.

The partial openness of the block, along with its functional diversity and strategic location, makes it particularly suited for exploring with rooftop-based regeneration strategies. By activating rooftops as accessible and interconnected spaces, the block can serve as a bridge between private residential areas and the surrounding public realm, effectively extending the neighborhood's spatial capacity without requiring additional land.

In this way, the block acts as a prototype, demonstrating how existing urban environments can be adapted to meet contemporary challenges such as demographic changes, limited public space, and the need for inclusive urban settings.

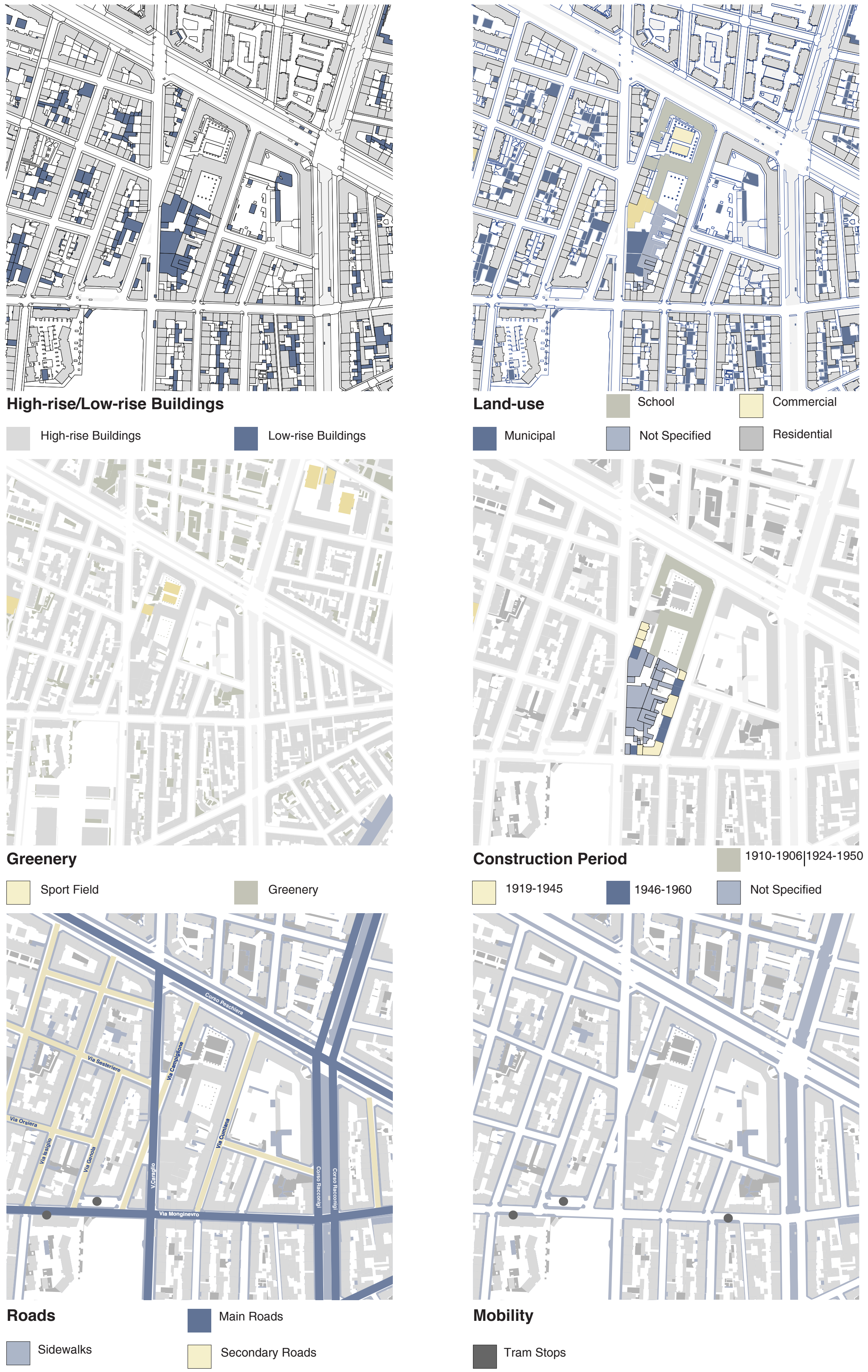


Figure 4.7. Urban analysis layer of the selected block
Source: Author's elaboration

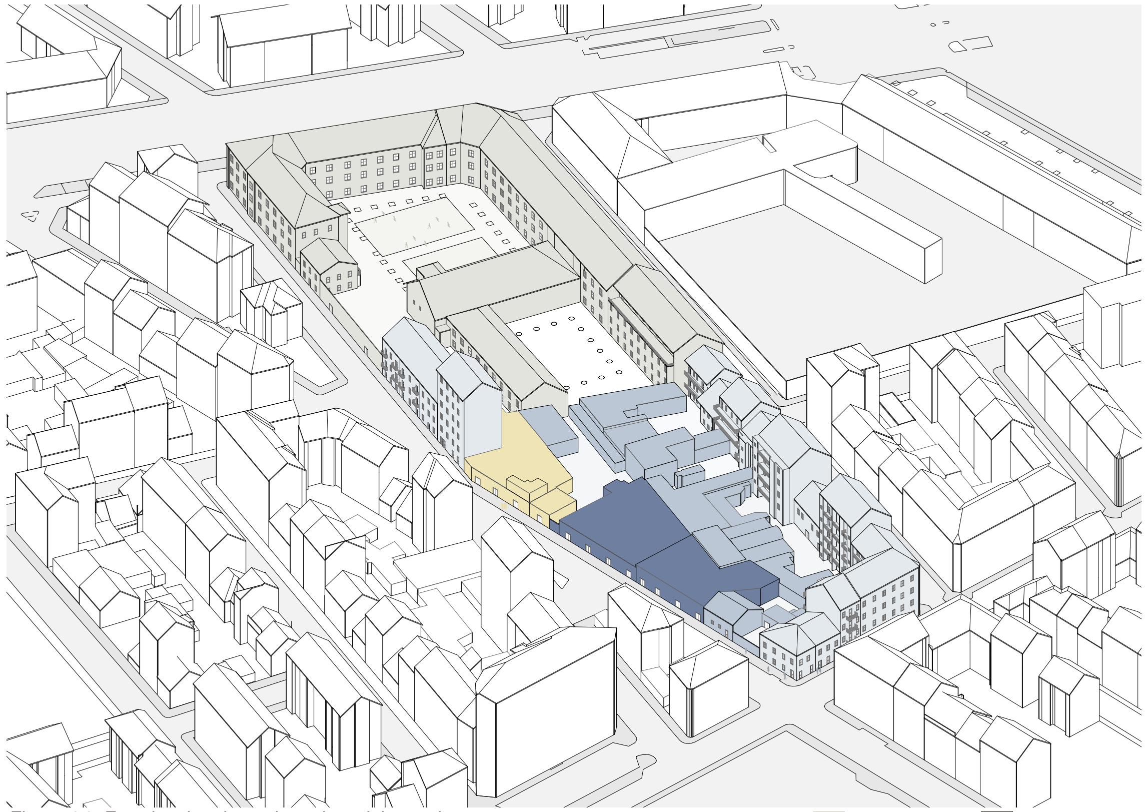


Figure 4.8. Functional and user-based spatial organization of the selected urban block
Source: Author's elaboration

Figure 4.9. Visual documentation of the selected block
Source: Google Earth Pro

Figure 4.10. Visual documentation of the selected block
Source: Google Earth Pro

Figure 4.11. Visual documentation of the selected block
Source: Google Earth Pro

Figure 4.12. Visual documentation of the selected block
Source: Google Earth Pro

Figure 4.13. Visual documentation of the selected block
Source: Author

Figure 4.14. Visual documentation of the selected block
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Figure 4.15. Visual documentation of the selected block
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Figure 4.16. Visual documentation of the selected block
Source: Author

Figure 4.17. Visual documentation of the selected block
Source: Author

Figure 4.18. Visual documentation of the selected block
Source: Author

Figure 4.19. Visual documentation of the selected block
Source: Author

Figure 4.20. Visual documentation of the selected block
Source: Author

05

EXPLORATORY DESIGN PHASE

05.2. **Functional Program and Design Strategy**

According to the urban and morphological analysis, the selected block in San Paolo consists of residential buildings, a school, several small commercial activities on the ground floor, and a series of underused or vacant spaces. These characteristics make the block an ideal site for testing an experimental and adaptive design approach, inspired also by the methodology of AOT Architectural Office, Time To Imagine Torino project. Following their logic, the project proposes four progressive design strategies, each one exploring a different layer of rooftop transformation and responding to the specific needs of the neighborhood.

Strategy 1: Energy production block

The first strategy focuses on transforming the rooftops into a decentralized clean energy system. Through the implementation of photovoltaic panels, the block becomes an energy positive cluster, capable of reducing air pollution and supporting Turin's carbon neutral ambitions.

The main objective of this strategy is to generate energy, reduce dependence on centralized energy systems, and lower carbon emissions at the neighborhood scale. Environmentally, this strategy aligns with Turin long-term goal of carbon neutrality. Spatially, the energy infrastructure is integrated into the existing surface without consuming additional land.

Strategy 2: Green roofs and Community gardens

The second strategy introduces green roofs and productive community gardens, which enhance environmental quality and social well-being. The objective is to enhance environmental performance while improving everyday spatial comfort for residents and users of the block.

This green infrastructure helps reduce the urban heat island effect, improves storm water management and increase biodiversity. It supports biodiversity by providing habitats for insects and birds, while strengthening green continuity within the dense urban fabric. Moreover it offers residents especially families and school users with accessible ecological spaces for learning, growing food, and reconnecting with nature. The presence of vegetation also improves acoustic comfort, creating a calmer microclimate and enhancing overall quality of space.

Strategy 3: inclusive Hybrid Public space

The third strategy focuses on creating a system of inclusive public spaces on the rooftops. Considering the proximity to the school and demographic profile of San paolo characterized by both elderly residents and young families, this stage develops a Hybrid urban platform where all age groups can come together. Play areas, open-air cinemas, resting zones, and cultural spaces encourage social interaction and support the three different pillars of public space design: social cohesion, by strengthening neighborhood ties; social encounter, by enabling informal interaction; and social learning, through shared activities and integrational exchange.

Strategy 4: Co Housing and Student Housing

The fourth strategy introduces lightweight modular co-housing units designed for students and young professionals. The neighborhood is close proximity to universities, this solution can respond to the growing demand for affordable housing while fostering interaction within the community.

Shared outdoor and semi-private spaces promote interaction among residents and with the broader community. This strategy sees housing as a supportive and limited function balanced with public and ecological uses to avoid overloading the rooftops.

Strategy 5: Final integrated scenario

The final proposal combines all the previous strategies into a single cohesive vision, a multifunctional, adaptive landscape that integrate energy production, green roofs, inclusive public space, and co-housing into a unified rooftop environment. Instead of indiscriminately adding a new layer, this strategy identifies the most suitable rooftop areas for each function based on environmental performance, accessibility and social needs.

The integrated strategy allows the rooftop system to operate as a flexible and evolving urban infrastructure, where energy-producing surfaces coexist with ecological functions and community-oriented spaces. By concentrating each strategy where it performs best, it maximizes environmental efficiency while maintaining spatial balance and user comfort.

The result is a layered system that can support biodiversity, improve microclimatic conditions, encourages social interaction, and enhances everyday urban life.

Through this synthesis, the block is transformed into a protype of urban metamorphosis for the city of Turin. Underutilized rooftops are redefined as active contributors to the urban system, forming a new second layer of the public life.

05.2.1. **Energy production block Strategy**

Primary users

Residents of the block

School Facilities

Ground floor Commercial Activities

Thes energy production strategy aims to transform underused rooftops of low-rise buildings into active spaces capable of generating energy. The primary benefits of this strategy include enhanced usability for buildings occupants and an educational role in energy production. This strategy does not require the complete transformation and introduces the lightweight element.

A solar access and solar potential analysis were conducted using Autodesk Forma to evaluate the number of hours of direct sunlight received by building surfaces within the selected block. The analysis was performed for two different representative dates including January 1st (Figure 5.1),which represents winter conditions with low sun angles and extended shading, and June 1st (Figure 5.2), representing summer conditions with maximum solar exposure.

The results indicated a solar distribution across the rooftop surfaces, strongly influenced by surrounding building heights and morphology of blocks. In summer conditions, a significant portion of the rooftops received between 6 and 9 hours of direct sunlight per day, identifying these areas as suitable for photovoltaic integration and energy-production functions. In contrast, winter conditions show a higher percentage of surfaces receiving limited solar exposure (2-0 hours). This can highlight the importance of seasonal adaptability and differentiated rooftop programming.

An annual solar energy potential analysis was also conducted (Figure 5.3 ,5.4). The result shows that the feasibility of photovoltaic panels on selected rooftop areas, with an average solar energy potential of approximately 1,190kWh/m2 per year, and the values of some rooftops can show the range between 1,300 and 1,320 kWh/m2. These surfaces are identified as the most suitable locations for photovoltaic panel installations due to their higher energy output compared to more shaded or poorly oriented roofs.

Energy production strategy aligns with SDG13(Climate Action) by reducing carbon emissions through on-site renewable energy generation. By integrating the photovoltaic systems into the urban fabric, it also supports the SDG 11(Sustainable Cities and Communities) by strengthening local energy resilience and sustainable neighborhood infrastructure.

Based on this analysis, photovoltaic systems are strategically concentrated rooftop areas with higher solar potential while maintaining the flexibility for other areas that can accommodate different strategies. The effectiveness of this strategy is highly influence by roof orientation, shading conditions and not all the rooftops are equally suitable for this kind of transformation. Therefore, the idea is to implement this strategy is phases based on spatial suitability. Roof areas prioritized for energy production will be complemented by shaded zones that can be allocated for green roofs, community spaces and hybrid uses that benefit form moderated solar exposure.

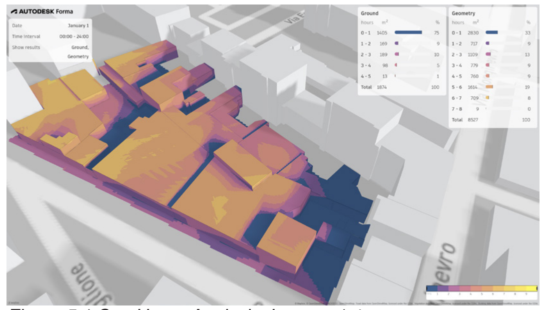


Figure 5.1.Sun Hours Analysis January 1st
Source: Autodesk Forma by Author

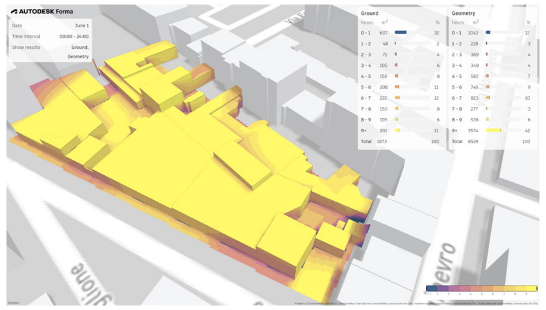


Figure 5.2.Sun Hours Analysis June 1st
Source: Autodesk Forma by Author

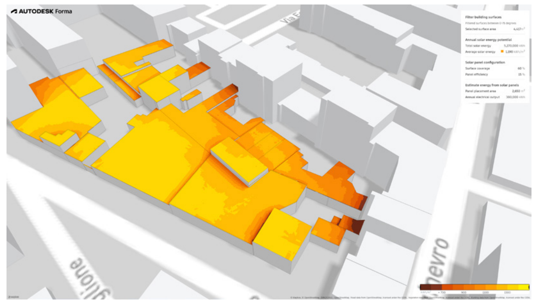


Figure 5.3.Solar Energy Potential Analysis
Source: Autodesk Forma by Author

Figure 5.4.Solar Energy Potential Analysis
Source: Autodesk Forma by Author

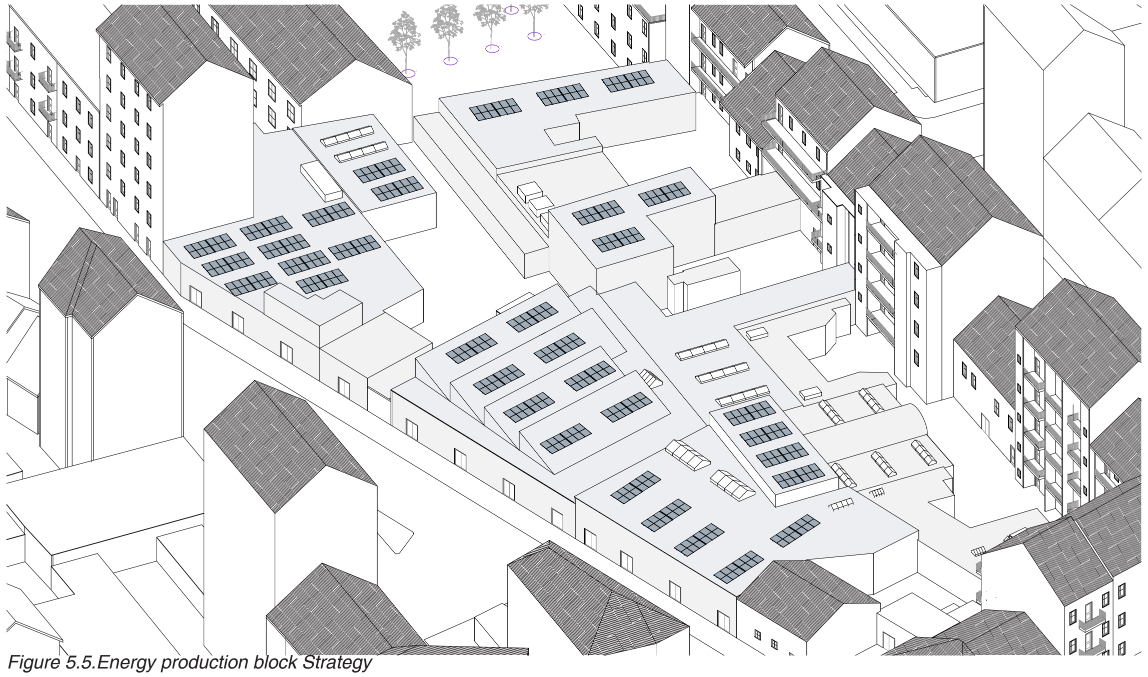


Figure 5.5.Energy production block Strategy
Source: Author

05.2.2. **Green roofs and Community gardens**

Primary Users
Residents of the blocks, family and elderly inhabitabts
Local Community groups

Type of the Green Roofs
Intensive-Extensive

The green roof strategy highlights the importance of vegetation in the environmental and social regeneration of the urban blocks. It focuses on transforming rooftops into environmental and social infrastructure that improves microclimatic conditions, supports biodiversity and increases thermal comfort, all while providing space for social interaction. The green roof design contributes to SDG13(Climate Action) by mitigating urban heat island effects, improving stormwater management and enhancing environmental resilience. At the same time, these spaces support SDG3(Good Health and Well-being) by creating new layer of interaction between residents, promoting mental and physical health.

