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Adaptive Reuse of High-Rise Buildings for Housing: A Study of Istanbul Central Business District

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Abstract

The abrupt shift to remote work due to the Covid-19 pandemic increased vacant office spaces globally, especially in high-rent central business districts (CBDs). These vacant office spaces offer the potential for conversion into housing, addressing the shortage of affordable housing in central areas. Additionally, this topic presents a unique experimental ground for architecture students. This study focuses on the Istanbul CBD as a case study, examining the historical developments that led to a rise in office vacancy rates and housing inequality, and exploring the potential for adaptive reuse of these vacant office buildings. A key focus of this study is to underline the pedagogical value of adaptive reuse, highlighting how such projects can inspire more diverse and equitable housing models, fostering experimental and sustainable design approaches. It systematically evaluates the outcomes of a 4th-year architectural design studio that focuses on the adaptive reuse of the Tat Towers in the Istanbul CBD, a structurally vacant high-rise office building, and asks: How does the context of adaptive reuse enable a different design approach, and, potentially, new spatial norms and standards to emerge, and how might this hold a pedagogical value for architecture education? Following these questions, the article discusses how norms and standards are not only culturally but also typologically contextual, and how the students have explored how norms and standards might change, outlining new design approaches to adaptive reuse.

Keywords

adaptive reuse; building conversion; design studio; high-rise buildings; housing; office vacancy; spatial norms

1. Introduction

Covid-19 minimised the physical presence at work and created a sudden need for businesses and their employees to start or increase working from home (Istanbul Planlama Ajansı [IPA], 2021a; Organisation for Economic Co-Operation and Development, 2021). This trend continued and created higher vacancy rates in office markets worldwide, specifically in the central business districts (CBDs) with higher rents and operational costs. As a result, vacant office spaces are brought to the forefront as a potential for conversion into housing, and several opportunities and challenges arose, particularly concerning spatial norms and space standards in reusing such spaces.

Historically, high office vacancy rates have often been associated with financial and real estate crises (Remøy & van der Voordt, 2014), and oversupply of office spaces usually combined with a shortage of affordable housing (Barlow & Gann, 1995). Today, vacant offices represent a worry for global commercial property investors (Oliver, 2023) and simultaneously, an opportunity to address the growing demand for housing in central areas through adaptive reuse (Barlow & Gann, 1993; Bullen & Love, 2010; Canelas et al., 2022; Geraedts & van der Voordt, 2007; Keogh, 2023; Langston et al., 2008; Remøy & van der Voordt, 2014). For instance, the 1980s property boom (Ball, 1994) and the early 1990s recession resulted in high vacancy rates and the conversion of redundant office buildings into residential use in the City of London, Downtown Toronto (Heath, 2001), and Downtown Manhattan (Beauregard, 2005). Similarly, between 2002 and 2003, the dot-com bubble burst increased the vacancy rates in Tokyo, and since then, the conversion of vacant office buildings to residences has become common (Ogawa et al., 2007).

Post-Covid shifts in working habits, a downturn in property values, and relatively high cost and time of commuting resulted in higher rates of vacant offices. As of the second quarter in 2023, data reveals a 19.2% office vacancy rate nationwide in the US, with Downtown New York hitting a higher 24.2% (Cushman & Wakefield, 2023a). Central London saw an increase to 9.4% (Jones Lang LaSalle, 2023a), Downtown Toronto reached 15.8% (Coldwell Banker Richard Ellis, 2023a), Australia's CBDs reported 14.4% (Jones Lang LaSalle, 2023b), and Hong Kong experienced a record 15.7% vacancy rate (Coldwell Banker Richard Ellis, 2023b). Notably, a considerable proportion of these spaces are structurally vacant, implying extended durations of vacancy without a prospect of future occupancy (Remøy, 2010). Moreover, projections for the US suggest that without strategic interventions to improve or repurpose these spaces, only a quarter of office spaces will meet the demand by 2030 (Cushman & Wakefield, 2023b). These are not mere statistics but indicators of a profound shift in the urban fabric, necessitating strategic interventions.

In this context, Istanbul CBD is a compelling case. The Büyükdere–Maslak axis, which historically ran along a well-planned modern residential neighbourhood in the 1950s, has evolved into the major artery of the Istanbul CBD, where one-third of the Class A office space in the metropolitan area is located. According to recent data, the overall office vacancy rate in the Istanbul office market is 15.2% (Gayrimenkul Yatırımcıları Derneği, 2023), with the CBD's Class A office spaces witnessing a higher vacancy of 21.9% (Propin, 2023). Besides, Istanbul reportedly faces a housing crisis resulting from a combination of economic downturn, increasing influx of migrants, and extreme earthquake risk (World Bank, 2022). Despite these challenges in accessing affordable housing, the city experiences a new-build luxury housing surplus (IPA, 2021b) on the urban periphery and a significant vacancy in office spaces within the central districts.

Several factors contribute to the elevated vacancy rate in office spaces. First, the rapid increase in foreign exchange rates and high inflation in Turkey led to a rise in rents and operational costs. Second, the operational launch of the Istanbul Financial Centre in Ümraniye is anticipated to not only increase the total volume of available office spaces but also instigate the relocation of several key company headquarters. Third, the current architectural standards seem inadequate in accommodating the evolving demands of new working habits. Most significantly, the structurally vacant high-rises or "ghost buildings" substantially inflate the vacancy metrics. The Tat Towers in the Istanbul CBD, vacant since its completion in 2008, is a notable example. Excluding the expansive 142,000 sqm gross floor area of the Tat Towers, the Class A office vacancy in the area considerably narrows to 11.73% (Propin, 2023).

There is also legislative support for office-to-residential conversions but limited effort and know-how. The Zoning Regulations of Planned Areas defines CBDs as zones primarily for administrative, social, cultural, and commercial purposes, as well as social infrastructures. In 2022, a provisional article in building regulations was introduced, allowing up to an 80% conversion of land use from mixed-use (commercial and residential) to exclusively residential (Çevre, Şehircilik ve İklim Bakanlığı, 2022). This was aimed at repurposing a national surplus of 4 million sqm of office space into housing. Of this surplus, 1.5 million sqm is in Istanbul, equivalent to 10,000 new residential units.

