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Chapter 10

Built Form and Market Value in Residential Layouts

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Introduction

Housing form in cities is often a direct reflection of urban policies and regulatory frameworks. Over the past few decades in Tehran, rapid urbanization combined with top-down building codes has transformed the traditional housing morphology. Courtyard-centered houses have largely given way to row apartment buildings under the pressures of modernization and regulatory compliance (Mohajer Milani & Einifar, 2020; Mohajer Milani & Einifar, 2017). Studies have posited that formal regulations—such as land use plans, building coverage limits, and sprojection requirements—are among the principal drivers of these transformations (Mohajer Milani & Einifar, 2020; Madanipour, 1998). For instance, the introduction of the "60% + 2m" building code in Tehran mandated that new constructions occupy only the northern 60% of a plot with a 2-meter frontal projection, giving rise to a standardized row-house apartment typology throughout the city (Mohajer Milani & Einifar, 2017; Shayesteh & Steadman, 2016). This policy not only standardized the mass-space configuration of buildings, but also created distinct spatial patterns (e.g., the so-called "northern" vs. "southern" apartment layouts) as developers maximized buildable area within the code's geometric constraints (Mohajer Milani & Einifar, 2017; Madanipour, 1998).

Urban form standardization has had clear benefits, such as efficient use of land and faster housing production, helping Tehran accommodate a growing population. However, it has also introduced challenges. Modern Tehran apartments often feature repetitive internal layouts that may not fully align with inhabitants' cultural preferences or evolving lifestyles. One notable concern is the preservation of privacy and hierarchy in domestic space – a cornerstone of traditional Iranian housing design (Dousti, 2018; Nayyeri Fallah & Khalili, 2015; Khamenehzadeh, 2017; Khozaei Ravari, Hassan, Abdul Nasir, & Mohammad Taheri, 2022; Seifian & Mahmoudi, 2007). In classic courtyard homes, spatial organization naturally segregated public guest areas from private family areas, reinforcing social norms of privacy (Nayyeri Fallah & Khalili, 2015). In today's standardized apartments, by contrast, open-plan living areas and exposed kitchens have become common as a result of space-saving and market trends, potentially at odds with longstanding cultural expectations of separation (Nayyeri Fallah & Khalili, 2015). Researchers have highlighted that privacy as a cultural value still plays a critical role in shaping how spaces are used, even if contemporary layouts do not inherently support it (Nayyeri Fallah & Khalili, 2015). For example, Nayyeri Fallah *et al.* (2015) found that lessons from traditional Iranian housing could inform better spatial organization in modern high-density units to address privacy needs.

Another outcome of policy-driven design uniformity is its interplay with housing market trends. The past several decades witnessed significant shifts in Iranian urban demographics and housing demand. Average household size in Tehran has steadily declined – by 2016 it was around 3.0 persons, with one- and two-person households comprising over a third of all households (Makino & Natsume, 2025). This demographic change creates demand for smaller, more efficient units. Yet the market's response, largely constrained by one-size-fits-all building rules, has been to supply many similar mid-sized apartments rather than a diverse mix of unit types. A longitudinal study by Darvish *et al.* (2019) analyzed Tehran apartments over five decades and noted a progressive reallocation of space within units (e.g. shrinking kitchen and living areas, smaller private rooms) to accommodate changing lifestyles. These findings suggest a housing stock in flux: while policies ensured a baseline uniformity (making units easier to mass-produce), the needs and preferences of residents have been evolving, sometimes leading to a mismatch. On one hand, standardization has made housing a commodity in Tehran's volatile real estate market – with apartments often bought and sold as investment assets. On the other hand, the lack of variety and flexibility in layouts could limit how well new housing meets the nuanced preferences of smaller families,

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multigenerational households, or those seeking features like home offices or enclosed kitchens, which the current dominant designs seldom provide.

Given this context, this study aims to read the contemporary urban form of Tehran's housing by examining its prevalent internal layouts and linking them to the policies that generated them. We focus on identifying the common apartment layout typologies that have emerged under regulatory influence, and we discuss how these typologies relate to market indicators such as housing supply trends and user satisfaction. The overarching goal is to elucidate the impact of urban policies on both the physical configuration of housing and the broader housing market, thereby informing future policy directions.