Green roofs can be classified into three main categories: Extensive, semi-intensive, and intensive green roofs. This thesis focuses on the use of extensive and intensive green roof systems, as they best address the spatial, structural, and social conditions of the project area.

Extensive green roofs are defined by a thin substrate layer, typically ranging from 6 to 20 cm in depth, and have an approximate weight of 150-60 kg/m2. These roofs generally require minimal maintenance and do not need regular irrigation. Due to their lightweight structure, extensive green roofs are suitable for buildings with limited load-bearing capacity. Additionally, they contribute to reducing surface temperature and mitigating the urban heat island effect. (GSA, 2015 and Oberndorfer et al, 2007).
Intensive green roofs, on the other hand, are designed to be accessible and usable by people, which significantly impact on the structural design of the roof. They support a wider variety of vegetation, including shrubs and small trees, and typically have a substrate thickness ranging from 15cm up to 1m, with a weight between 180 and 500 kg/m2. These systems require irrigation and regular maintenance but offer greater ecological and social benefits. Some of these benefits include improved biodiversity and enhanced opportunities for social interaction (GSA, 2015 and Oberndorfer et al, 2007).

Based on the block structure and zoning of the project, the rooftops of the selected block are categorized as private, collective, and public. Roofs located next to the residential units are classified as private, while the roof of the commercial building is classified as collective and proposed as community gardens. The community garden use planter boxes that do not require full green roof adaptation. This approach ensures the safety of residents while allowing for small-scale cultivation and social use.
Roofs that are not accessible to users and remain fully private are classified as extensive green roofs. This classification is due to their lightweight construction, low maintenance requirements, and ability to reduce roof surface temperature and enhance environmental performance.
Lastly, rooftops belonging to municipal buildings are designed as intensive green roofs. These roofs provide accessible spaces for public gathering, urban farming, and recreational activities. They promote social interaction while also supporting flora and fauna, reinforcing the ecological and communal role of rooftops within the district.

This strategy requires careful management and high maintenance, as well as effective coordination among users. Accessibility must be thoughtfully managed among users and the seasonal variations can influence the type of activities. Activities should be beneficial for the area to be more flexible and adaptable for residents.

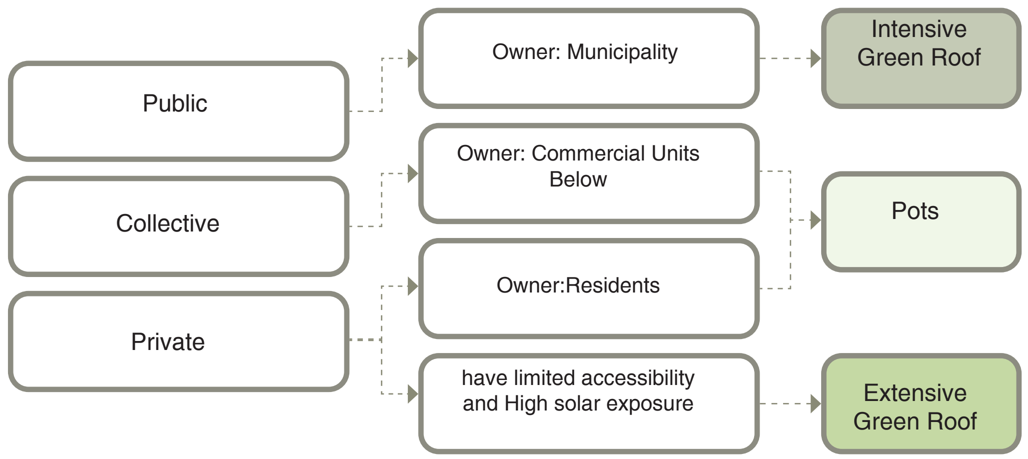


Figure 5.6.Relationship between ownership, accessibility and rooftop Typologies
Source: Author

Conceptual Diagram

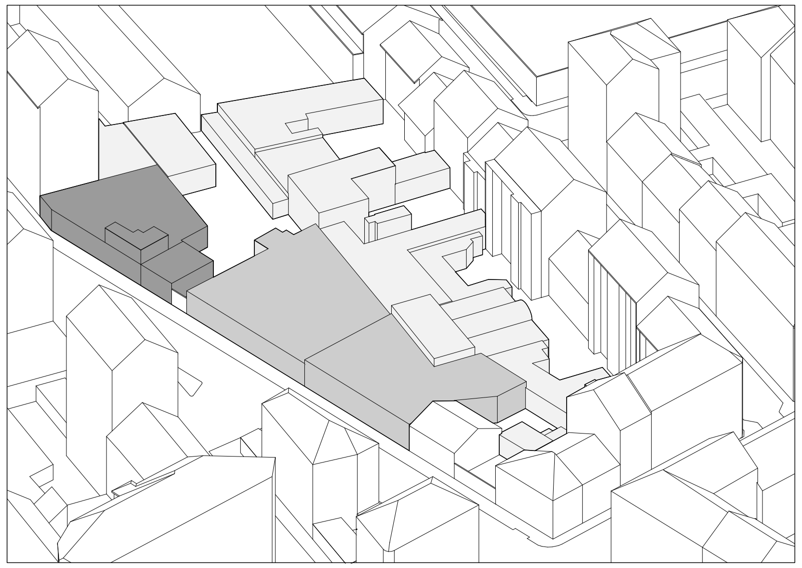


Figure 5.7.Zoning Framework Public Collective Private
Source: Author

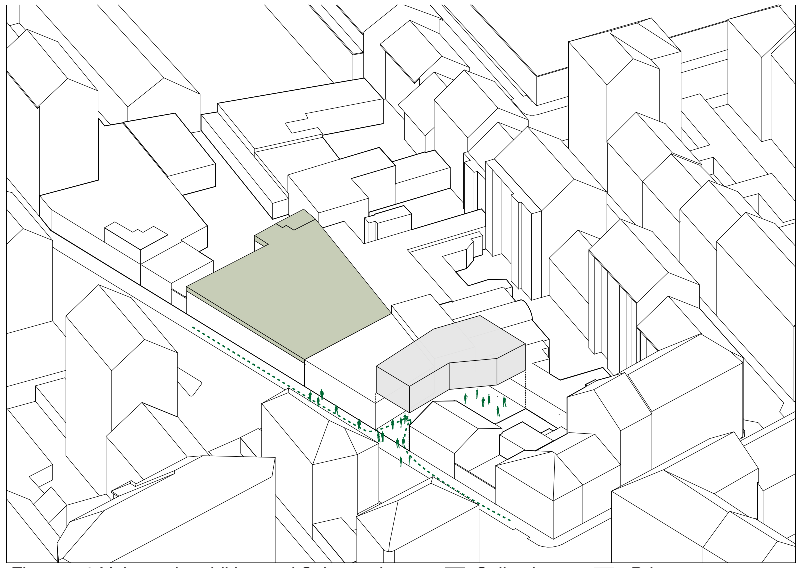


Figure 5.8.Volumetric addition and Substraction Collective Private
Source: Author

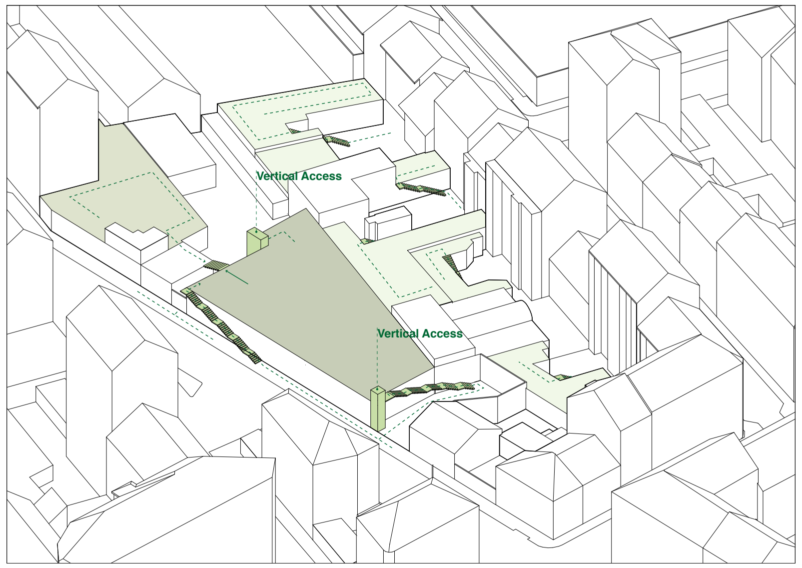


Figure 5.9.Accessibility strategy: Vertical and Horizontal connections
Source: Author

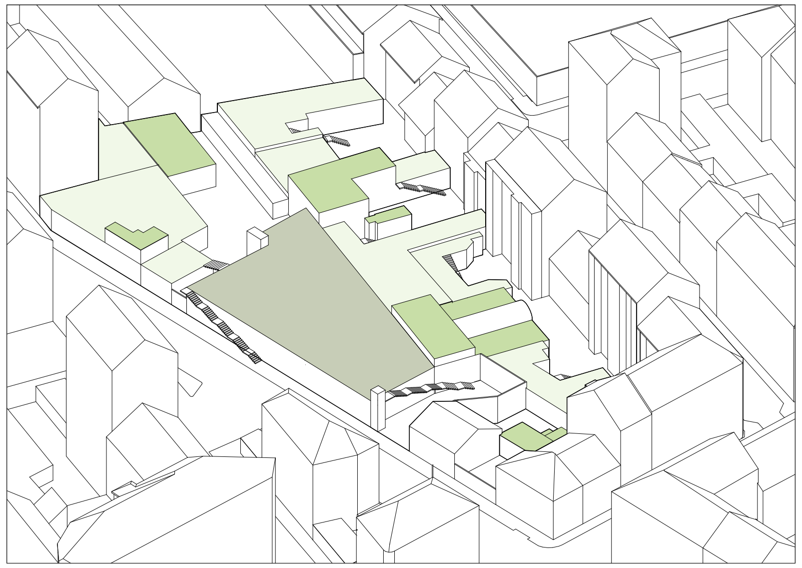


Figure 5.10.Green Roof Typologies Public Collective Private
Source: Author

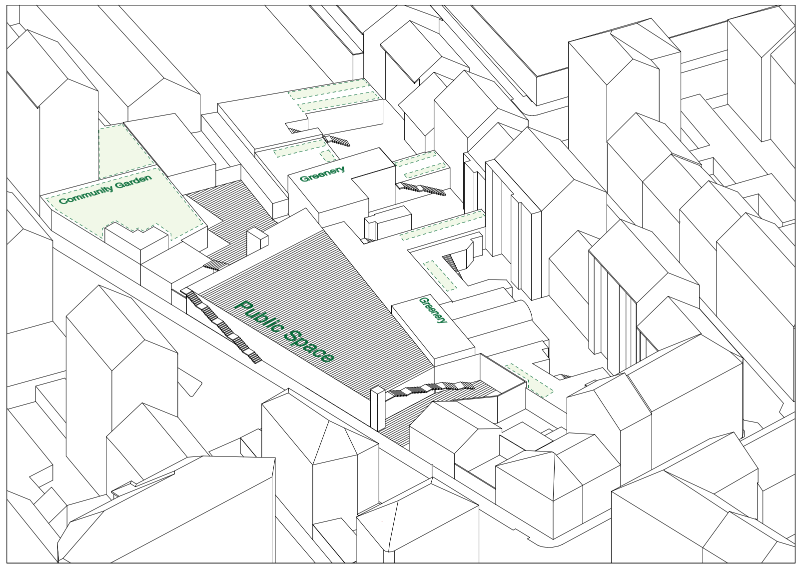


Figure 5.11.Design Strategy:Organization of public spaces and guiding spatial lines
Source: Author

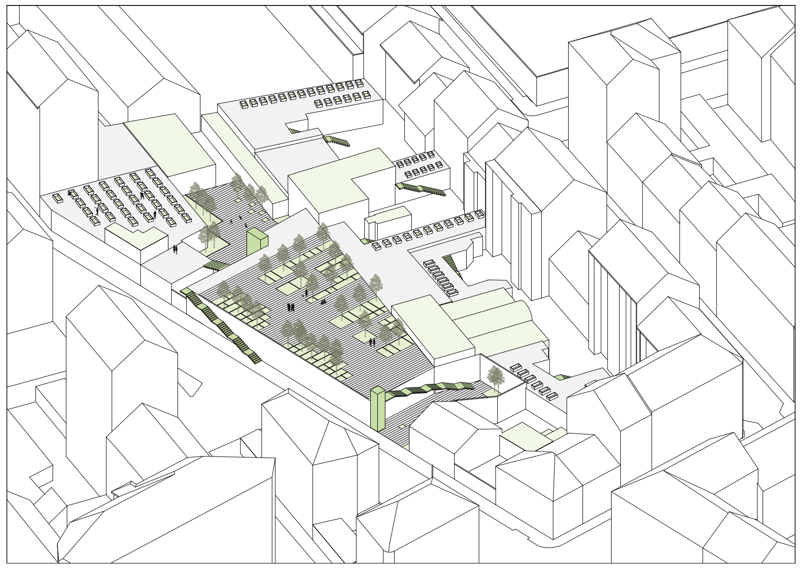


Figure 5.12.Final Design, Green Roof
Source: Author

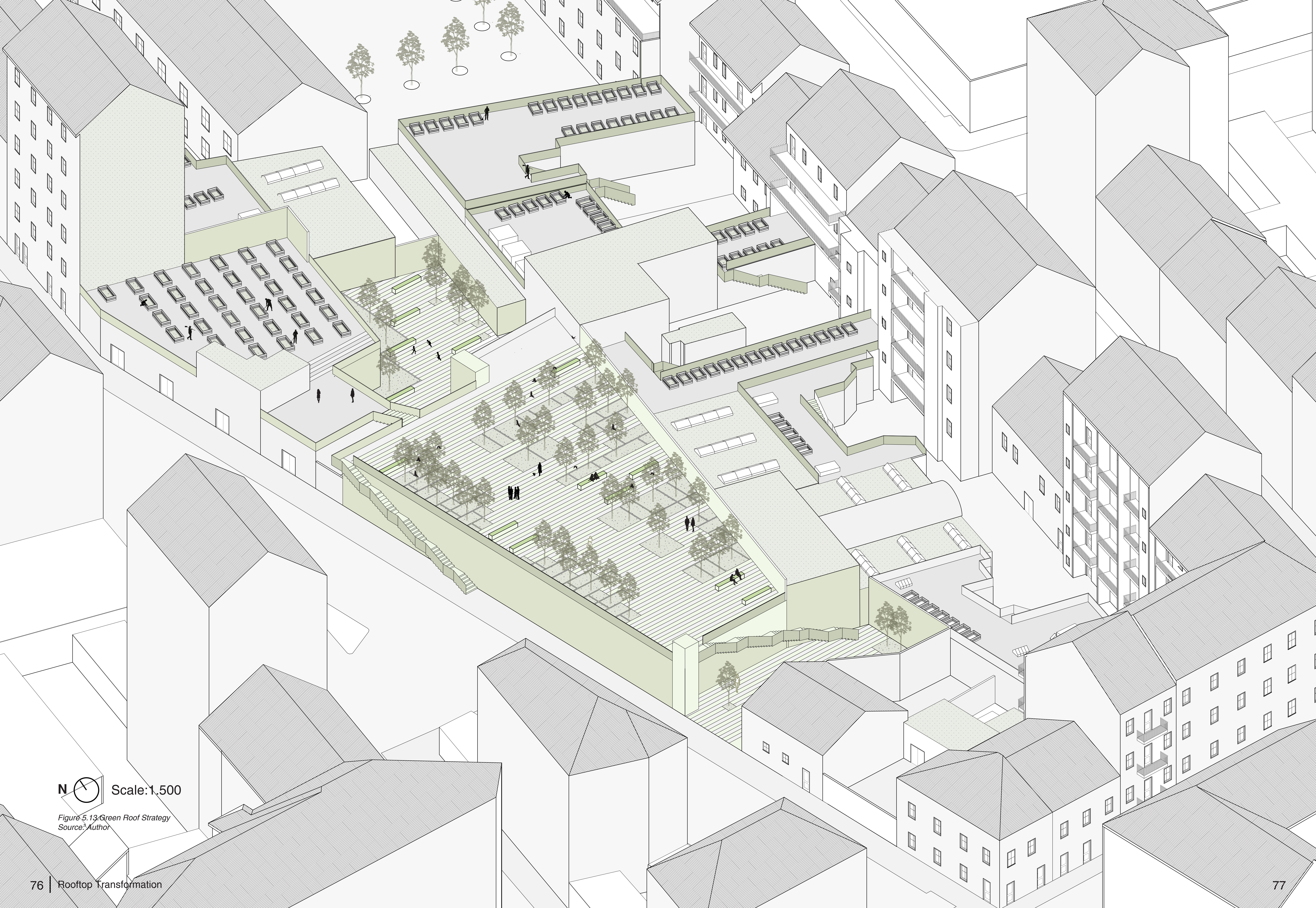


Figure 5.13 Green Roof Strategy
Source: Author

Figure 5.14.Green Roof Strategy Plan
Source: Author

05.2.3.**Inclusive Hybrid Public space**

Primary users
Students
Residents
Local Community
Visitors

The inclusive hybrid public space introduces flexible public and semi-public areas that invite people of all ages to use the space. The area is divided into different sections for various activities. For instance, the section near the school is designed to provide space for children of the school. The area belonging to the commercial zone can serve multiple purposes. This space can feature lightweight and reversible structures, such as pergola-like market frames, to host activities including local markets exhibitions and community events.