Despite these legislative efforts, reports show that converting surplus office spaces in the Istanbul CBD to residential use could detrimentally impact living standards. This area's current social and technical infrastructure is designed for a maximum of 30% residential occupancy. Surpassing this limit could notably degrade the quality of life, including a projected 70% increase in traffic congestion (IPA, 2022). Therefore, while the legislative recognition for converting spaces in CBDs is evident, implementing these regulations requires clarification and refinement. Updated planning decisions, detailed design guidelines, and toolkits for practical application are notably absent and urgently needed.

While this topic requires immediate and collaborative action from governmental organisations, professional institutions, academic circles, and industry practitioners; it also presents an excellent research opportunity for architecture schools to explore and address these challenges in the design studio. More specifically, vacant high-rises have great potential for office-to-residential conversions. They not only offer earthquake safety and compliance with climate change strategies but are also conveniently located in the city centre and equipped with advanced infrastructure adaptable to the evolving spatial needs of residents. This entails a thoughtful reimagining of redundant buildings for relevant repurposing—explicitly to equitable housing, a critical review of urban planning with respect to environmental objectives, and a reassessment of spatial norms and standards in transforming global cities, all of which resonate with the complexity and research-led nature of advanced architecture studies.

Based on the outcomes from a senior year architectural design studio, this article asks how adaptive reuse context enables a different design approach in office-to-residential conversion, and potentially, new spatial norms and standards to emerge, and how this might hold a pedagogical value for architecture education. These questions are explored through a 4th-year architectural design studio, Tectonic Tactics, focusing on the conversion of Tat Towers—a structurally vacant, high-rise office building offering a strong case for adaptive reuse—to a residential function.

Moreover, the Istanbul CBD offers a valuable context due to its unique historical urban development—from affordable single-family houses and informal settlements to upscale housing developments—making it an ideal case to examine housing inequalities. From this point, this study aims to explore how the adaptive reuse of vacant office buildings might offer an opportunity to think about more diverse and equitable housing models as well as develop new design approaches that are more experimental and sustainable. The study is a means to explore issues of sustainability and how these might inform design briefs and strategies in architecture education.

The following sections introduce the research methodology, overview the historical developments leading to high office vacancy rates and housing disparities in the Istanbul CBD, outline the current spatial norms and standards in the area, and study the Tat Towers for potential reuses. This examination is crucial for exploring alternative living scenarios and influencing the democratisation of vacant private buildings in central urban areas, ultimately serving the public.

2. Method: Studio-Work-As-Research

Adaptive reuse stands as a distinct discipline, intersecting architecture, interior design, planning, engineering, and conservation (Plevoets & Van Cleempoel, 2019). It is recognised as both a cultural and architectural process with transformative potential (Lanz & Pendlebury, 2022). Along with the growing discussions on limiting new constructions or even advocating for a complete halt, it is progressively gaining more prominence in architectural education, with schools such as Hasselt University (BE), the Rhode Island School of Design (USA), the Manchester School of Architecture (UK), and Politecnico di Milano (IT) concentrating their curricula on this emergent field.

Acknowledging this pedagogical value, the study adopts a qualitative and exploratory research approach to evaluate the outcomes of Tectonic Tactics, a 4th-year architectural design studio conducted during the 2021/22 Autumn term. The course's primary objective was for students to develop research-driven design projects that integrate complex architectural programs within an urban context, along with advanced technological components and architectural representations. Focusing on the speculative and adaptive reuse scenarios in the Istanbul CBD provided students with a unique, real-world context.

The students explored the Büyükdere–Maslak axis, concentrating on the regeneration of two vacant structures: the Tat Towers and the Diamond of Istanbul. 38 students participated in the studio, with 34 working in pairs and four pursuing individual diploma projects for their design proposals. The term lasted 14 weeks and began with a five-week intense research phase. Students formed groups to compile a research book that covered five key topics: historical development, networks and infrastructure, energy and affordable life, the future of working and dwelling, and case studies of adaptive reuse. This research book later became a vital reference for their design process.

For their design proposals, the students conducted an in-depth analysis of vacant high-rises in the Istanbul CBD. The focus was divided, with six teams working on the Tat Towers and 14 teams on the Diamond of Istanbul. Given the study's limited scope, this article evaluates explicitly the six proposals for the Tat Towers, thereby excluding the projects concerning the Diamond of Istanbul. This narrower focus allows for a detailed examination of the student projects for the Tat Towers, highlighting the diverse approaches and solutions

proposed for its repurposing. Thinking through students' work helped us understand the research problem in a critical, speculative, and explorative way. It offered diverse perspectives on the future of vacant structures and equitable housing models.

Students' works were evaluated within a set of criteria. Based on the preliminary research on the adaptive reuse context and the historical development of the area, the criteria are technical solutions, design approach, use of space, organisation of sustainable living spaces, and integration with the city fabric. Six design proposals for the adaptive reuse of Tat Towers were evaluated. Their common and differentiating aspects were summarised and discussed according to the evaluation criteria.

3. Rising Vacancy Rates and Housing Pressures in the Istanbul CBD

The Istanbul CBD, widely known as the Büyükdere–Maslak axis, is distinct from its global counterparts in its inconsistent planning and development process. Historically, the area remained rural until the 1950s, planned initially as a military buffer zone for preserving Istanbul's northern forests and water basins. After the resignation of Henri Prost, the then-chief of the city's planning office, two major planning decisions were made in the area: first, the construction of the Levent houses in the 1950s, which were initially planned for low-income families, but eventually built as luxurious single-family houses; and second, the development of pharmacy, textile, and automotive industries until the 1980s (Öktem, 2005; Figure 1). With the arrival of internal migration flows, the industry rapidly led the spontaneous growth of squatter settlements around the axis that formed new neighbourhoods of Gültepe, Ortabayır, Çeliktepe, and Sanayi next to the industry and across the luxurious detached houses of Levent.