Theoretical Frameworks for Reading Urban Form

Urban form is often the unintended archive of past regulations. As Hillier and Hanson (1984) theorized in *The Social Logic of Space*, spatial layouts of buildings embody "rules" that can be analyzed as networks of connected spaces, revealing the social logic imposed by designers or policymakers. Space syntax research has since demonstrated how formal constraints and cultural norms shape these spatial networks in predictable way (Shayesteh & Steadman, 2013). In parallel, the typo-morphological approach (or urban morphology) emerged to classify and analyze the city's physical fabric. Typo-morphology, rooted in mid-20th-century Italian and French scholarship (Muratori, Caniggia, Panerai), combines typological and morphological analysis to describe urban form across scales (Cataldi, 2002; Moudon, 1997). It views the city as a dynamic structure shaped through time by the interplay between built forms and their users (Saylan & Gürer, 2024). This framework highlights recurring building types, street patterns, and open-space configurations, providing a contextual understanding of how housing layouts evolve. Crucially, both space syntax and typological morphology inform urban design and policy by revealing the linkages between spatial structure and social outcomes.

Another perspective considers urban policy as a form of design in itself. Planning regulations – such as zoning laws, building codes, and housing standards – act as invisible architects of the city by prescribing what can be built where. Scholars have noted that these rules not only constrain construction but actively shape the emergence of new building typologies and urban patterns (Shayesteh & Steadman, 2013). For instance, blanket regulations on building heights, plot coverage, or street access have introduced generic housing types and uniform layouts across different cities (Shayesteh & Steadman, 2013)(Mohajer Milani, 2021). This regulatory design perspective emphasizes that urban policies embed particular spatial visions (e.g., notions of density, order, or aesthetics) that manifest physically in housing layouts and city form. In summary, space syntax and typo-morphology provide analytical lenses to "read" spatial configurations, while an urban policy design lens recognizes that policy decisions themselves are a driving force sculpting the residential fabric.

Global Perspectives on Spatial Configuration, Daylight, and Housing

Major urban thinkers worldwide have enriched these frameworks with insights on how urban form affects social life, environmental quality, and housing markets. Madanipour foregrounds the socio-spatial interplay in city design, arguing that urban space is both product and shaper of society. His studies of Tehran's modernization, for example, show how imported Western planning models (New Town ideals, modernist layouts) strongly influenced the city's 20th-century form (Madanipour, 1998). Madanipour (1998) notes that foreign-trained planners brought paradigms from places like Paris, London (e.g., Milton Keynes concepts), and America, leaving a tangible imprint on Tehran's housing layouts and neighborhood design. This underscores a global pattern: planning ideas and policies circulate internationally, often reconfiguring local urban forms.

In contrast, Jan Gehl champions a human-centered approach, reminding planners that quality of space at eye level – sunlight, walkability, social interaction – is crucial for livability. Gehl's classic *Life Between Buildings* (1971) critiqued the modernist obsession with towers and open plazas that prioritized *sun, light, and air* at the expense of street-level public life. Modernist planners (e.g., Le Corbusier's "towers in a park") indeed ensured ample daylight and ventilation, but as Gehl argues, this often eliminated the traditional streets and social spaces that make cities vibrant (Gehl, 1971). Gehl's work, alongside William Whyte and others, demonstrated that intimate, well-designed urban spaces encourage casual interactions – an insight prompting policies to reclaim streets for pedestrians and ensure human-scale design (e.g., limiting blank facades, providing sunlight in public squares). Similarly, Jane Jacobs famously contended that diverse, fine-grained urban form underpins economic and social vitality. In *The Death and Life of Great American Cities* (1961), Jacobs identified *four ingredients for vibrant urbanism*: mixed uses, short blocks, varied building ages, and sufficient density (Jacobs, 1961). She showed that overly rigid, top-down schemes (such as uniform high-rise housing projects or superblocks) often disrupt this diversity, undermining local economies and community "eyes on the street." Jacobs' legacy has led urban policy toward "zoning for diversity", encouraging a mix of housing types and retention of older buildings – policies aimed at sustaining the unplanned richness that markets and communities create.

Access to daylight in housing is another universal concern linking design and policy. Pioneering work by Ralph Knowles introduced the *solar envelope* concept – a hypothetical volume within which buildings can be constructed so as not to overshade their surroundings (Knowles, 1981). This idea, and similar climate-based design principles, have influenced city guidelines worldwide by ensuring new buildings do not rob neighbors of sunshine. For example, the "right to light" is implicitly protected in many codes: in the UK, the Building Research Establishment (BRE) (2011) guidelines and local bylaws use tools like the 45° rule to prevent excessive shadowing, while in Japan (Sorensen, 2002) and China (Wang & Li, 2009) explicit solar access standards shape development. Research in building science also links daylight to energy efficiency and health, reinforcing why urban regulations often mandate minimum sunlight exposure for dwellings. In sum, global scholarship converges on a key point: the configuration of space – from street networks down to building massing – profoundly affects social interaction, environmental quality (light, air), and even economic dynamics. Planners and designers like Madanipour, Gehl, Jacobs and others advocate for policies that respect these relationships: policies that create human-scaled, well-lit, mixed environments tend to yield more sustainable and vibrant housing outcomes.