This strategy supports local residence and strengthens the connection between rooftops. The design is based on people and private owners. It directly addresses Sustainable Development Goal 11(Sustainable cities and communities) by transforming disconnected and underused rooftops into accessible, walkable and socially active urban spaces. By enhancing spatial continuity and public accessibility, it also supports SDG 3, which promotes well-being.

The temporary and seasonal nature of these activities does present some limitations, but certain green roofs may need to be included to mitigate the urban heat island and enhance comfort. However, this adaptability reinforces the system's ability to respond to the community's needs.

The inclusive hybrid public space is conceived as a shared rooftop environment used by people of different ages, rhythms, and social roles, whose presence varies in duration and intensity throughout the day. Rather than assigning fixed functions, the space accommodates short-stay and long-stay users through spatial differentiation and adaptable layouts.
Short-stay users, such as workers, students, visitors, and passers by primarily engage in transitional and spontaneous activities, including movement, pausing, informal seating, observation, and brief social interactions. These users activate edges, stair-adjacent areas, and open platforms, where flexibility allows the space to respond to changing daily needs.
Long-stay users, including residents, families, and elderly people, occupy quieter and more protected zones designed for gathering, rest, and extended use. These areas support slower rhythms, social continuity, and everyday practices, reinforcing a sense of belonging and neighborhood identity.
Children, particularly those connected to nearby schools, use the space at specific times for play, events, and collective activities, introducing temporal variations in intensity. The coexistence of these user groups generates a layered public space, where overlapping uses occur without conflict due to clear spatial gradients, visual continuity, and adaptable furniture.
Through this structure, the rooftop functions as an inclusive urban platform, capable of supporting diverse users and activities over time, while remaining open, flexible, and socially accessible beyond a single target group.

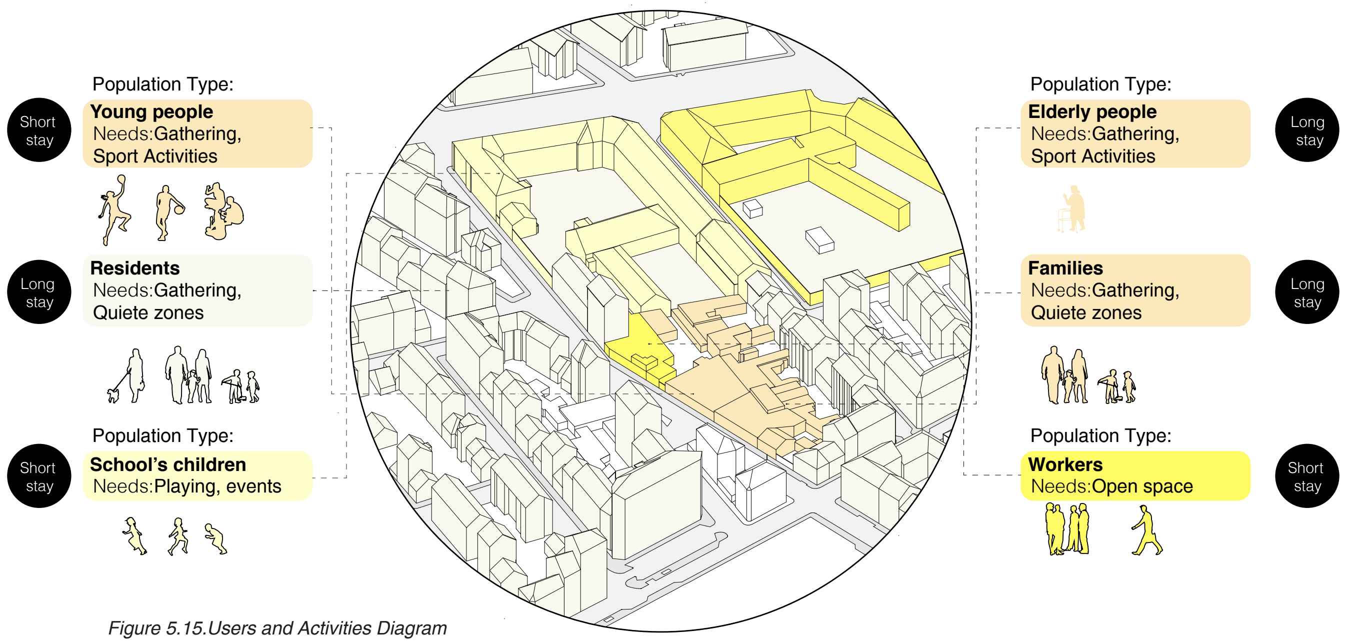


Figure 5.15.Users and Activities Diagram
Source: Author

Daily activity and occupancy diagram

The daily activity and occupancy diagram illustrate how the proposed inclusive rooftop public space strategy supports various user groups throughout the day, responding the different time of the days and social rhythms. The diagram is structured along a temporal axis (morning, afternoon, evening) and an activity axis, showing how rooftops transform to more collective and social functions. This indicates that activities can adapt continuously rather than being fixed to one program.

Morning: Low intensity and well-being activities

In the morning activity is spread across the project. Area's adjacent to the school are active due to school related movement, which contributes to a sense of presence and safety, though they do not dominate the entire system. The morning phase emphasizes accessibility, calm use, and coexistence of multiple user groups. Private and collective residential areas support daily routines such as circulation, short breaks and individual use. Public terrace and seating zones host low-intensity activities such as resting, informal meetings, and well-being-oriented use, particularly for elderly residents. The market and lightweight structures operate as flexible platforms for small-scale daily exchange.

Afternoon: Overlapping Uses and Social mixing

During the afternoon, the system transitions into a more mixed-use condition. As school activity decreases other programs become more visible and active. This phase demonstrates the hybrid nature of the project, where social, recreational and everyday use overlap, reinforcing inclusivity and shared ownership of space. Recreational areas, sports zones, and open terraces attract more people, including children, teenagers, adults, and residents returning home. Semi-public spaces encourage informal interaction, allowing different activities to coexist without strict separation.

Evening: collective and social activation

In the evening, activity shifts toward collective and social uses across the entire rooftop network. This phase represents the highest level of social intensity, confirming the role of the projects as a new layer for public life, independent of a single function. Public platforms host shared spaces, informal gathering, cultural events and neighborhood meetings. Recreational and circular spaces support a group activities and social interaction. The absence of school-related functions allows the spaces to fully transform into community-oriented environment, emphasizing social cohesion and collective life.

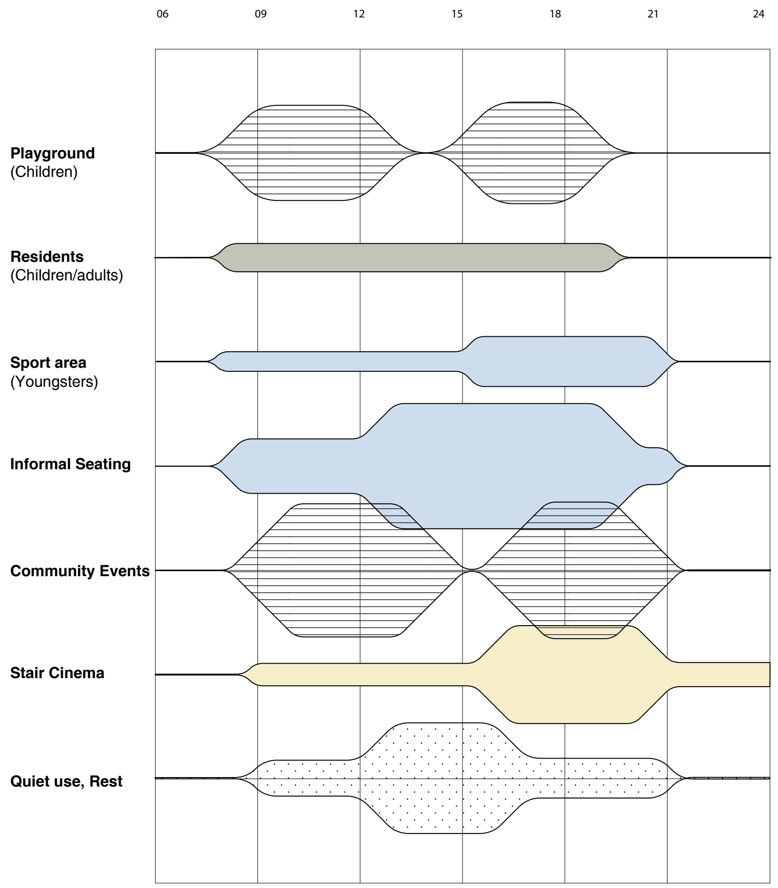


Figure 5.16.Daily Activity and Occupancy Diagram
Source: Author

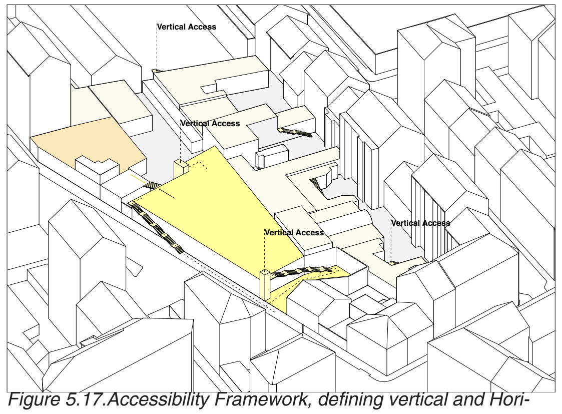


Figure 5.17.Accessibility Framework, defining vertical and Horizontal Acess
Source: Author

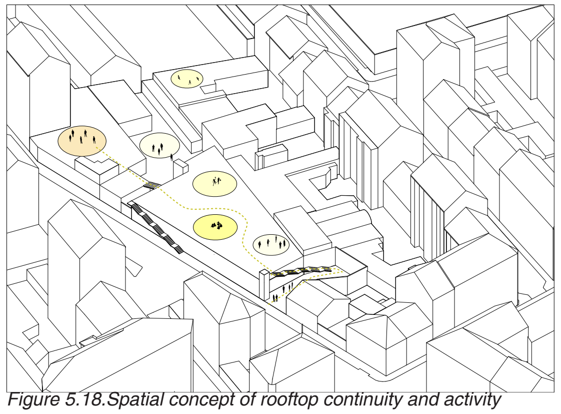


Figure 5.18.Spatial concept of rooftop continuity and activity nodes
Source: Author

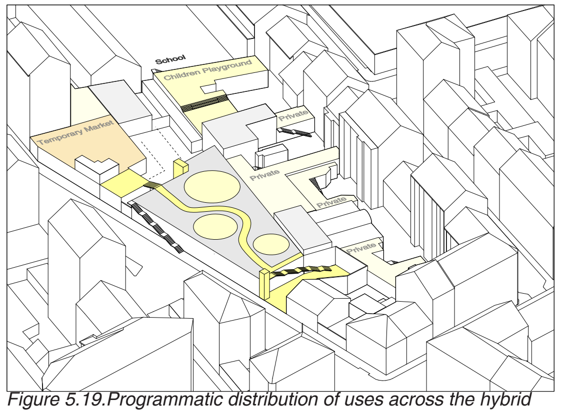


Figure 5.19.Programmatic distribution of uses across the hybrid public space
Source: Author

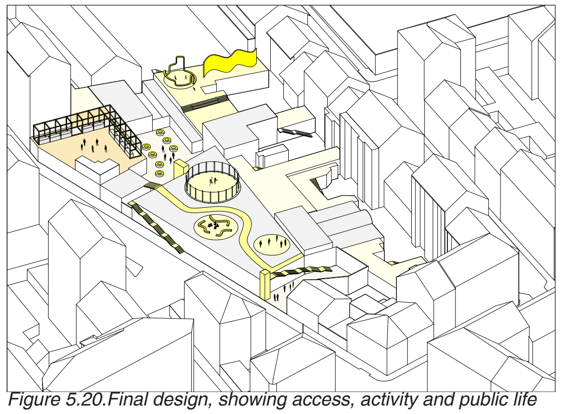


Figure 5.20.Final design, showing access, activity and public life
Source: Author

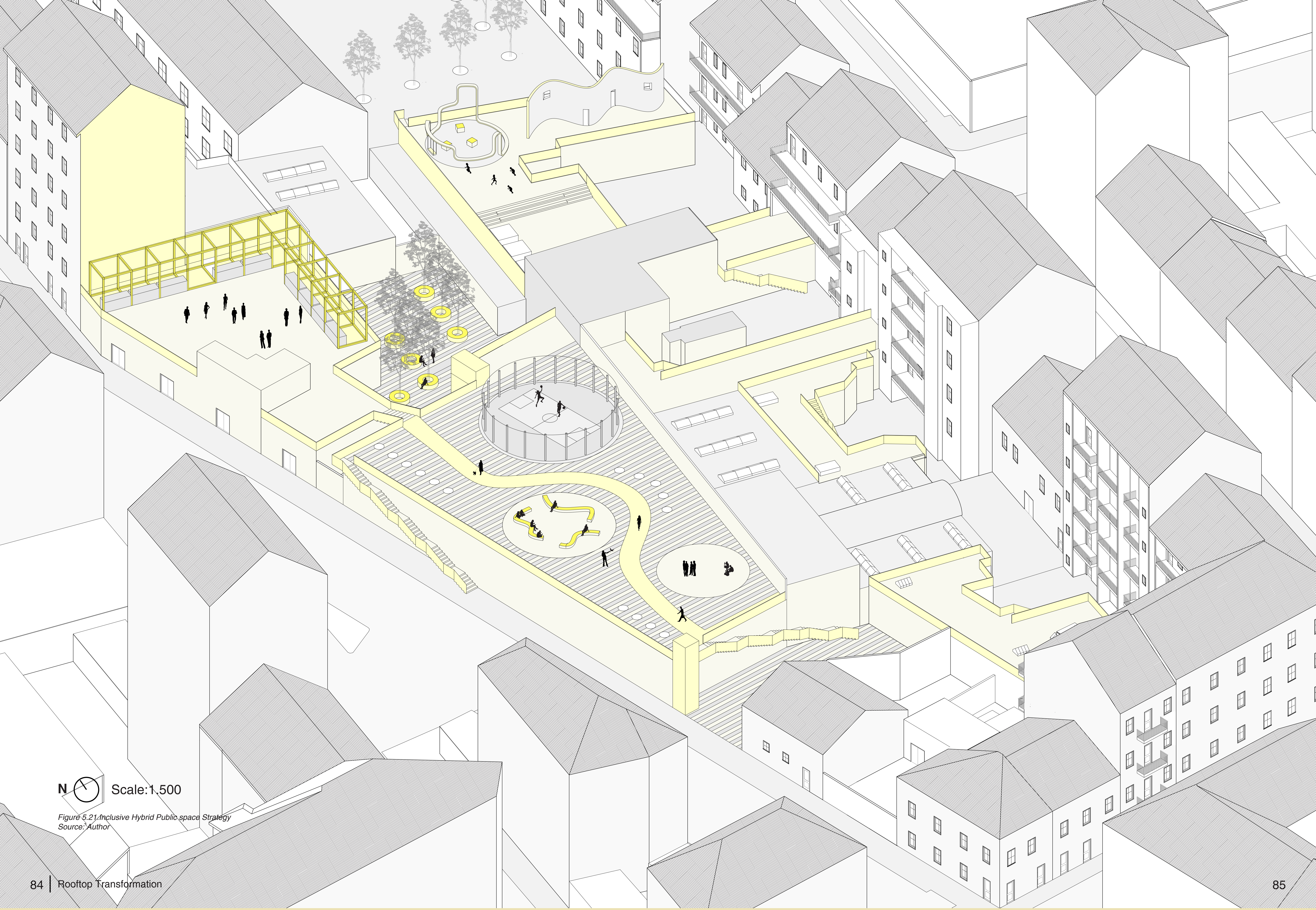


Figure 5.21 Inclusive Hybrid Public space Strategy
Source: Author

Figure 5.22.Inclusive Hybrid Public space Strategy Plan
Source: Author

05.2.4. **Co-Housing and Student Housing**

Primary users

Students

Young professional

Residents seeking shared living model

The co-housing strategy aims to provide a residential layer integrated within the rooftop system, expanding the role of rooftop beyond public to include living spaces. Given proximity of the selected block to the Politecnico di Torino, the housing is a significant concern for students. This strategy responds to the demand by proposing an alternative residential model that is compact, flexible and socially oriented.