The four phases of the Levent housing project were built in the 1950s with the provision of low-rate, long-term loans for affordable housing by Emlak Kredi Bank, a former Turkish public bank specialising in real estate. The initiative aimed to address the issues of rapid urbanisation and housing shortages. However, the initial phases of the project drew criticism for their design as single-family homes, with unit sizes reaching 180 sqm,

Figure 1. Levent houses and industry development on Büyükdere Street. Images courtesy of Emlak Bank (left) and SALT Research/Gültekin Çizgen Archive (right).

which were too large to be considered affordable mass housing (Yöney & Salman, 2010). In contrast, the fourth phase was developed as multi-storey apartment blocks, which were later recognised in the national inventory as "an exemplary prestige housing area retaining its original settlement and architectural stylistic characteristics" (Ayataç et al., 2016, p. 266). Today, all phases of Levent houses remain occupied and are considered high-value properties.

With the infrastructural operations that connect the area to Istanbul's first (1974) and second (1988) Bosphorus bridges, as well as to its only international airport at the time, the axis attracted several of Turkey's largest holding companies to establish their headquarters (Öktem, 2011). The shift from industry to services became particularly evident in the Gayrettepe/Levent district, as former industrial buildings were demolished to build new high-rises. Today, this section of the CBD occupies a unique position, nestled between the Ortabayır and Levent neighbourhoods, presenting stark contrasts in sociological and demographic aspects and living standards (Figure 2).

Levent stands as a testament to urban planning ideals, with its single-family homes surrounded by gardens, systematic road layouts, parks, green spaces, and parking lots. In contrast, Ortabayır represents a more typical middle-class housing settlement, similar to Gültepe and Çeliktepe. The legal status of the informal housing in Ortabayır, Gültepe, and Çeliktepe underwent a significant shift in the 1980s, as these settlements were legalised (Ünsal, 2013). This legalisation was a governmental attempt to address the housing shortage,

Figure 2. Aerial view of the Büyükdere–Maslak axis.

especially in the absence of a formal social housing policy (Kuyucu & Ünsal, 2010). Despite these efforts, transforming the unplanned building stock into safe, affordable, and quality housing proved challenging. Here, you find irregularly structured, multi-storey apartments, lacking communal spaces, green areas, and parking.

In the following years, the Büyükdere–Maslak axis has become a landscape of diverse groups from business districts, gated communities, legalised squatter neighbourhoods, shopping malls, and university campuses. This transformation was initially driven by urban policies and planning decisions to attract direct foreign investments and new corporate headquarters. The axis became a hub for significant educational institutions, with the relocation of the Army War College and Istanbul Technical University, later followed by private universities. Moreover, a primary concern in the 2000s has been Istanbul's high earthquake risk, leading to the development of "branded housing projects" (Serin et al., 2020, p. 347) for exclusive communities in the area. Consequently, these multifaceted developments have intensified housing demands, reshaping the area's real-estate landscape.

On the other hand, the investment projects along the Büyükdere–Maslak axis did not always materialise as planned. For example, structures like the Tat Towers (1989–2008) and the Istanbul Tower 205 (2011–2019) have never been occupied and remained vacant since completion. The Rams Beyond Istanbul, formerly the Diamond of Istanbul, is currently under construction after being on hold for over a decade. These buildings have great potential for conversion into housing since they are safe from earthquakes, adaptable to climate change strategy and action plans, located in the city centre, and have high-tech infrastructure that can be appropriated for changing spatial needs.

Pressures on housing extend beyond the CBD and spread throughout Istanbul. It is estimated that over half of the housing stock of Istanbul is illegal either because the dwellings unlawfully occupied public or privately owned land, violated the zoning regulations, or were built without proper inspection and permits by disregarding the norms set by the authorities (Keyder, 1999, p. 143). Within the legislation, earthquake resilience, fire safety, and energy efficiency in buildings are three key regulations directly related to design and application (Altındaş, 2016) alongside city building codes. In the aftermath of the devastating 1999 Izmit earthquake, Turkey introduced new building codes—Turkish Earthquake Code 2007 and Turkish Building Earthquake Code 2018—that radically changed measurements and calculations, and limited design flexibility (Afet ve Acil Durum Yönetimi Başkanlığı, 2018; Bayındırlık ve İskan Bakanlığı, 2007). Although regulations were revised when needed, they were often loosely enforced; as a result, it was unlikely to succeed in extensive and skilful applications of design-oriented space standards.

Since 2019, the number of new constructions in Istanbul has dropped to a third of its previous levels (IPA, 2022), and over the last decade, these new constructions have predominantly been located on urban outskirts with limited access and infrastructure. This created a supply-demand imbalance in the housing market where the main provider is the deregulated private sector. From September 2021 to 2022, there has been a 212.2% increase in real estate prices (Türkiye Cumhuriyet Merkez Bankası, 2022), leaving the Istanbulites in a housing crisis, including newcomer students. Currently, there are over one million students enrolled in universities in Istanbul, where the student accommodation capacity is barely 120,000, according to official statistics.

4. Spatial Norms on the Buyukdere–Maslak Axis

The Büyükdere–Maslak axis has experienced varied regulations over the past 70 years due to discontinuities in its planning and development processes. When the zoning plan changed from industry to CBD, there was a subsequent shift in consumption patterns and lifestyles, ushering in upscale residences, shopping centres, and five-star hotels (Keyder, 1999). However, the spatial transformation of urban infrastructure failed to accommodate the demands of the new high-rises and their inhabitants. Economic instability expedited construction decisions, leading to the rise of large structures before essential infrastructure was in place. This absence of technological, regulatory, and legislative infrastructure resulted in a restricted and disconnected built environment. For instance, ground levels are used predominantly for commercial activities secured behind gates, while public access to upper floors and rooftops is non-existent. The street level is mainly car-oriented, with discontinuous sidewalks and crossings.

The parcels retain their long and narrow shapes from former industrial allocations, leading to the design of slender, elongated high-rise structures (Figure 3). While they tower upwards of 50–60 levels, they also extend underground for about 4–5 levels, encompassing functions like parking and storage. The base of these towers, spanning the first 4–5 floors above ground, often features more social programs. These spaces serve as shopping malls or community areas, tailored to the primary purpose of the building—be it residential or office space. Predominantly, these towers are occupied by offices and luxury residences, with their internal layouts mirroring global standards.

More than mere towering symbols of wealth, the towers can unify the contrasting Levent and Ortabayır districts. For example, the ground-level commercial spaces could play a crucial role as mediators,

Figure 3. The contrast between the office towers in Levent and the surrounding neighbourhoods.

harmonising the two distinct urban fabrics. For this, it is essential to diversify the social programs of these ground floors to cater to varied residential needs. To foster a deeper connection with the Ortabayır District, where open social spaces are limited, introducing outdoor activity zones, alongside indoor amenities, can help bridge the invisible divide between the areas.

High-rises along the Büyükdere–Maslak axis, visible from the Bosphorus and Asian side, symbolise Istanbul's modern transformation and embrace of new façade technologies. However, the privilege of their panoramic views is often reserved for a few, defined by socioeconomic status. One potential solution could be to open select levels of certain structures, such as the Tat Towers, to public programs, democratising the view.

5. Adaptive Reuse of the Tat Towers

To address current spatial issues in Istanbul, such as the unknown future of vacant offices in CBDs, the shortage of diverse and equitable housing models, and the absence of well-planned and adequate social and physical infrastructure, a fourth-year architectural design studio, Tectonic Tactics, was set up as a laboratory. This semester-long studio initiated a five-week intense research phase, where students examined the area. This covered the historical and spatial analysis of the area, mapping of transportation networks, infrastructure, and site-specific conditions, as well as exploration of energy production potentials, water collecting and treatment technologies, and alternative food sources. Further investigations sought to reimagine future working and dwelling models, as well as the future of commons. In the subsequent nine weeks, the term was dedicated to the design phase, where six groups of students developed adaptive reuse scenarios for the Tat Towers, integrating their research findings into tangible design solutions.

The 41-storey Tat Towers stand at the height of 143 metres, encompassing a gross floor area of 142,000 sqm. This expansive space is divided into 28 levels designated for office use, with an additional eight underground levels dedicated to parking, shopping, and recreational facilities. Each of the twin office towers occupies a floor space of 1,150 sqm, interconnected through a multi-level atrium that spans from the ground to the fifth floor, housing a shopping mall. Due to legal constraints, images of the interior and architectural drawings are limited. However, the plan drawing of the southern block shows that the building complex is constructed using reinforced concrete, and the towers' stability is achieved through 12 columns placed parallel to the core, aligning with the façade's octagonal design (Figure 4). The façade is designed with blue, uniformly panelled curtain walls (Figure 5). Students' analysis revealed that the adaptive reuse of less common typologies as such requires a different design approach and new solutions that might inform housing design.

Construction of the towers started in 1989 and reached completion in 2008, though the interiors remained unfinished. Towers have a strategic location at the entrance of the Büyükdere–Maslak axis, connecting two major traffic arteries, Büyükdere and Barbaros Avenues, linking to the first Bosphorus Bridge, and standing as one of the busiest public transportation hubs. One might expect the complex to have drawn considerable interest, yet the towers have remained vacant since their construction, embroiled in ongoing inheritance disputes among the owners. Legal disputes, rooted in familial conflicts, persist, making any demolition proposals questionable. Therefore, their 15-year condition as the city's "ghost towers" spotlights their potential for transformation and innovation. However, compounding the issue, a 2011 report by Istanbul Technical University highlighted structural compliance issues, noting that the existing system failed to meet the requirements of the Turkish Earthquake Code 2007 (Öztürk, 2011). As such, substantial repairs and

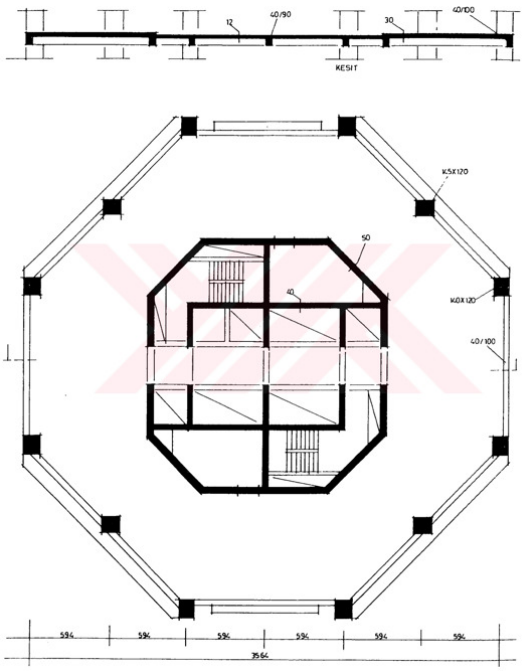


Figure 4. Plan drawing of the Tat Towers' southern block. Source: Yılmaz (1998, p. 56).

Figure 5. Street view of the Tat Towers.

strengthening work are prerequisites for the towers' future occupation in contrast with the newer high-rises along the Büyükdere–Maslak axis. Regarding this, students were also asked to consider and suggest structural improvements for a possible adaptive reuse scenario.

A notable aspect of the Tat Towers is their location directly across from the Zorlu Center, a mixed-use complex including residential, office, retail spaces, and performance centres. The construction of Zorlu Center, built on expropriated public land and once used as public housing of the General Directorate of Highways, was a matter of extensive public discourse. This vast 720,000 sqm complex, designed by Emre Arolat Architecture and Tabanlıoğlu Architects, was opened in 2014. The Centre boasts 72,000 sqm of

tiered green spaces and an expansive 45,000 sqm green roof, an "urban balcony" as named by the architects ("Zorlu Center / Tabanlioglu Architects + EAA - Emre Arolat Architecture," 2014). This green roof spans over the shopping mall, performance centre, and car park, with four luxurious towers—offering exclusive Bosphorus views and residences, offices, and a hotel—rising above. As one of Europe's largest green roofs, the "urban balcony" was conceived with the promise of public access. Ironically, despite its size and visibility, access remains restricted, resulting in a vast but inaccessible green vista (Figure 6). This makes the area particularly good for studying housing inequality and underlines the need for developing more diverse and equitable housing solutions.