The co-housing model features shared living arrangements that combine private units with collective outdoor and semi-private spaces. These shared areas, such as gardens and circulation spaces, encourage daily interaction and mutual support and sense of community among residents. By Integrating housing with social and green infrastructures, this strategy promotes a more inclusive and resilient living environment while minimizing additional land consumption.

The semi-public spaces associated with the co-housing system are designed using lightweight flexible and reversible structures. These areas primarily serve as shared study areas, supporting students by providing accessible environments for learning and social exchange. In contrast, residential units require heavy construction systems to meet structural, acoustic and safety requirements, resulting in higher cost and greater technical complexity.

As a result, the number of residential units are limited. In some cases, adding housing to rooftops may generate challenges related to increased density, privacy and coexistence with existing residents. Therefore, prioritizing shared spaces that are accessible to the broader block community can represent a more appropriate and balanced solution.

The co-housing strategy directly supports SDG11(Sustainable Cities and Communities) by promoting a compact shared living solution to reduce land consumption while strengthening social cohesion within the existing urban fabric and fostering social interaction, mutual support and balanced living environment in line with SDG3 (Good Health and Well-being) .

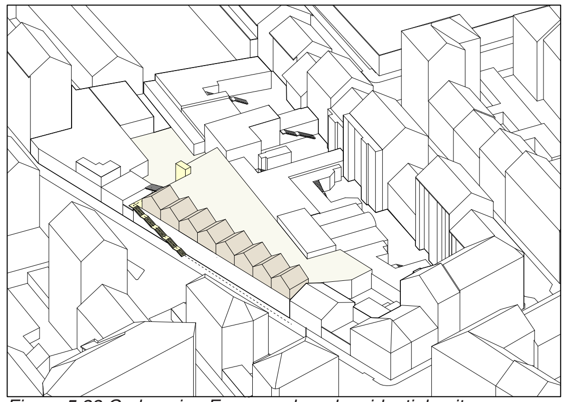


Figure 5.23.Co-housing Framework and residential unit aggregation
Source: Author

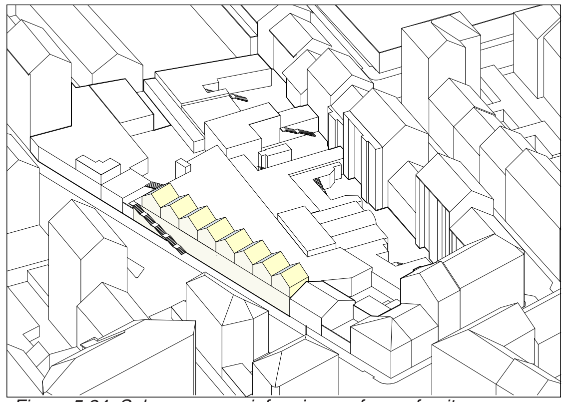


Figure 5.24. Solar exposure informing roof use of units
Source: Author
High solar exposure :Pv panels
Lower solar exposure:Roof windows for daylight

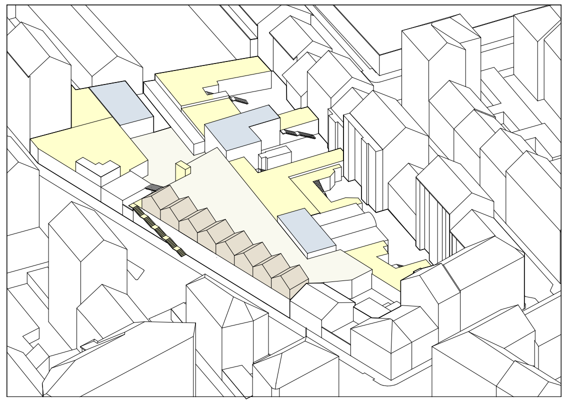


Figure 5.25.Programmatic distribution of collective spaces, co-housing and energy producing areas
Source: Author
Collective spaces
Solar panels

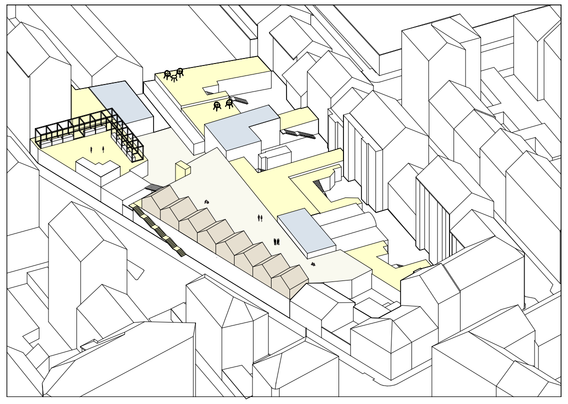


Figure 5.26.Final design, showing access, activity and public life
Source: Author

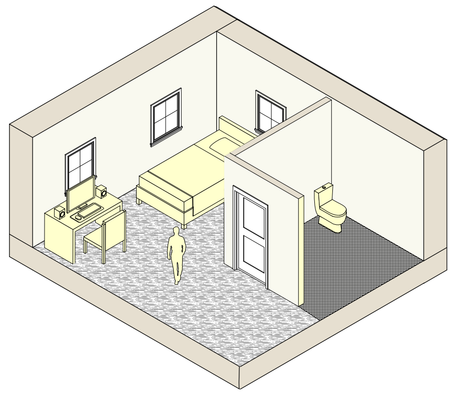


Figure 5.27.Example of housing unit within the co-housing strategy
Source: Author

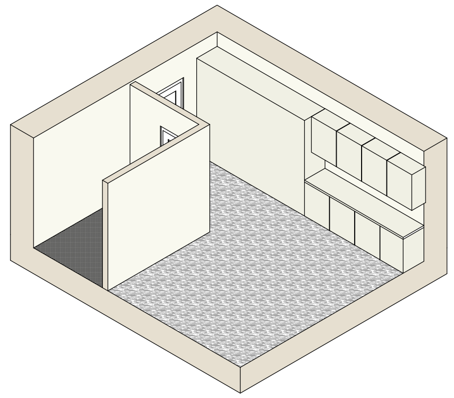


Figure 5.28.Example of housing unit within the co-housing strategy
Source: Author

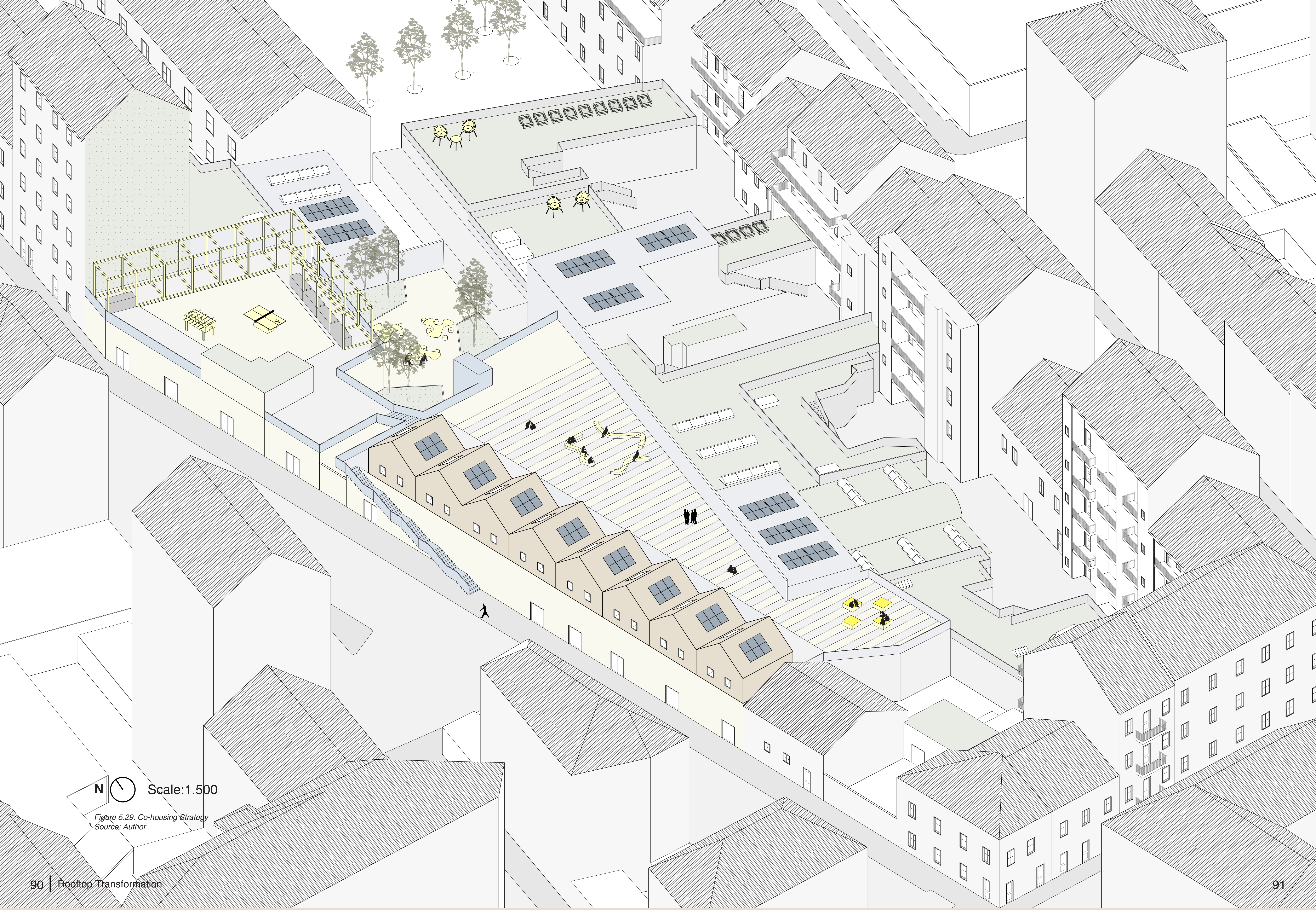


Figure 5.29. Co-housing Strategy
Source: Author

Figure 5.30.Co-housing Strategy Plan
Source: Author

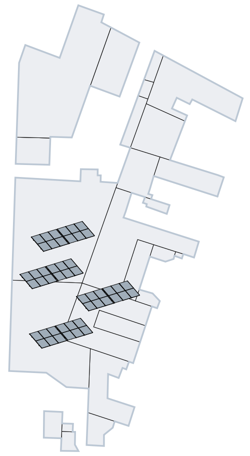
05.2.5.**Final Integrated Strategy**

Primary users
Students
Residents
Local Community
Visitors

An adaptive rooftop system for San Paolo
The final integrated strategy brings together the three main rooftop interventions, energy producing rooftops, green and ecological roofs, and inclusive hybrid public spaces, to create a unified and adaptive urban system. At the urban scale this strategy supports SDG11(Sustainable Cities and Communities) by promoting compact development, enhancing accessibility of the residents, and activating underutilized built surfaces without additional land consumption.

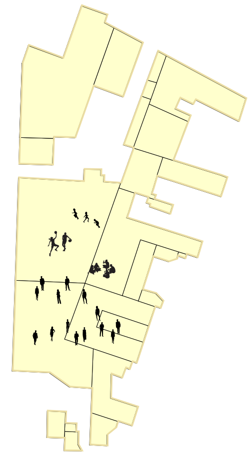
The rooftop network serves as an alternative public space, providing new routes, meeting spaces and collective amenities for residents. From an environmental perspective, integrating energy production strategy with green roofs help achieve SDG13(Climate Action) by reducing carbon emissions, mitigating urban heat island effects, and improving microclimatic conditions. Based on the zoning assessments, solar-exposed rooftops are prioritized for energy production, while shaded or less exposed surfaces are used for ecological and social uses, demonstrating differentiated and climate-responsive design strategy.

Socially, the inclusion of hybrid rooftops spaces and sharing components supports SDG3(Good Health and Well-Being) by encouraging physical activity, social interaction. Semi-public space is designated for owners of the building. These areas are designed to accommodate flexible and temporary small markets that can generate profit for them. Private spaces are reserved for the residents and users of the buildings.
This final strategy is flexible and can evolve over time based on changing needs and ownership structures. It illustrates how transformation can enhance resilience connectivity and social life within our building.

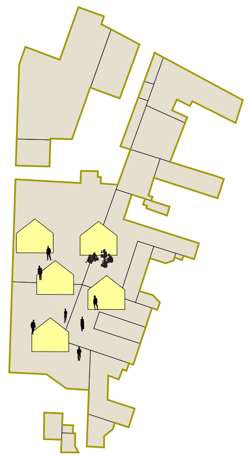


Energy Production

Green Roof



Hybrid Public space



Co-housing

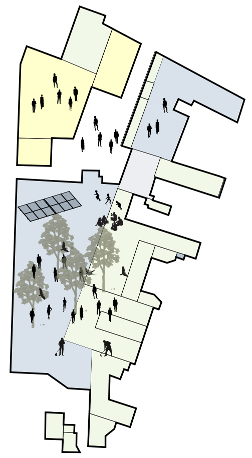


Figure 5.31.Sequence of Rooftop strategies within the integrated final framework
Source: Author

05.2.5.1. **Energy-Production Rooftops in the Integrated Strategy**

Within the integrated final strategy, the areas selected for energy production correspond to rooftops with the highest solar exposure, as identified through solar radiation analysis. These surfaces receive prolonged direct sunlight, particularly during summer months, which makes them less suitable for intensive public use or green platforms. In such conditions, the introduction of accessible green roofs could increase thermal discomfort and humidity levels, potentially reducing spatial comfort and usability.

For this reason, these highly exposed rooftops are strategically allocated to photovoltaic energy production. The installation of solar panels allows these surfaces to be actively used while avoiding overheating issues associated with prolonged occupation. At the same time, photovoltaic systems transform environmental constraints into productive assets, contributing to local renewable energy generation and supporting broader sustainability goals.

An additional advantage of this strategy lies in its limited structural impact. The installation of photovoltaic panels requires minimal demolition and intervention on the existing roof structure, preserving the integrity of the buildings while reinforcing their functional performance. Since these rooftops are primarily associated with private or semi-private buildings, the energy produced can also generate direct economic benefits for residents or property owners, creating an incentive for participation in the rooftop transformation process.

Finally, the vertical and spatial configuration of these rooftops further supports this choice. Due to their greater height and limited physical connection to residential courtyards, providing frequent public access would require extensive stair systems or vertical circulation elements. Allocating these areas to energy production avoids unnecessary circulation infrastructure while ensuring that rooftop interventions remain efficient, realistic, and context-responsive within the overall project framework.