Soules (2021) uses the Zorlu Center as an exemplar of "superpodiums," an architectural form that emerges from the rise of finance capitalism. Superpodiums amplify the housing liquidity by elevating residential towers above the ground and placing them on a "new" and "isolated" platform. The green roof of Zorlu Center, therefore, separates housing from the broader "global pool of investment assets." The intersection of finance capitalism and housing becomes particularly pronounced in such examples, given the financial sector's deep integration into housing real estate. Proximity to such a poignant symbol of stratification—between the "upstairs" elite and the "downstairs" masses—presents an opportunity. Any architectural proposal or intervention in this area would not only serve as a pioneering example but would also substantially boost public awareness. With predictions suggesting that by 2050 about 75% of an estimated 11 billion global population will reside in urban areas, the emphasis on vertical, dense housing becomes central in discussions of societal well-being. This makes the topic relevant for discourse within the architectural community and academic circles.

Students concentrated on scenarios addressing both environmental and site-specific concerns. While providing affordable housing for diverse demographics, these scenarios included programmes such as waste recycling, farming, energy conversion, education, retail, and services. All the studio projects emphasised the importance of crafting inclusive public spaces connected to residential functions; strengthening the structural system with innovative technology; and shaping a landmark that serves as a model for repurposing high-rise structures in a democratic manner.

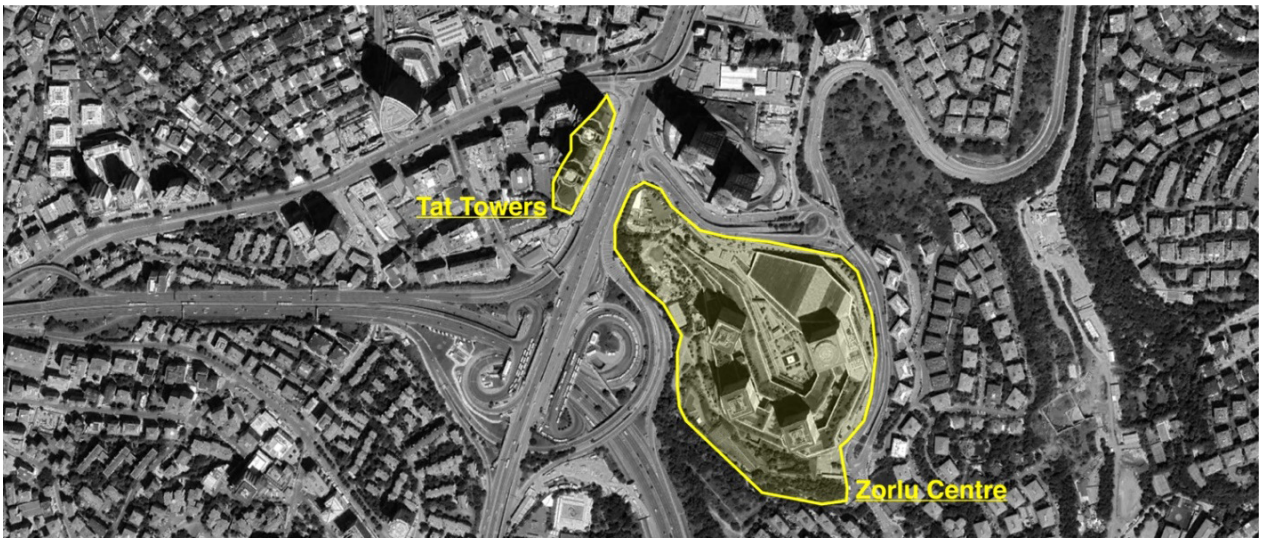
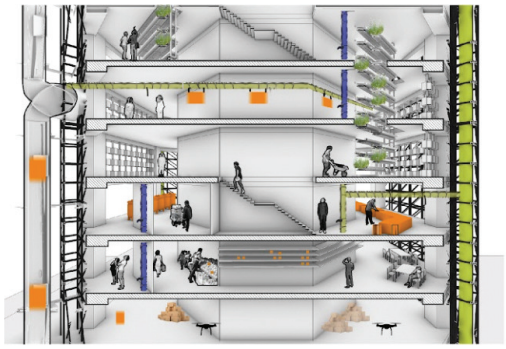
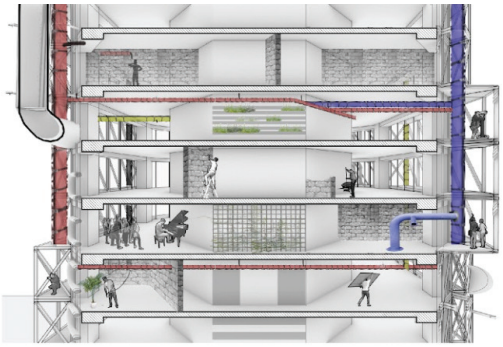


Figure 6. Aerial view of the Tat Towers and the Zorlu Center mixed-use complex.

Group 1 identified the high energy demands of heating, ventilation, and air conditioning systems as a key factor in the underutilisation of high-rises, and asked: How can we harness sufficient energy to facilitate co-living in these buildings? They suggested leveraging the unique aspects of high-rises, such as their height and visibility, to generate profit and forge an urban identity. This entailed a radical redesign, visibly integrating energy production systems into the building's façade, reflecting the area's industrial history (Figure 7). They proposed a set of sustainability measures: recycling waste, restoring water systems, installing wind turbines, promoting technologically advanced agriculture, and fostering urban beekeeping, the latter of which synergises with the diverse flora of the adjacent cemetery. These measures were designed to supply energy and food for both residents and public spaces. Regarding the future of housing,



Production + Drone System
The surplus of the products produced in the building is delivered to different regions with the drone system. This drone system, which repeats on different floors, enables the distribution of products quickly and easily.