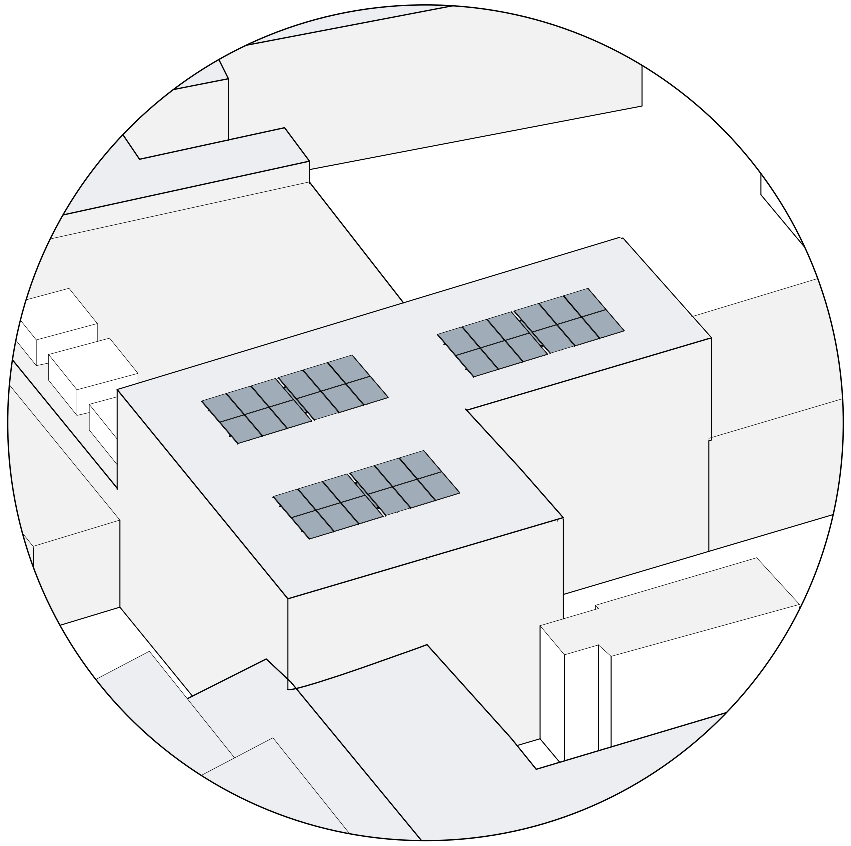


Figure 5.32.Energy production rooftops within the integrated final strategy
Source: Author

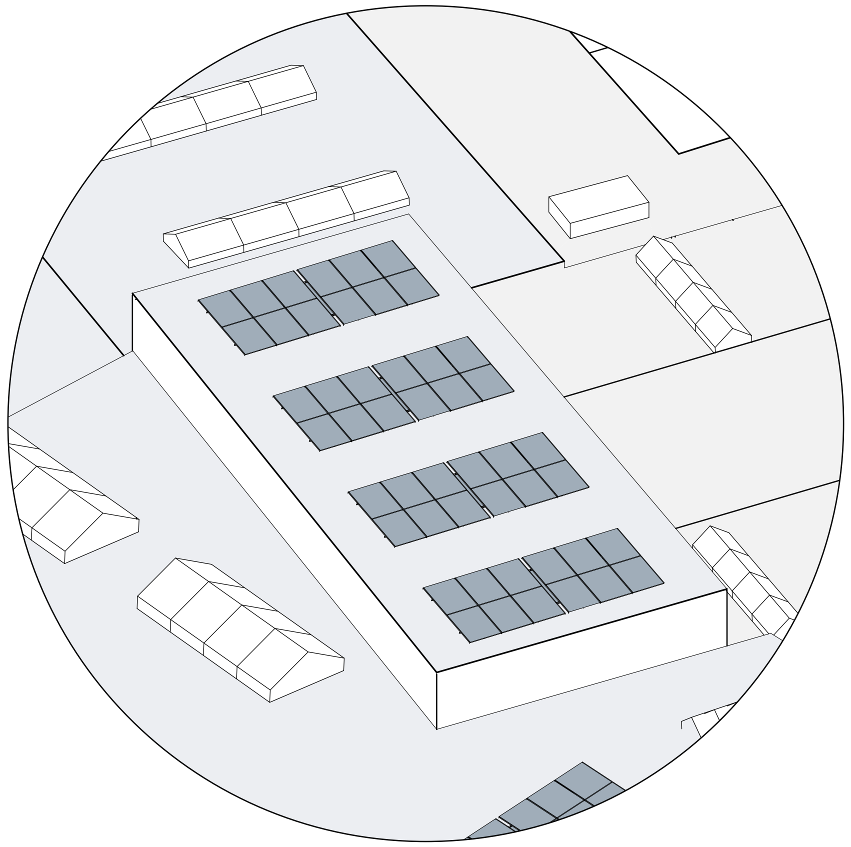


Figure 5.33.Energy production rooftops within the integrated final strategy
Source: Author

05.2.5.2.**Green Roofs in the Integrated Final Strategy**

Within the integrated final strategy, green roofs are applied selectively in areas where their environmental and social benefits can be maximized. In private and semi-private rooftop zones directly connected to residential units, green roofs are introduced as small domestic gardens that residents can use for planting, relaxation, and everyday activities. These spaces support informal social interaction among neighbors while improving well-being through proximity to greenery.

Vegetation in these areas contributes to mitigating the urban heat island effect, improving microclimatic comfort, and enhancing the visual quality of the surrounding environment. The use of lightweight planting systems and movable pots is intentional, as it avoids the need for structural reinforcement of existing roofs. These flexible solutions allow residents to adapt and personalize the space over time, reinforcing a sense of ownership and care. This approach is inspired by the Rooftop Republic project in Hong Kong, where rooftop gardening functions not only as environmental infrastructure but also as a tool for social learning, collective engagement, and user happiness.

In contrast, rooftops and open spaces at ground level that belong to the municipality, such as internal courtyards—are primarily dedicated to more extensive green areas. These spaces can accommodate larger vegetated surfaces and trees, providing ecological continuity and accessible green infrastructure for a broader range of users. On the rooftops themselves, intensive green roofs are limited, as they require thicker structural layers, higher load capacity, and continuous maintenance. Instead, the project favors a mixed approach that balances environmental performance with structural feasibility and long-term manageability.

Overall, the green roof strategy contributes to environmental resilience, social well-being, and spatial comfort, while remaining adaptable to the existing structural conditions of the block and compatible with other rooftop functions introduced in the integrated scenario

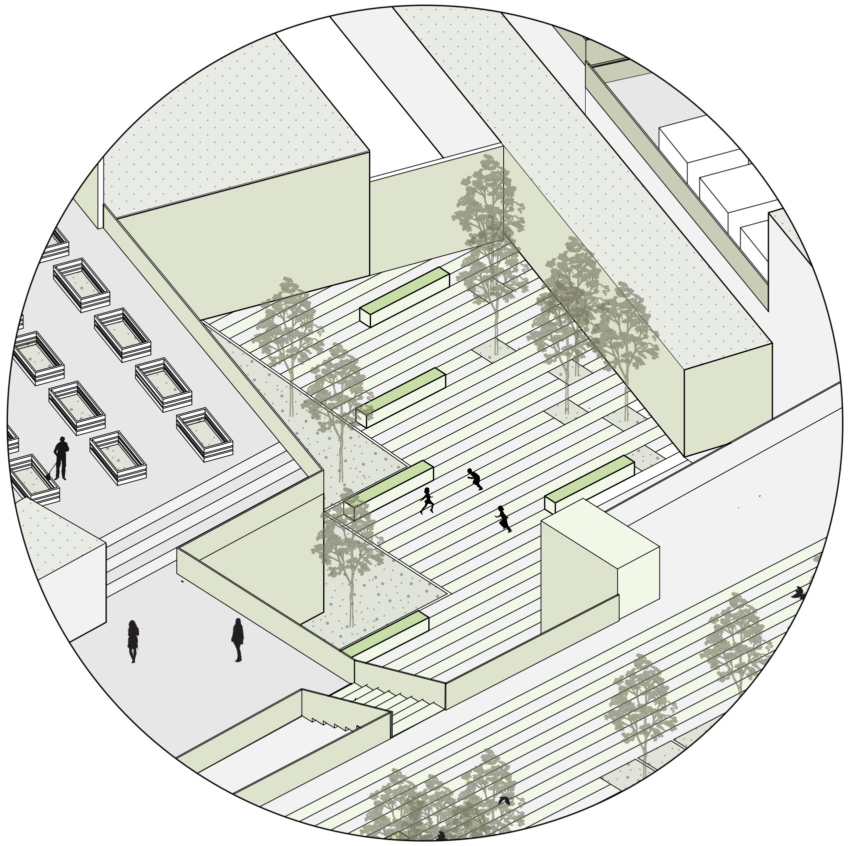


Figure 5.34.Public greenery within the integrated final strategy
Source: Author

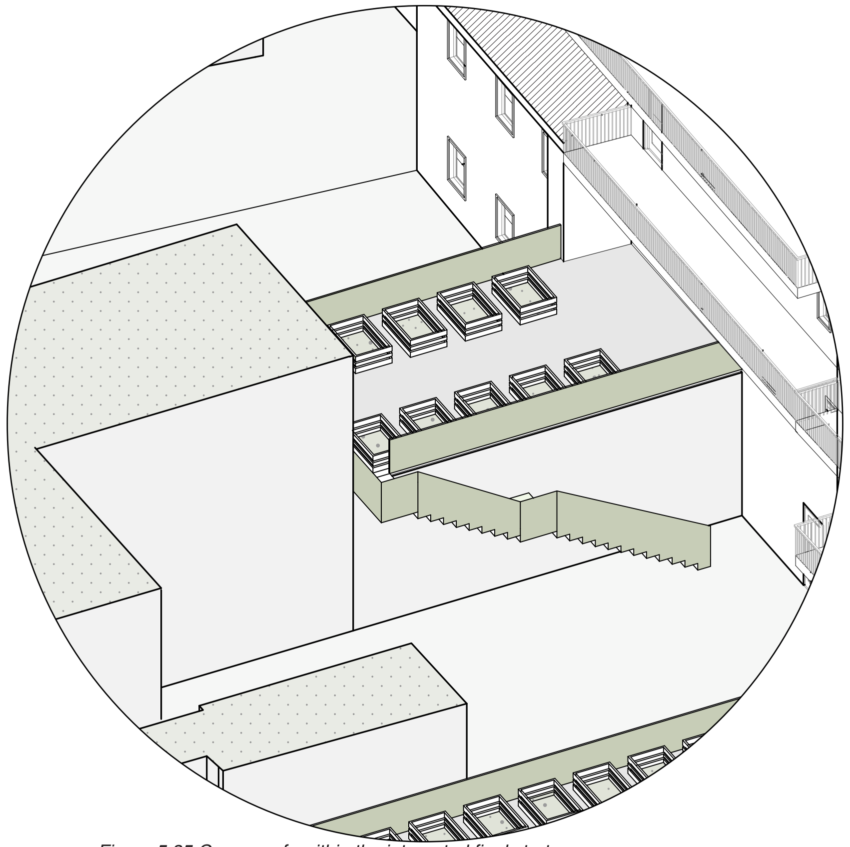


Figure 5.35.Green roofs within the integrated final strategy
Source: Author

05.2.5.3.**Hybrid Public Spaces in the Integrated Final Strategy**

Within the integrated final strategy, hybrid public spaces are located in areas of the rooftop system that naturally support social activity and collective use. These spaces are conceived as flexible platforms that accommodate different forms of interaction throughout the day and across seasons. Particular attention is given to zones dedicated to informal seating, where long, continuous benches and adaptable furniture encourage people to sit together rather than in isolated groups. This spatial configuration promotes spontaneous encounters, conversation, and shared use, reinforcing social cohesion among users of different ages and backgrounds.

The design of these areas aims to bring together a diverse range of users—including residents, students, elderly people, and visitors, by offering inclusive and non-programmed spaces that can be interpreted freely according to individual needs. Rather than defining a single fixed function, these hybrid spaces remain open to multiple activities such as resting, meeting, observing, or participating in small collective events. This approach reflects the idea of public space as a social infrastructure that supports everyday life rather than a strictly designed object.

Another key component of the hybrid public space strategy is the introduction of lightweight and reversible structures. These elements define semi-public zones that host temporary and economically active uses, such as local markets, pop-up exhibitions, or small workshops. As these areas are located on private or semi-private rooftops, they are designed to generate value for local users while remaining accessible to the wider community. The use of modular and lightweight materials allows the structures to be easily assembled, dismantled, and adapted over time, ensuring flexibility and minimizing permanent impact on the existing buildings.

Through this combination of informal social spaces and temporary productive functions, the hybrid public space strategy enhances social interaction, economic opportunity, and spatial diversity. It plays a central role in the integrated scenario by connecting environmental strategies with social life, transforming rooftops into active, inclusive, and adaptable urban spaces.

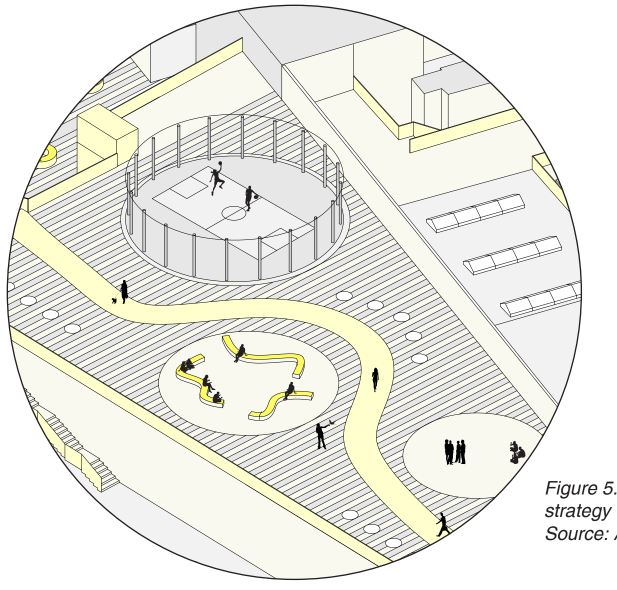


Figure 5.36.Hybrid public space within the integrated final strategy
Source: Author

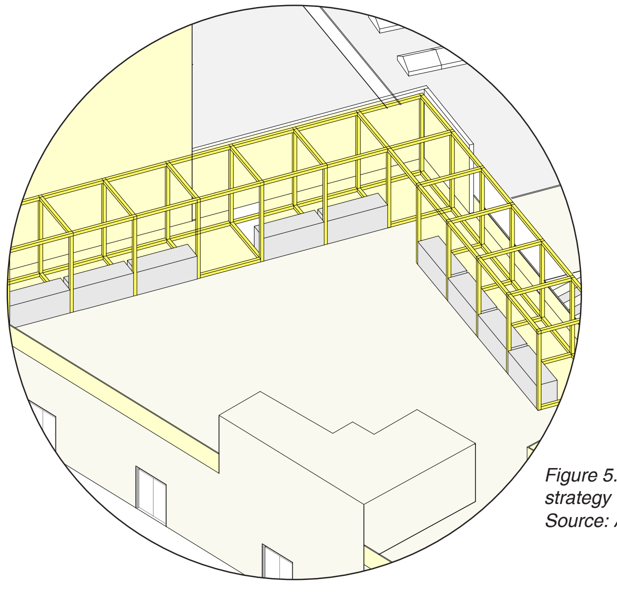


Figure 5.37.Temporary market within the integrated final strategy
Source: Author

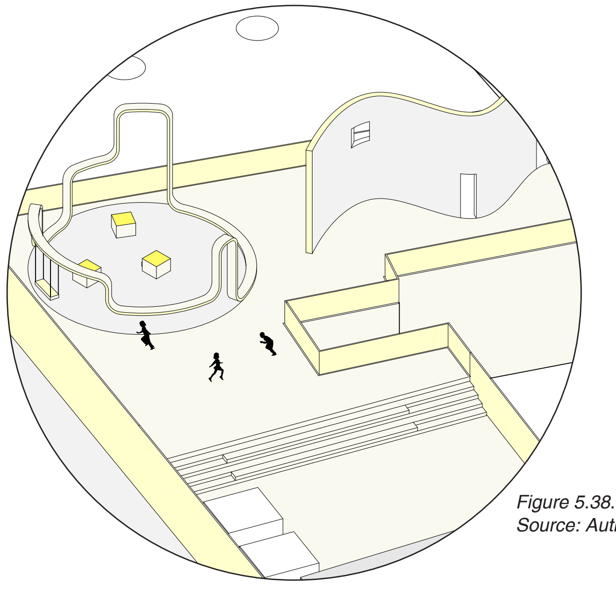


Figure 5.38.Playground within the integrated final strategy
Source: Author

05.2.5.4. **Co-housing in the Integrated Final Strategy**

Within the integrated final strategy, co-housing is introduced in areas that naturally support social interaction and collective living. These spaces are located around shared yards that function as semi-private communal areas, actively designed with green elements and informal seating. The presence of vegetation, open ground surfaces, and benches creates a pleasant and welcoming environment that encourages residents to spend time outdoors, fostering daily encounters and a sense of belonging.

The shared yard acts as a social heart for the co-housing units, where residents can gather, relax, and interact in a more informal and spontaneous way. This spatial configuration strengthens neighborhood relationships and supports a collective living model without compromising individual privacy. The proximity between private units and shared outdoor spaces allows residents to remain connected while maintaining personal boundaries.

In addition, private rooftop areas associated with co-housing are conceived as a combination of green and hybrid spaces. These areas integrate small gardens and flexible platforms that can be used for everyday activities, informal meetings, or quiet moments. By merging ecological elements with shared spatial features, the strategy enhances both environmental quality and social cohesion, supporting a living environment that is inclusive, adaptable, and resilient.

Through this approach, co-housing is not treated as an isolated residential function, but as an integral part of the broader rooftop ecosystem, contributing to community life, environmental comfort, and the overall social sustainability of the block.