Residence + Public Spaces
Users of the completely public space can temporarily use it for accommodation, work, etc. They also use it for activities. They can provide privacy by creating their own spaces with partition walls. The areas where the steel structure expands also increase publicity and increase the flexibility of the space.

Figure 7. Design proposal of Group 1. Images courtesy of D. Özer and H. Mutlu, 2021.

they predicted a shift in living patterns, with a trend towards reduced personal space, expanded communal areas, and downsizing or short-term uses.

Since the building is in an area used by office workers during the daytime, Group 1 proposed a residential solution that would allow those who work within the area but face housing affordability issues and long commutes the option to stay near their workplaces for short periods, with access to essential amenities like food and energy. Their concept reimagines not a house but a communal space offering "a bed" for the short term. Moreover, they strategically designed the towers to include public spaces, observation terraces on the upper levels, and exterior elevators. This proposal ensures that individuals from all income groups can access and enjoy the panoramic views of Istanbul, whether they are socialising, working, or resting.

Group 2 recognised the need for affordable eating options in the office-dense vicinity of the area, aiming to harness the communal spirit of food. They envisioned shared kitchens and expansive dining areas where people could gather at large tables for everyday meals or special events like weddings without incurring costs. Their vision included one tower dedicated to temporary uses—shared culinary spaces, event venues, a marketplace, and housing for office workers—while designating the other for permanent uses. The operation of the temporary tower was conceived to sustain itself, providing for energy and nutritional demands through methods like hydroponic farming, a distinction they wanted visibly reflected in the tower's façade. They proposed outfitting the left tower with a solar control façade to maximize spatial efficiency and modulate light and heat while reinforcing its structural integrity to support varied uses (Figure 8). Moreover, Group 2 planned to leverage the produce grown in the agricultural tower—considered a permanent use—by selling it at multiple outlets, thereby generating revenue and providing temporary housing units for local workers, aligning with the design proposal of Group 1.

Group 3 embraced the "entertainment for healing" concept addressing the psychological impact of economic strain and environmental distress. They proposed transforming the building into an accessible space for

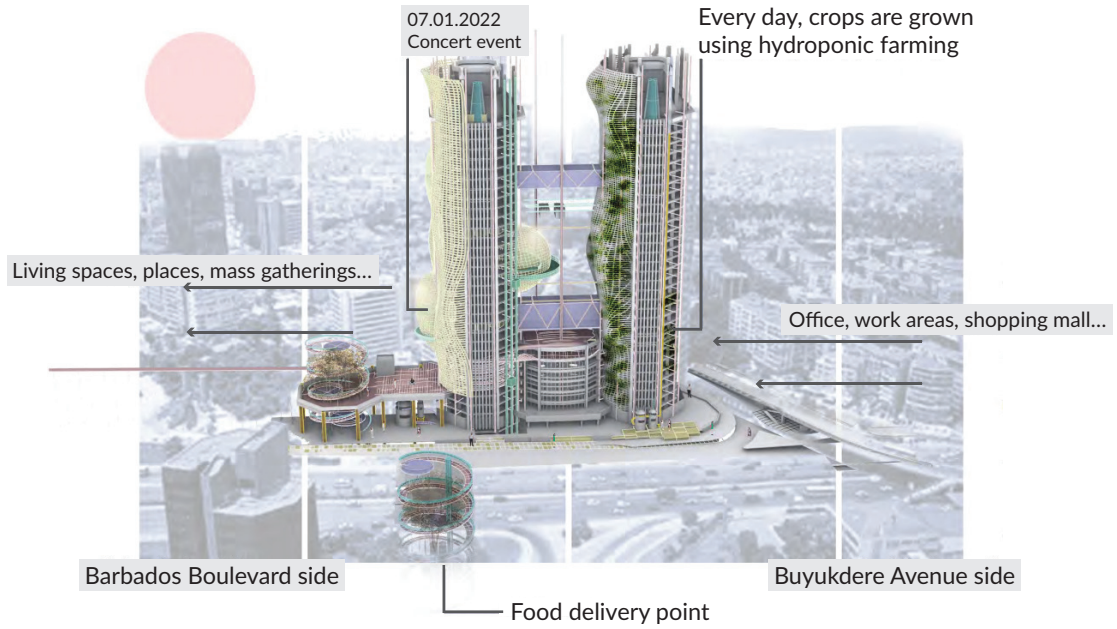
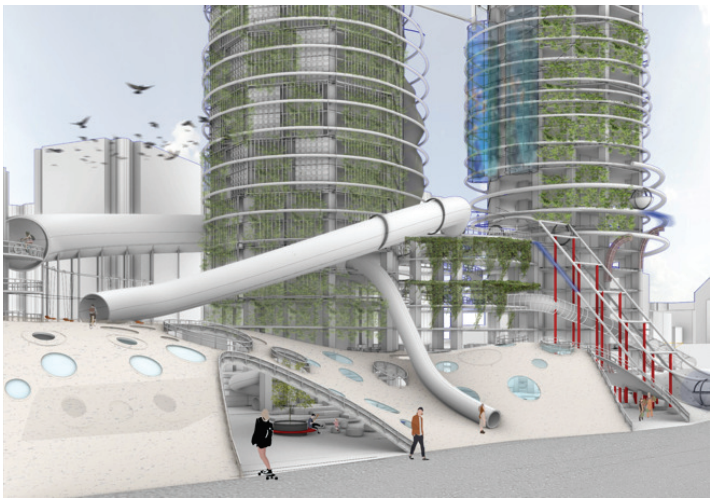


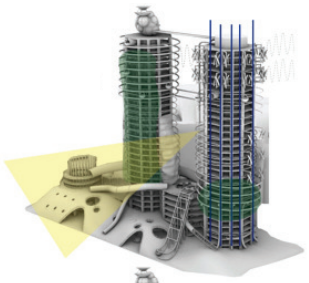
Figure 8. Design proposal of Group 2. Image courtesy of S. Koca and M. Sandıkçı, 2021.

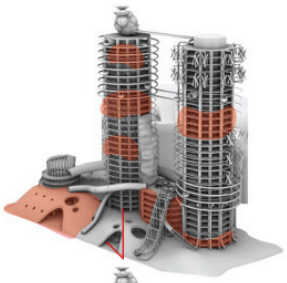
children, pedestrians, and cyclists by introducing a topographic façade that rises organically from the ground (Figure 9). This smoothly rising shell, intermittently perforated to allow natural light to penetrate, subtly refers to the underutilised shell of the Zorlu Center, which evolved into a green extension of the surrounding luxury estates over time. Their proposal aimed to create a multifunctional space where entertainment, housing, food, and energy production intersect harmoniously with hydroponic farming and algae cultivation, thus ensuring that the space was self-sustaining and engaging for individuals of all ages. Rejecting the conventional housing solutions, Group 3 reinterpreted the housing concept, seeking to provide shelter for those in need. They offered temporary housing to a broader demographic, including office workers, students, and women facing adversity.

Group 4 identified housing as a critical issue affecting not just families but also students and women in challenging circumstances, and they proposed a dual-purpose solution that would provide women's shelters and student dormitories within the building. They imagined the residents, as students and women, actively participating in vertical farming systems that would serve as a means of empowerment and a way to fulfil their basic needs. They also suggested a series of social programs to support the community further. Their



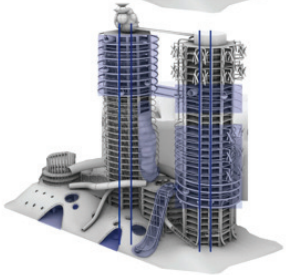
Step 1:
Open the building to the nature.
Natural resources (wind, sun, water) creating the systems that convert to energy (solar panels, wind turbines, aquaponic farming, vertical farming).

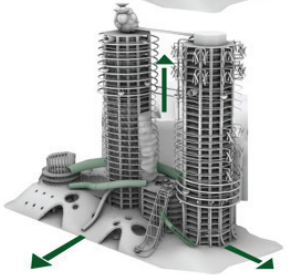




Step 2:
Adding commercial areas that create buildings' own economic cycle which is related with the future (data centers, future offices, drone garage, rentable event space, experimental open market).

Step 3:
Adding our main argument for structures to adapt the tower to our symbolic and innovative understanding.





Step 4:
Open the whole programs to the public.

Figure 9. Design proposal of Group 3. Images courtesy of C. Gürz and M. Kavçin, 2021.

architectural proposal features a shell beginning from the building's base and extending over the atrium, a design that not only covers the underground agricultural systems but also fosters public programs. This idea extends upon the unrealised ambitions of the Zorlu Center, bringing them to fruition. To address energy sustainability, they proposed the integration of algae panels into the façade, creating a unique night-time appearance. Their approach subverts traditional socioeconomic hierarchies, giving prominence and visibility to those often overlooked, ensuring that the towers' panorama is now a shared asset for all.

Group 5 proposed an innovative concept that refers to the area's historical ties to the textile industry and its position as a logistics hub due to its bridge connections. They envisioned repurposing textile recycling and clothing swaps as a communal meeting point, offering an alternative to traditional shopping malls. The building's height and central location were seen as strategic advantages, facilitating drone deliveries, and serving as a distribution centre for online shopping. Moreover, they suggested a sustainable energy and waste management approach for private and communal residences. Their proposal includes recycling furniture, water, and food waste, and integrating solar panels, wind turbines, and algae panels into the building's design, to create a self-sustaining ecosystem within the urban landscape. Their proposal also envisions inhabitants engaging in the building's production cycle, thereby eliminating the commute and creating a holistic environment that meets all essential needs of residents.

Group 6 identified disruptions to several systems, including accessibility, waste management, production, and housing in the area, and asked: How can we reconnect everyday life by treating the building as a topography? They analysed the urban actors, such as workers, shoppers, residents, travellers, and students, and addressed their needs to reconnect the dynamics of urban life. This includes transportation, offices, shops, recreational areas, and housing, with access through various designed paths and movements. By multiplying the ways of access, they challenged the conventional borders and limits of private property, questioned the dichotomies such as interior-exterior and public-private, and proposed an alternative sustainable living model for the Tat Towers (Figure 10).