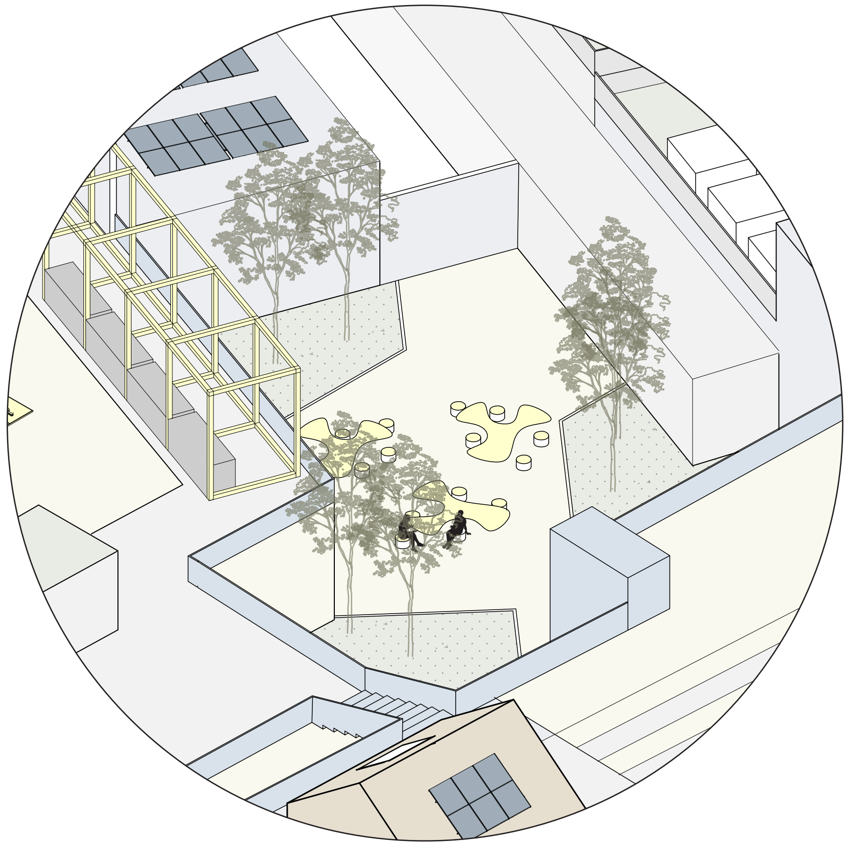


Figure 5.39.Public space within the integrated final strategy
Source: Author

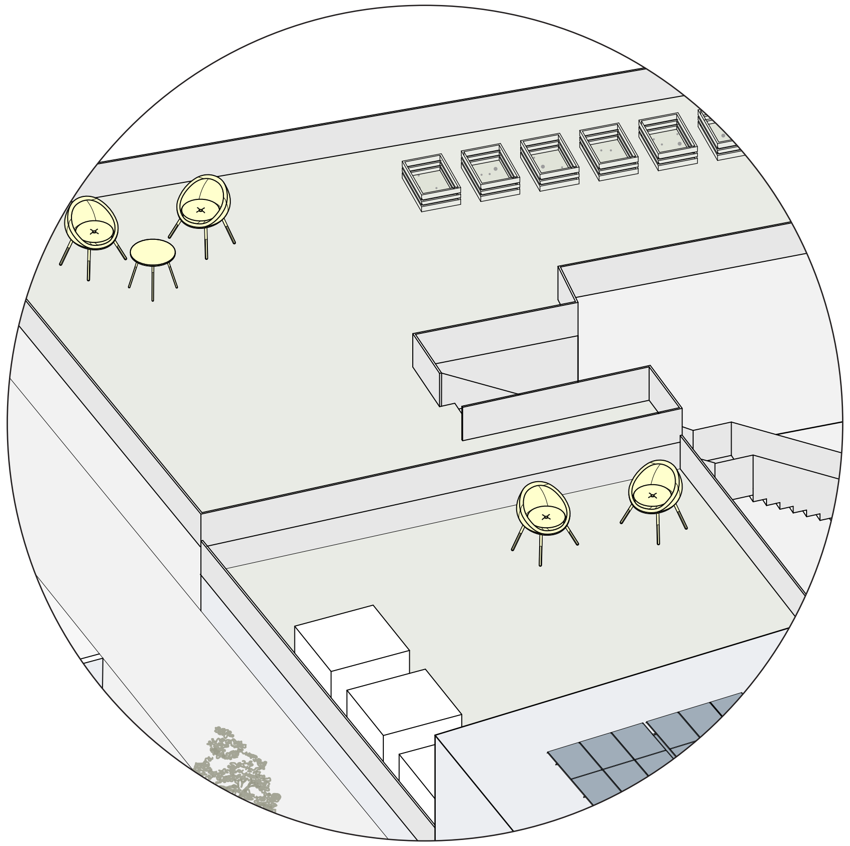
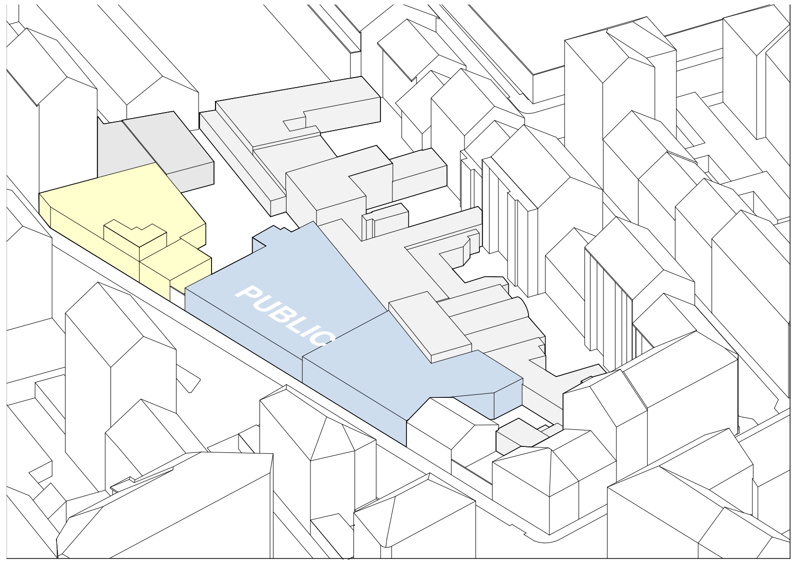
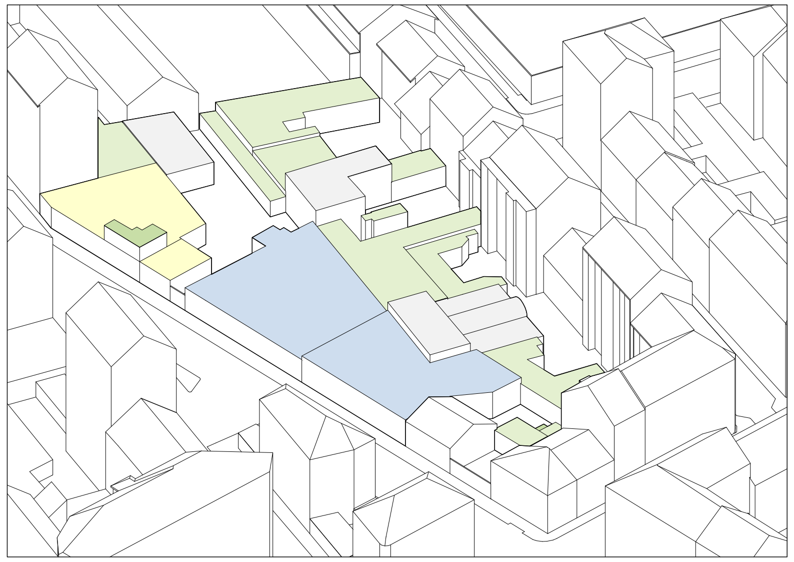


Figure 5.40.Collective space within the integrated final strategy
Source: Author



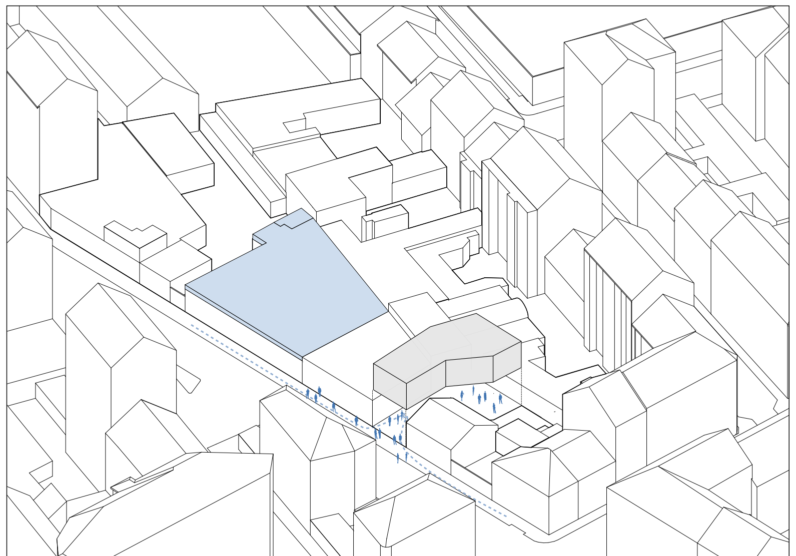
Public Collective Private

Figure 5.41. Zoning Framework
Public, collective and private spatial distribution across the rooftop system
Source: Author



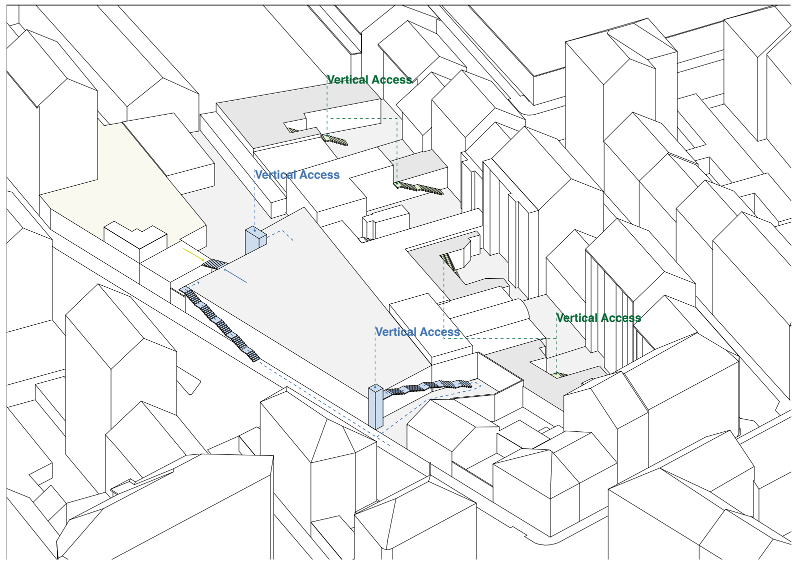
Final Hybrid Green roof Energy Production

Figure 5.42. Assignment of strategies
Allocation of hybrid public space, green roof, and energy-production areas within the integrated strategy.
Source: Author



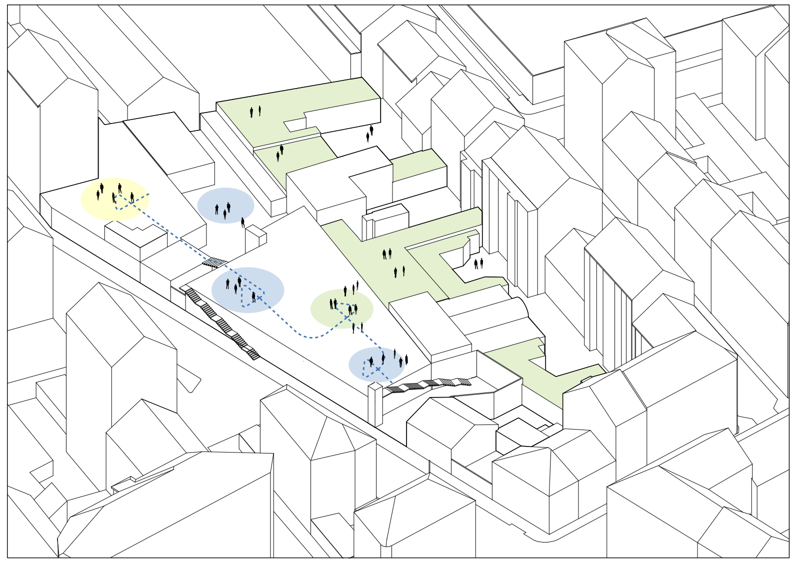
Add Substract

Figure 5.43. Volumetric transformation
Volumetric addition and subtraction shaping the rooftop spatial configuration.
Source: Author



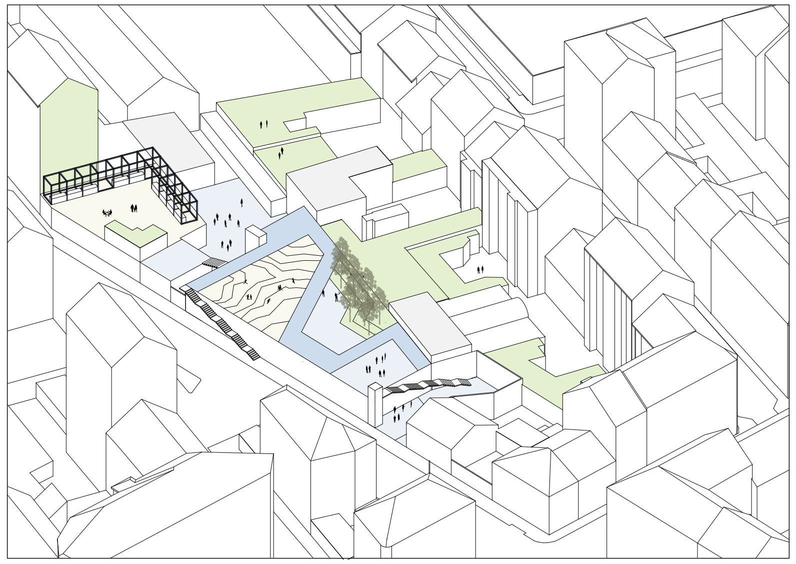
Final Hybrid Green roof Energy Production

Figure 5.44. Accessibility framework
Definition of vertical and horizontal access connecting ground level and rooftops
Source: Author



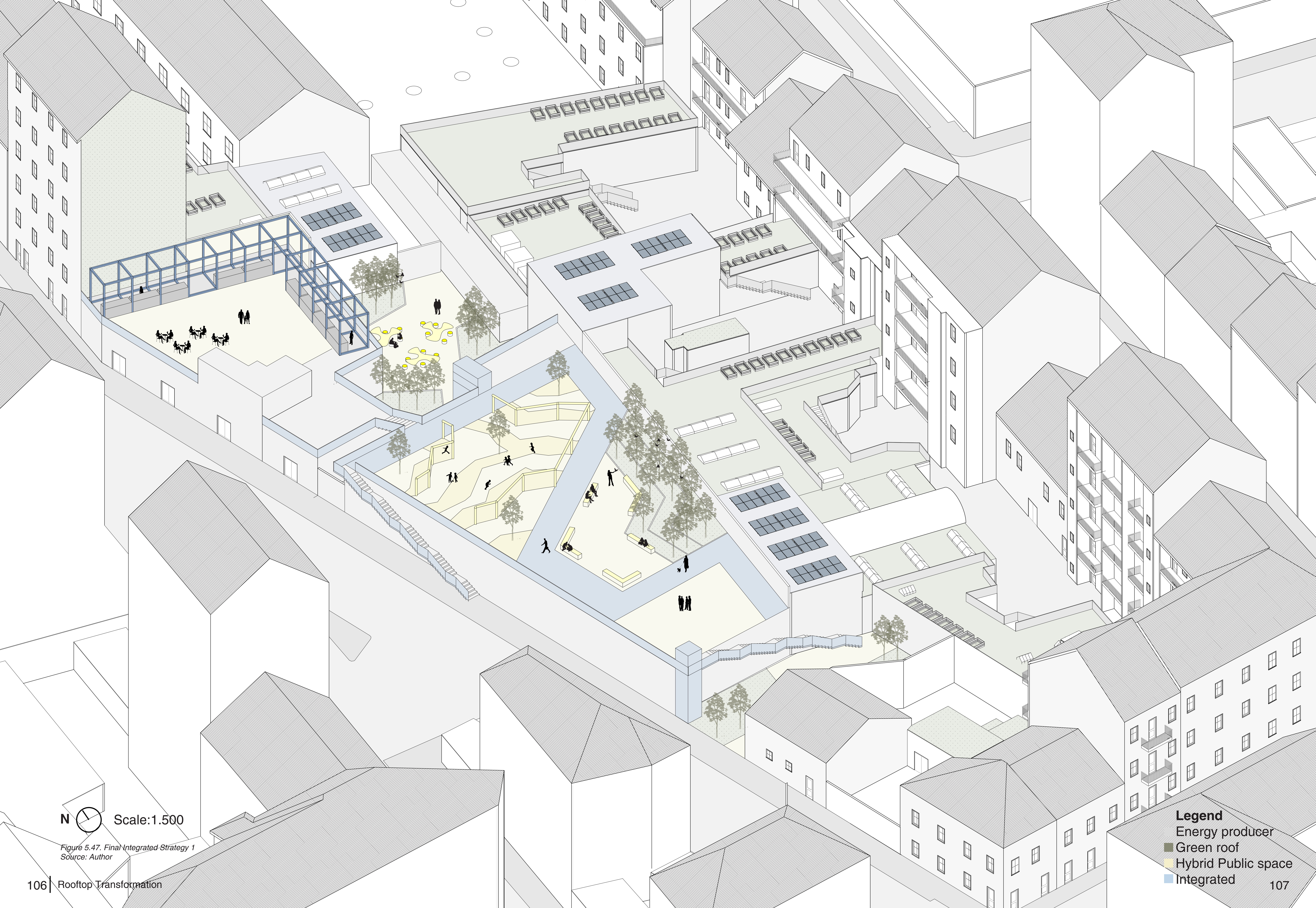
Final Hybrid Green roof Energy Production

Figure 5.45. Activity distribution
Spatial rules guiding movement, use intensity, and location of activities across the rooftop
Source: Author



Final Hybrid Green roof Energy Production

Figure 5.46. Final integrated design
Integrated rooftop system combining access, programs, environmental strategies, and public life.
Source: Author



N Scale:1.500

Figure 5.47. Final Integrated Strategy 1
Source: Author

Legend
Energy producer
Green roof
Hybrid Public space
Integrated

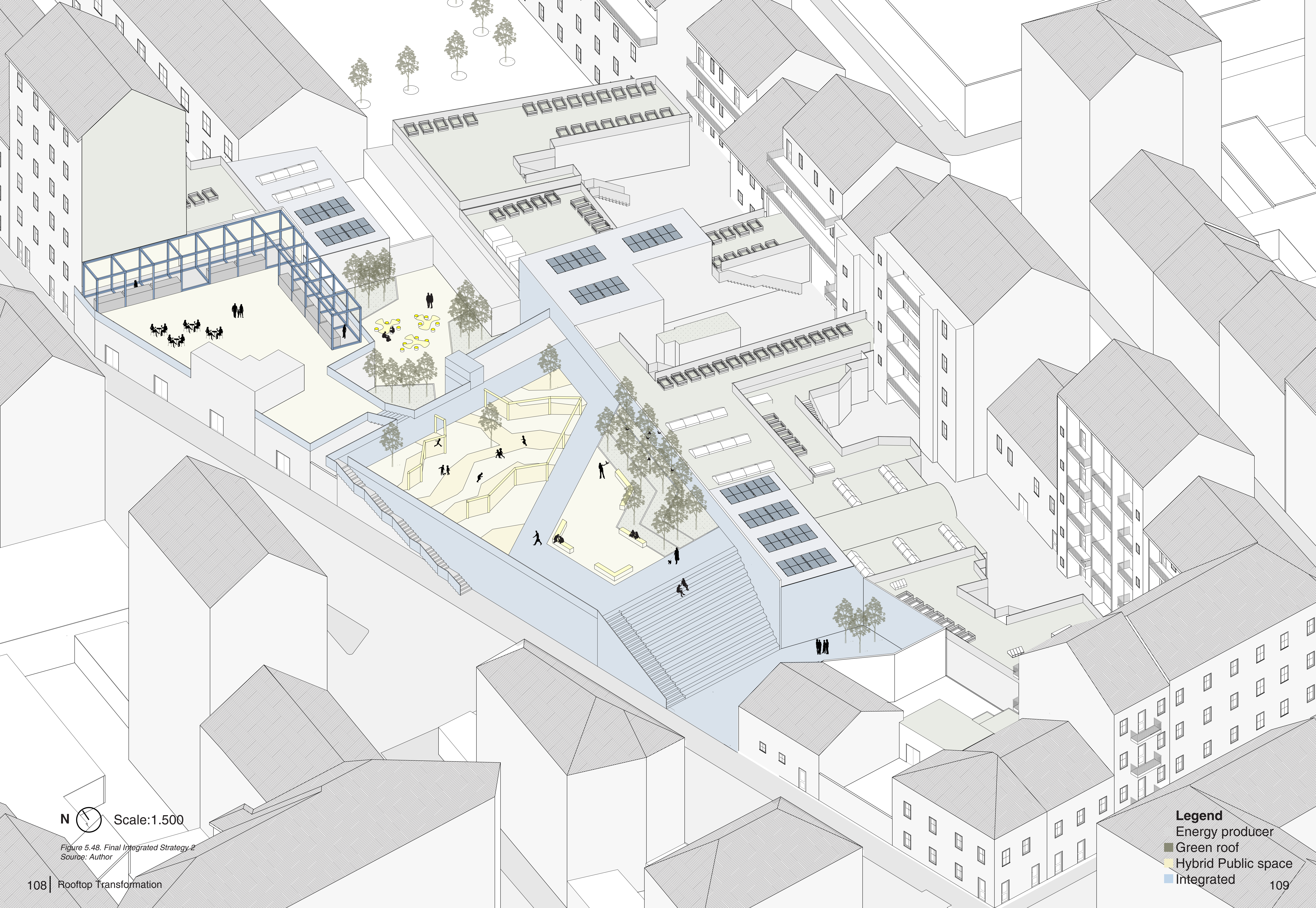


Figure 5.48. Final Integrated Strategy 2
Source: Author

Figure 5.49. Final Integrated Strategy 2 Plan
Source: Author

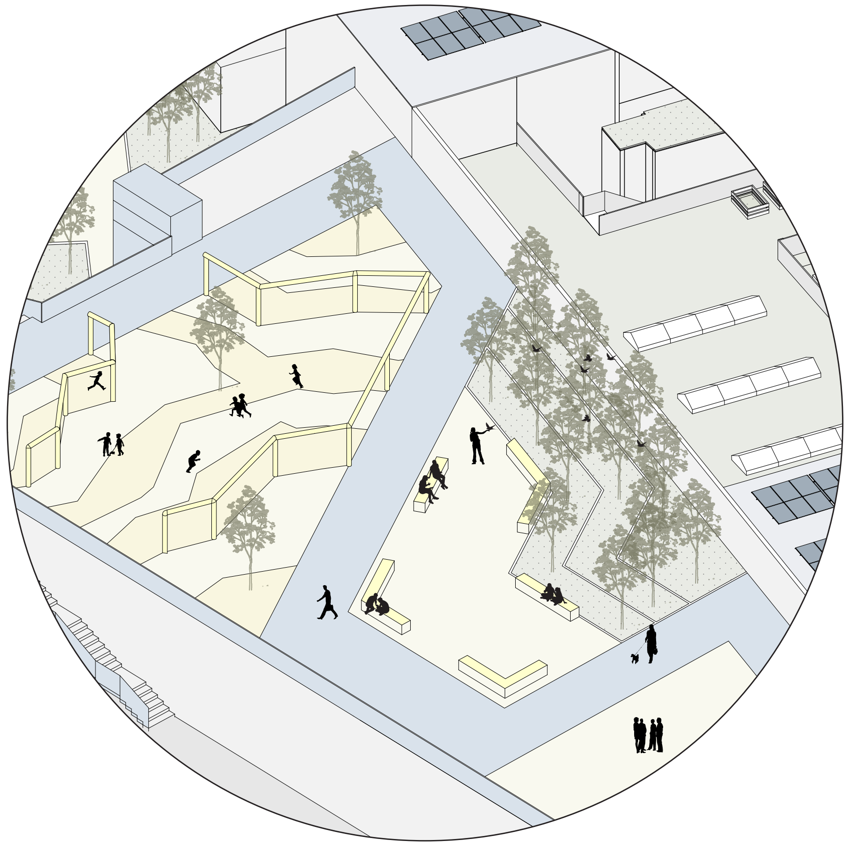


Figure 5.50. Public rooftop space as part of the integrated final strategy
Public platform supporting informal gathering, circulation, and everyday social interaction
Source: Author

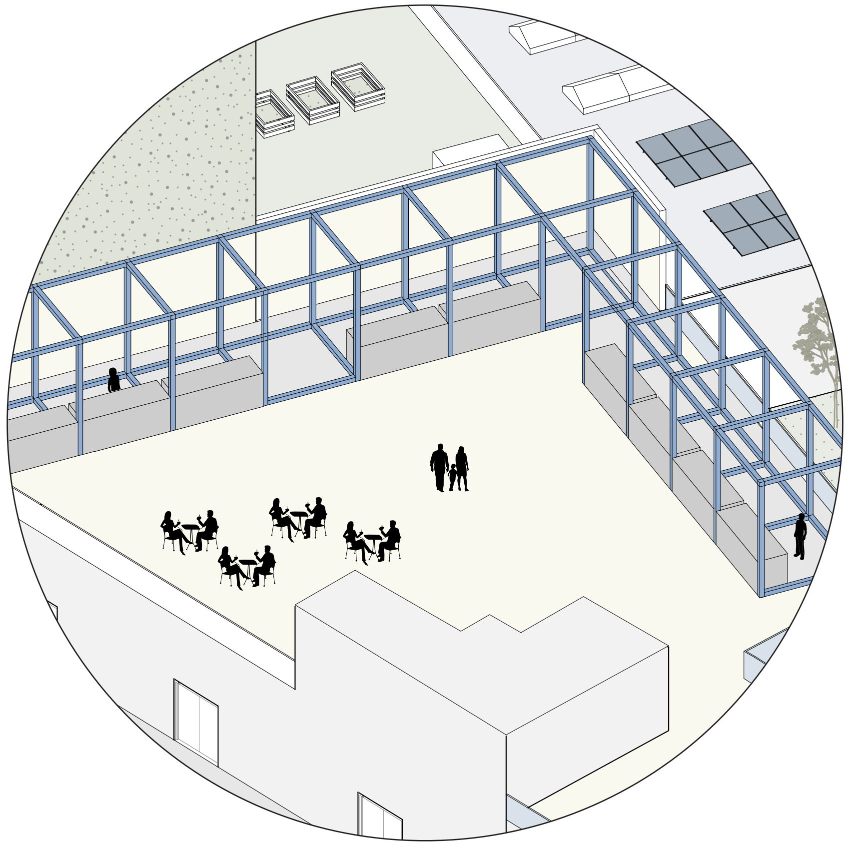


Figure 5.51. Temporary market as a collective rooftop space
Lightweight and reversible structures enabling seasonal markets, events, and economic activity
Source: Author

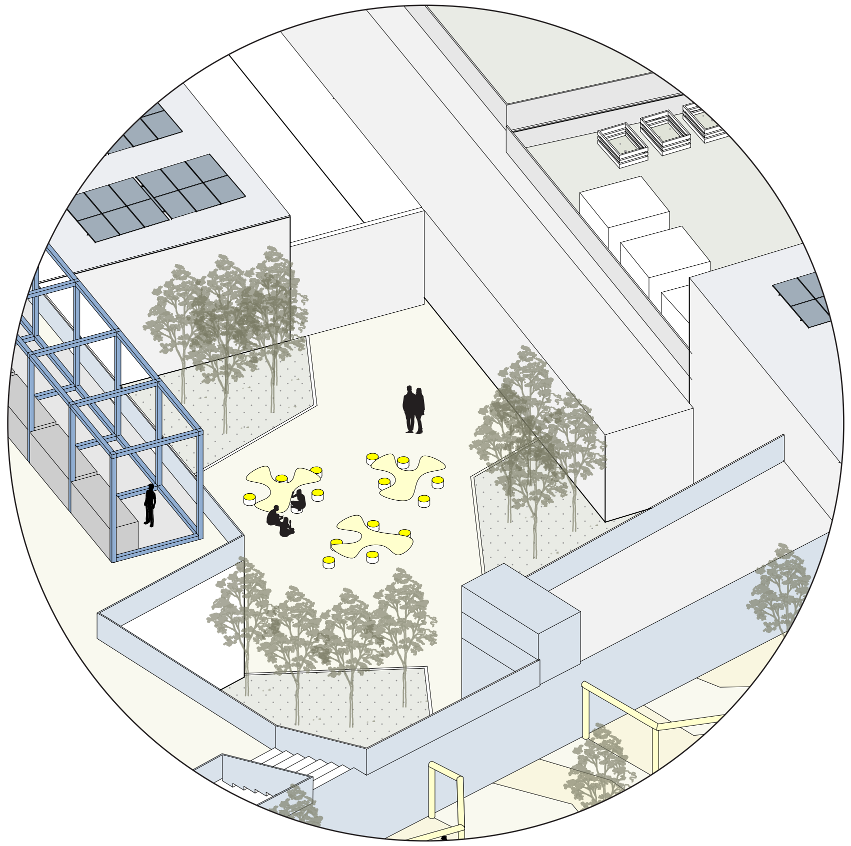


Figure 5.52. Ground-level public space connected to the rooftop network
Public open space reinforcing continuity between ground and roof and supporting daily urban life
Source: Author

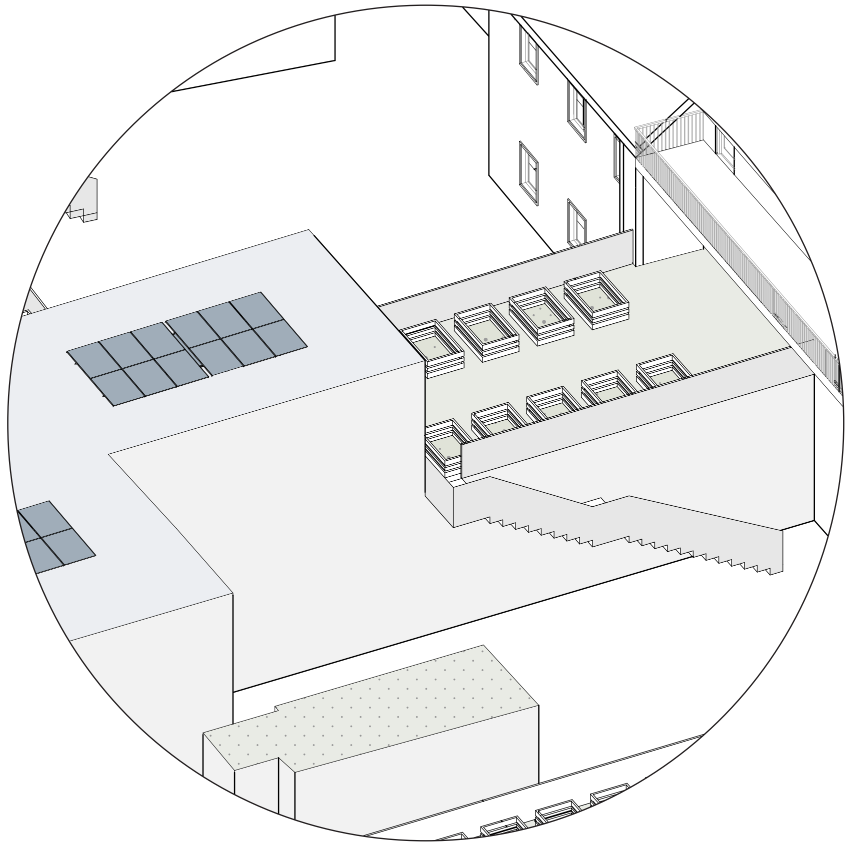


Figure 5.53. Private rooftop connectivity space for residents
Restricted-access rooftop area designed for residents, enhancing internal circulation and shared domestic use.
Source: Author

05.2.5.5.**Stepped stair in the Integrated Final Strategy**

This stepped public space is inspired by MVRDV's approach to architecture as an open social platform at TU Delft University. Although the building is no longer used as MVRDV's office (Why Factory), it has become an iconic urban place that hosts lectures, exhibitions, galleries, and public events, while also functioning in everyday life as an informal gathering space where people sit, meet, and interact. Located adjacent to the BK café, the space is actively used throughout the day as part of the university's social life.

In this project, the stepped configuration is reinterpreted as a hybrid interface between roof and ground, enabling movement, pause, and collective use. The stairs function not only as circulation elements but also as seating, stages, and social infrastructure, supporting both programmed events and spontaneous daily activities. Through this spatial strategy, the rooftop becomes accessible, visible, and socially active, reinforcing its role as a place of gathering and interaction within the urban fabric.

Figure 5.54.Why Factory, MVRDV, TU Delft
Source:By Author

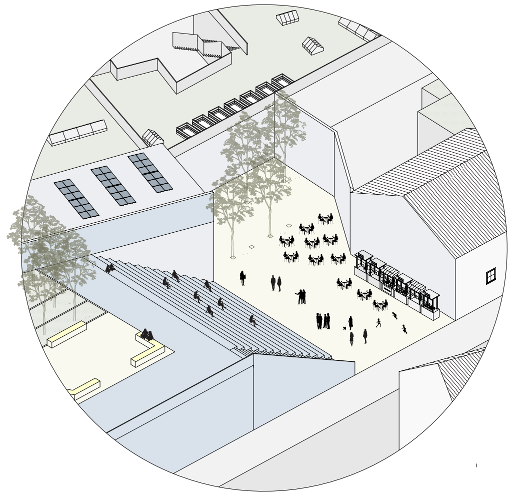


Figure 5.55.Open Space
Source:Author

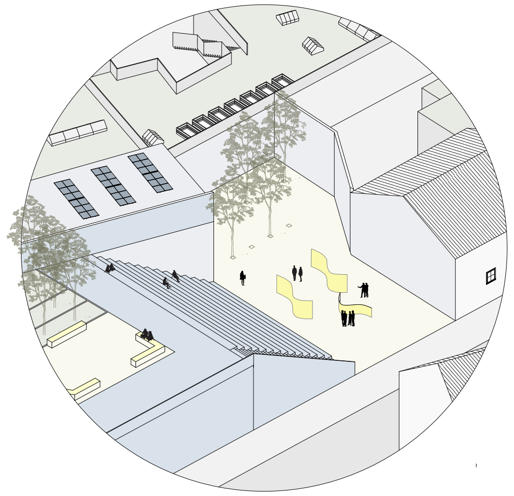


Figure 5.56.Open Gallery
Source:Author

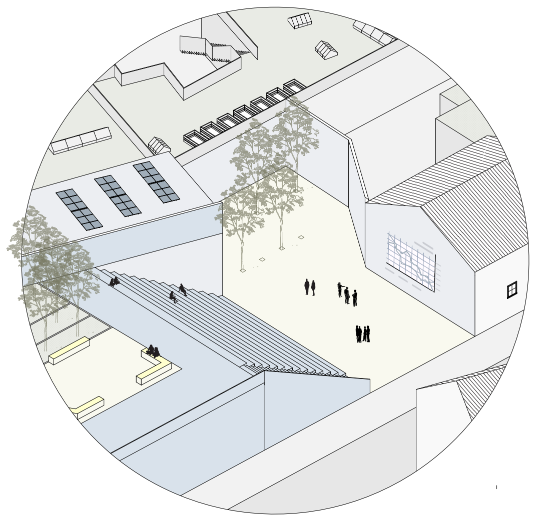


Figure 5.57.Events, lectures,cinema
Source:Author

05.2.5.6.**Temporary Market in the Integrated Final Strategy**

For the semi public space, as this space have the owner and it need to be profitable for the owners the design is using the lightweight reversible structure, based on the context of turin and different markets like corso racconigi and other cultural market this market can be a open weekly market that accomodates the daily needs of the residence and it can be profitable for the owners.