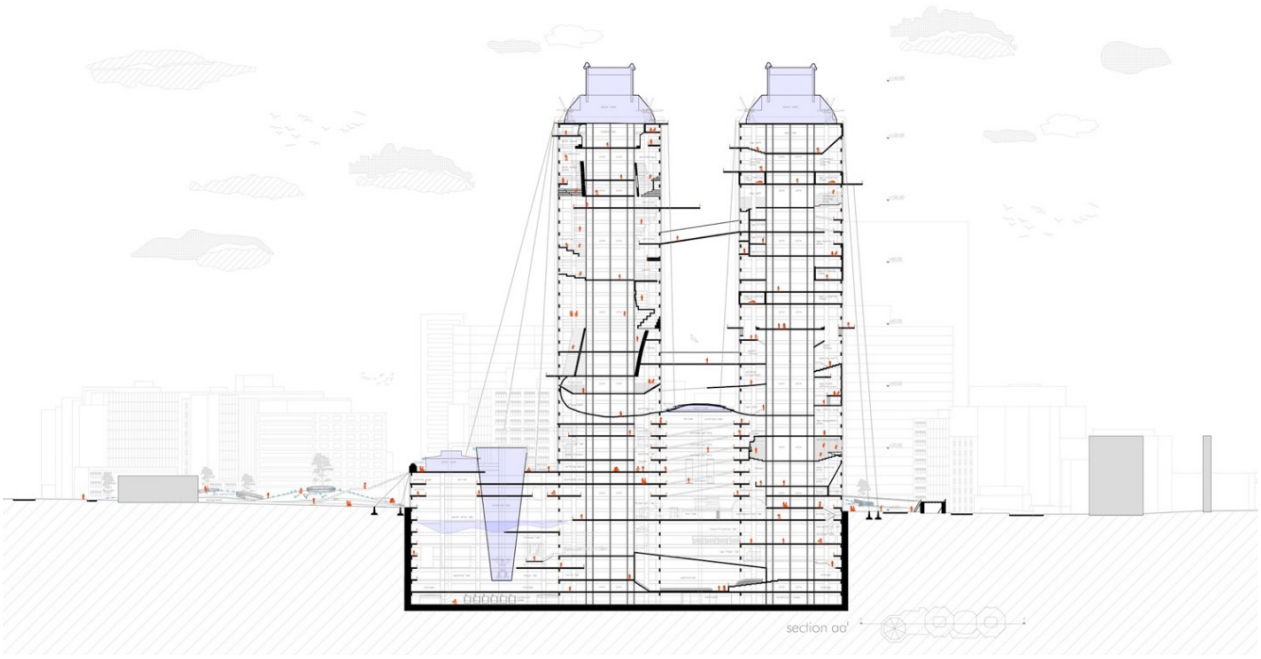


Figure 10. Design proposal of Group 6. Image courtesy of B. Meydancı and İ. Metin, 2021.

While discussing the topic in the design studio, the transformative potential of adaptive reuse was highlighted as a means to set a precedent. Beyond the benefits of lower costs and faster construction times, repurposing spaces with collective historical value into new, unique landmarks encouraged students to prioritise environmental considerations. It was critical for students to develop adaptable and flexible design proposals for various building types, including those under study.

Several recurring themes emerged in students' proposals. Foremost among these is the integration of food production into residential and social areas, a key component of the program. Proposals also included innovative solutions for the collection, purification, and reuse of water, and systems for recycling food and clothing. Renewable energy solutions featured prominently across the projects, with many advocating for using solar panels, algae-integrated façade systems, windshields, and wind turbines suited for high-rise buildings. These elements were functional and contributed to the building's unique identity and aesthetic.

The students' proposals reveal an understanding that housing issues are inextricably linked with economic and climate crises. A common thread across all design proposals is prioritising essential food, energy, and heating systems, reimagining the traditional home as a compact, temporary sleeping space. Moving away from standard 2- and 3-bedroom apartment layouts, the student projects envision short-term residential solutions, such as dormitories and shelters, to serve a diverse population. The emphasis on immediate, essential needs over traditional housing norms suggests that the urgency of the crisis has led to a focus on functionality and inclusivity in architectural design. For example, public spaces are integrated throughout the buildings, particularly on the upper levels, bringing communal areas closer to living spaces and enhancing accessibility.

Perhaps the most apparent commonality in the adaptive reuse scenarios for this prominent structure is the reliance on technology to support the envisioned "new life form." The proposed technologies and their display are integral to each concept, with façade designs deliberately detailed to showcase a technological aesthetic. This approach marks a bold step away from traditional aesthetics, highlighting a commitment to innovation and originality in the designs.

6. Conclusion

In cities such as London, New York, Toronto, Tokyo, Melbourne, and Hong Kong, the major conversion drivers have been sustainability aims, obsolete office buildings, and a tight housing market (Remøy & van der Voordt, 2014). In contrast, many office buildings in the Istanbul CBD already align with the green certification standards, are relatively new, and there is a surplus in the housing market, albeit with concerns about quality and accessibility. However, due to extreme earthquake risk, migration trends, and economic challenges, the growing need for secure, affordable, and energy-efficient homes is evident; and skilful applications of design-oriented space standards are inevitable in conversion. Consequently, democratising vacant or redundant private properties in central areas through adaptive reuse would epitomise the future of high-rises towards serving the public.

Studying energy crises, high-rise buildings, and extreme conditions in architectural design studios is often overlooked, yet delving into these topics is crucial. It has become evident that rather than developing housing units strictly designed for specific user profiles, there is a pressing need for inherently adaptable spaces conducive to communal or co-living arrangements. These spaces should prioritise optimising resources and

energy consumption and incorporate strategies to counter extreme conditions. To address these intricate and multifaceted challenges, a broader discourse is essential. Integration with diverse academic courses and formulating comprehensive recommendations are imperative, especially in the current landscape, where both research and practical applications in design are undergoing significant transformations.

While this study focused on the Istanbul context through an architectural design studio, many observations and insights are transferable to broader scenarios. To conclude, the students' proposals for adaptive reuse of vacant high-rise offices, such as the Tat Towers, present the following key potentials and challenges:

- The recent construction of these buildings typically incorporates earthquake resistance, promising safe housing options for diverse groups. Nevertheless, pre-earthquake code structures like the Tat Towers require strengthening work for compliance and safety. Students' projects tackled these issues, proposing structural improvements for the Tat Towers.
- The distinction between residential and office spaces is anticipated to diminish. Students embraced this potential and developed architectural programs such as mix-use, adaptable spaces, and inclusive short-term housing solutions such as dormitories and shelters.
- At present, these buildings stand isolated from their surrounding neighbourhoods. Transforming them into mixed-use programmes, improving public accessibility, promoting walkability, and ensuring sidewalk continuity can create socially inclusive spaces as well as co-living and co-working options for diverse demographics. Students highlighted this issue by focusing on pedestrian access and public social programs.
- Given their visibility from multiple vistas and their central location, these buildings have the potential to serve as iconic landmarks or models for future developments. Recognising this, students prioritised the façade design of their proposals to inspire subsequent adaptive reuse projects.
- Their energy-efficient, high-tech façade systems can optimise energy consumption, conserving resources and fostering environmental awareness. Many student groups proposed generating energy by solar panels, algae-integrated façade systems, windshields, and wind turbines.
- The integration of production and recycling systems within the future living scenarios of high-rises was deemed essential. The students' proposals highlighted the inclusion of spaces for food production, such as hydroponic farms, and emphasised sustainability measures encompassing water system restoration, waste, and textile recycling.

While this article explored the potential of converting high-rise vacant office buildings in Istanbul's context, the findings remained relatively broad due to the limited timeframe of the architectural design studio. Further in-depth and targeted studies on design solutions are essential to determine specific internal space standards.

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Conflict of Interests

The authors declare no conflict of interests.

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