The commercial spaces are conceived as lightweight, reversible, and demountable structures, drawing inspiration from Assemble Studio's seasonal and participatory installations and Lacaton & Vassal's logic of adaptable and non-permanent envelopes. Designed as modular systems using light materials, these elements accommodate temporary and evolving uses such as pop-up markets, exhibitions, workshops, and seasonal events. these kind of elements are easy to attach and collect and it can also have different options based on people needs.

By remaining structurally independent and easily removable, the commercial structures minimize permanent impact on existing buildings and rooftops while enabling reuse and spatial flexibility over time. This approach supports an incremental transformation strategy and reinforces the understanding of rooftops as dynamic, adaptable, and multifunctional urban spaces rather than fixed architectural objects.

Figure 5.58.Horst Festival, 2017
Source:https://assemblestudio.co.uk/projects/horst-festival

Figure 5.59.Design By Assemble Studio
Source:https://www.nudesignspaces.com/discover-digital-asset-s/p/assemble-studio

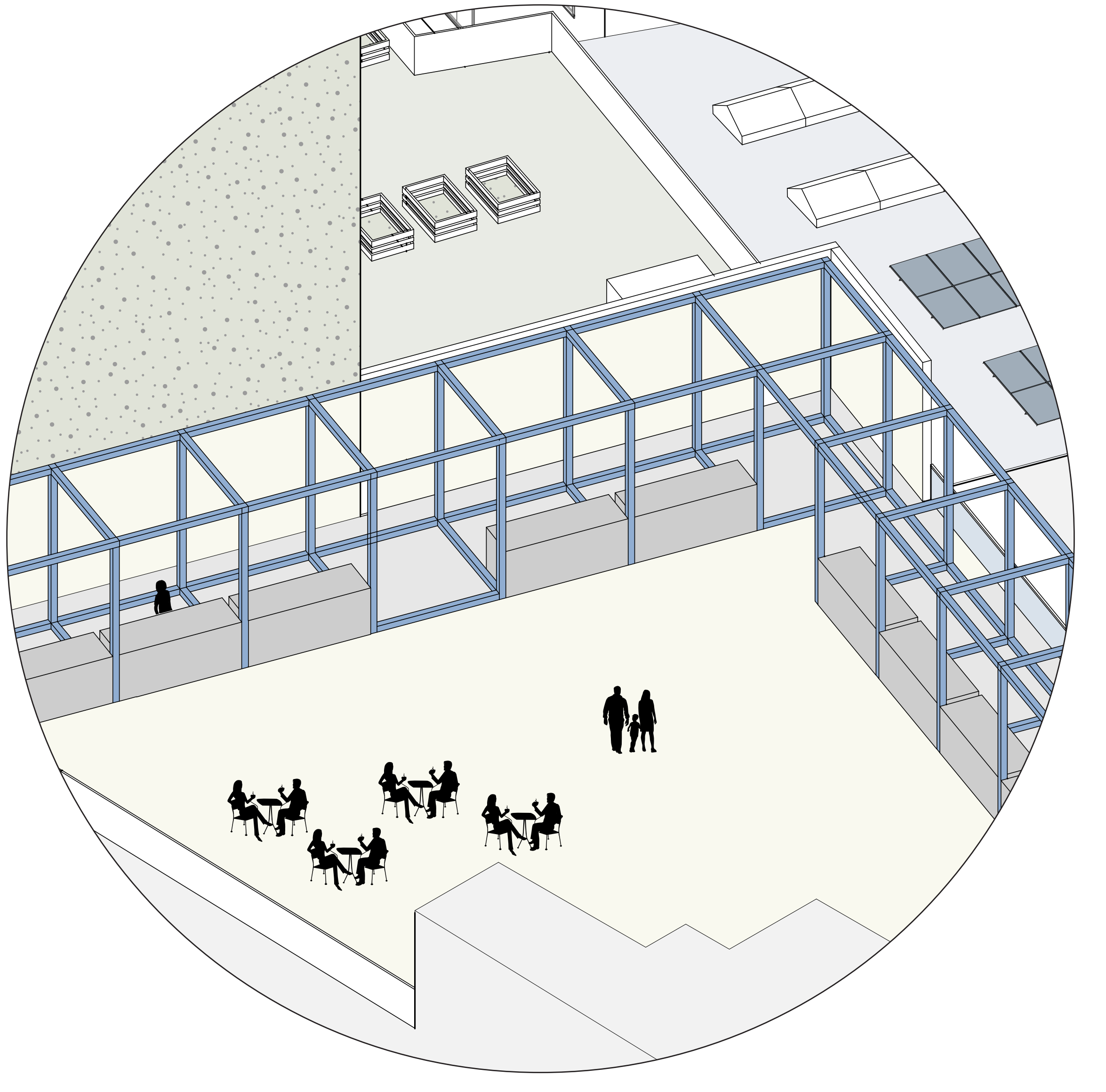


Figure 5.60. Temporary market Lightweight and reversible structures enabling seasonal markets, events, and economic activity
Source: Author

05.2.5.7.**Green Wall as Environmental and Visual Infrastructure**

Due to its scale and visibility, the large façade facing multiple rooftops, open spaces, and residential windows is conceived as a green wall. As a highly exposed surface, the wall becomes a shared visual element within the block, contributing not only to the environmental performance of the project but also to its everyday spatial experience.

The green wall improves microclimatic conditions by reducing surface temperatures, mitigating the urban heat island effect, and enhancing air quality through particulate absorption. It also contributes to stormwater management by retaining rainwater and slowing runoff. From an ecological perspective, the vegetated façade increases urban biodiversity by providing habitats for insects and birds, supporting a more resilient urban ecosystem.

Beyond its environmental benefits, the green wall plays a crucial social and perceptual role. As it is visible from surrounding residential units, it enhances visual comfort, reduces the perception of hard built surfaces, and introduces seasonal change into daily life. This constant visual presence strengthens the relationship between residents and nature, improving psychological well-being and contributing to a higher quality of living environment.

By transforming a large and potentially monotonous surface into an active ecological and visual element, the green wall functions as a shared environmental infrastructure that supports sustainability, comfort, and collective urban identity.

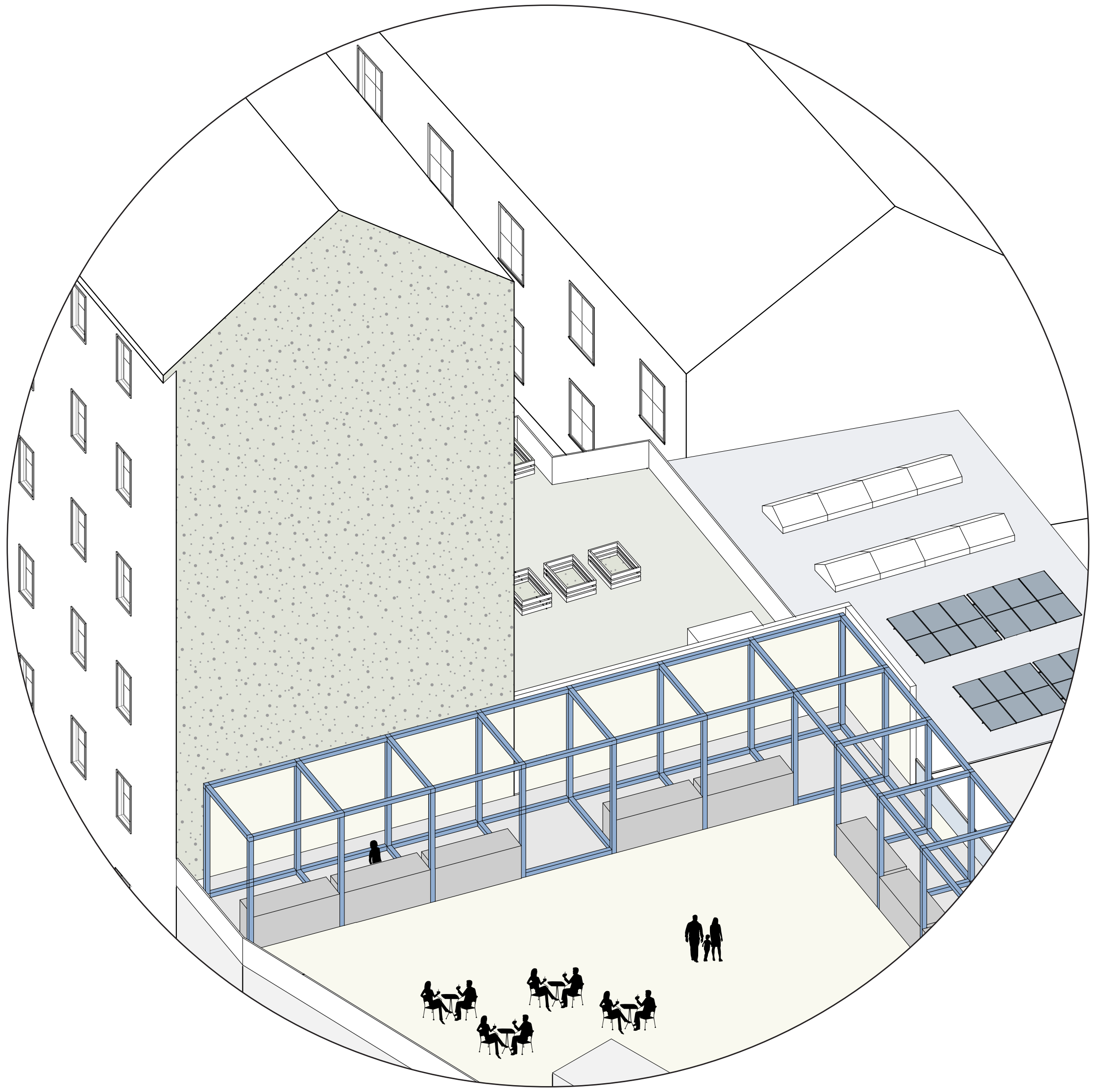


Figure 5.61. Green Wall
Source: Author

05.2.5.8. **Accessibility Strategy and Design Limitations**

Accessibility is a key principle of the final inclusive hybrid public space. During the design process, a ramp system was initially explored in order to ensure continuous and barrier-free access for users of all ages and physical abilities. The intention was to integrate the ramp as an urban element, allowing the act of movement itself to become part of the public experience rather than a purely technical solution.

However, due to the significant height difference between ground level and the rooftop, the ramp required to meet accessibility standards would result in an excessive length and slope. This condition would produce a space that is primarily symbolic rather than functional, risking underuse and reduced spatial quality. In this context, the ramp would function more as a design gesture than a practical and inclusive infrastructure.

For this reason, the final strategy prioritizes the use of elevators as the primary vertical accessibility solution, ensuring safe, efficient, and universal access to the rooftop public space. The elevator system is integrated within the urban framework of the project, maintaining inclusivity while preserving the usability and comfort of the rooftop environment.

This design choice reflects a critical approach to inclusive urban design, acknowledging that accessibility must be not only visible but genuinely usable. By balancing ambition with spatial and technical constraints, the project aims to create a public space that is accessible, comfortable, and realistically activated.

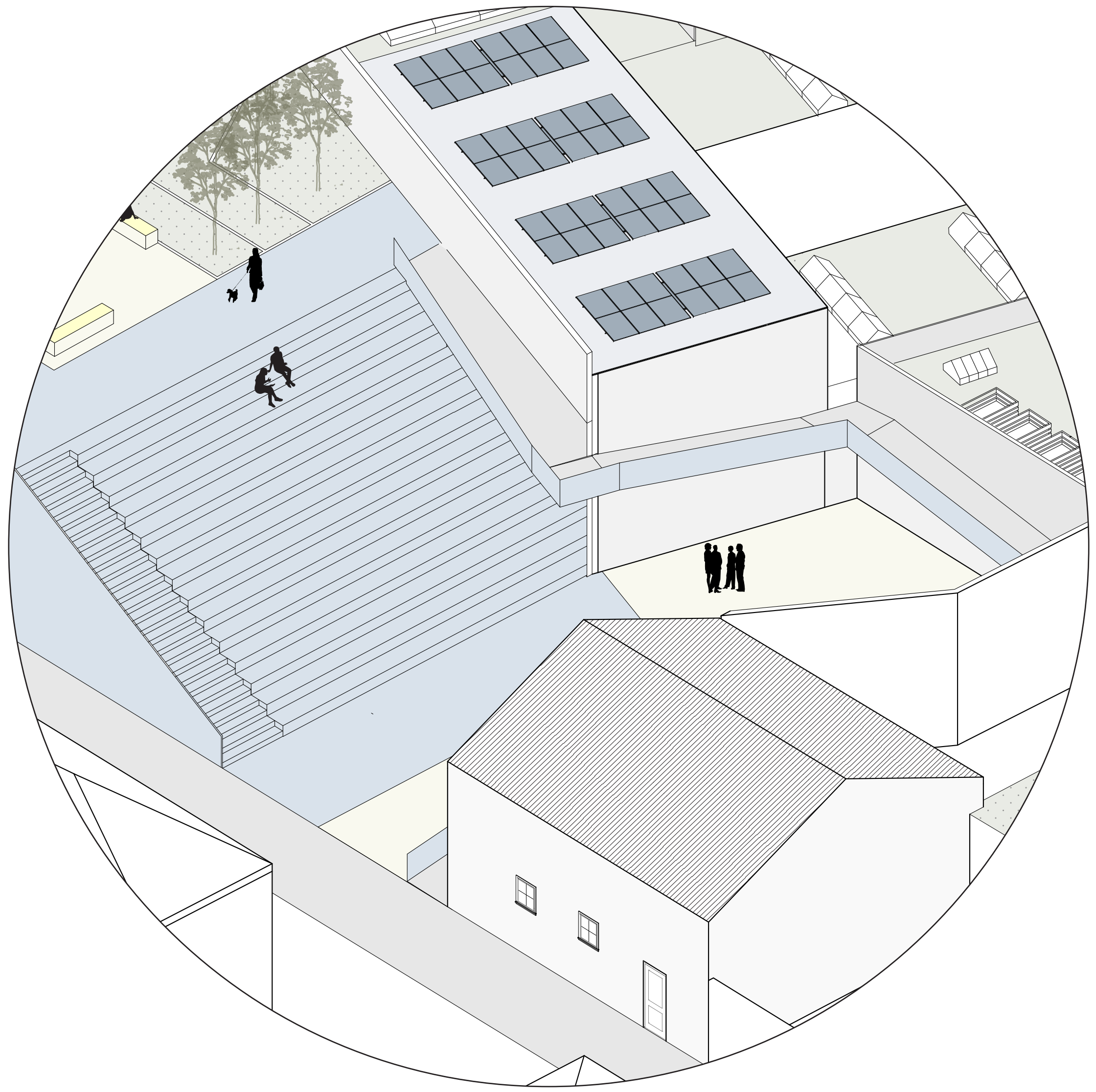


Figure 5.62. Ramp examination
Source: Author

Conclusion

The thesis has explored the potential of underutilized rooftops in urban areas as a strategy for sustainable and inclusive urban regeneration. In the context of Turin, a city facing demographic decline and ongoing land consumption, the research demonstrates the hidden potential of the city and the importance of rethinking of the role of the low-rise buildings as contributes to public life.

Focusing on the San Paolo neighborhood, the project adopts the framework of the compact city to reinterpret density as a qualitative condition due to the proximity, accessibility and shared use rather than quantitative growth. Through urban environmental and morphological analysis rooftops of low-rise buildings can accommodate ecological social and productive functions. The concept of metamorphosis guides this transformation as a gradual adaptive process that preserves the identity of existing fabric while enabling new forms of performance connectivity and meaning.

The analysis of international best practices, especially rooftop catalogue by MVRDV, plays a crucial role in shaping conceptual and methodological framework of this thesis. The references shows that how rooftops can serve as multifunctional flexible and socially active spaces. Rooftops inform spatial logic and their design can make project locally grounded and context responsive in San Paolo.

By transforming underutilized rooftops into energy-production, green, social and residential spaces, the project redefines rooftops as active components of the urban system. Through a set of adaptable and integrated strategies, including energy production, community gardens, hybrid public space, co-housing and their final combination, the research illustrates how urban resilience, social inclusion and environmental performance can be strengthened without further land consumption. Ultimately, the project proposes this transformation as a gradual participatory context-specific process that can offer a replicable model for compact and sustainable urban transformation.

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