From an economic perspective, urban policy's impact on housing markets has been a focus of both planners and economists. A growing body of evidence shows that restrictive land-use regulations can constrain housing supply and drive-up costs (Gyourko & Molloy, 2014). Glaeser, Gyourko, and colleagues (Gyourko & Molloy, 2015; Glaeser & Gyourko, 2003), for instance, demonstrate that stringent zoning in high-demand cities results in prices far above construction costs, effectively a regulatory tax on housing. In a broad review, Gyourko et al. (2014) conclude that regulation "appears to raise house prices, reduce construction ... and alter urban form". In other words, planning decisions about density and layout can have unintended consequences on affordability and spatial equity. Conversely, scholars like Alain Bertaud argue that flexible, market-responsive planning can improve housing outcomes: when policies allow a variety of housing types and sufficient density in accessible locations, the market can better meet demand, moderating price spikes (Bertaud, 2018). Thus, integrating economic insight, we see that urban form and housing market trends are intertwined – policies that change building heights, parcel sizes or permitted layouts not only reshape city skylines but also influence land values, development rates, and who can afford to live where (Gyourko & Molloy, 2015). This literature underpins the need for balance: urban regulations should guide development to achieve public goods (like daylight, open space, historic character) *without* unduly impeding the supply and diversity of housing.

Urban Form Regulations: International Case Studies

To concretize these themes, this section reviews how urban policies in various global contexts have affected housing layout – from East Asian megacities to European and Middle Eastern traditions.

Tokyo, Japan: Japanese building codes explicitly incorporate sunlight considerations in shaping urban form. The national Building Standards Act employs *"shadow line restrictions"* that limit a building's height and shape so it won't encroach into the defined "shadow zones" of neighboring properties (Japan Ministry of Land, n.d.). There are multiple such restrictions – for instance, the *neighboring land* and *roadside* shadow angles, and a stricter *north-side* setback in low-rise zones – all designed to ensure that even in dense Tokyo neighborhoods, houses receive a minimum amount of direct sunlight (Ministry of Land, 2018). In practice, this means many buildings taper or step back as they rise, preserving light for streets and yards. Additional *shadow duration* regulations use the winter solstice as a benchmark to prevent new constructions from casting long shadows on adjacent lots for more than a set number of hours (E-Housing Japan, n.d.). Together, these rules have encouraged the characteristic slender, low- to mid-rise building profiles in Tokyo's residential areas, as developers opt to build up within a constrained envelope rather than cover entire plots. The emphasis on sunlight in Japanese codes reflects a cultural priority on natural light and ventilation in homes, and it has spawned a variety of innovative design responses (from multi-level setbacks to angled roofs) to maximize floor area while respecting the light rights of neighbors.

Shanghai, China: China's big cities likewise enforce sunlight access standards, profoundly shaping housing layouts in high-density districts. In Shanghai, for example, residential zoning regulations require that each south-facing dwelling unit receive at least one continuous hour of direct sunlight at winter solstice (during the critical 9am–3pm period) (Quan, 2017). This rule – common across Chinese cities – means that tower blocks must be spaced sufficiently apart, or staggered in height, so that lower floors aren't in permanent shadow. Planners use a formula (often based on a multiple of building height, e.g. a 1.4H shadow radius) to determine the needed spacing between buildings (Quan, 2017). The outcome is visible in Shanghai's newer housing estates: tall apartment slabs or point towers are often arranged in parallel rows or checkerboard patterns with generous gaps, avoiding the wall-to-wall canyon effect. At a fixed floor-area ratio (FAR), meeting the solar requirement typically forces trade-offs in form: taller, slimmer towers with smaller footprints can achieve the sunlight standard more easily than lower, bulkier blocks (Liu, Tang, & Zheng, 2024). Indeed, a study of Shanghai's codes notes that under a given FAR, increasing building height necessitates proportionally greater spacing, which the city mandates to guarantee each building's access to sun and air (Liu, Tang, & Zheng, 2024). In sum, Shanghai's urban policies illustrate a clear case where

environmental performance metrics (daylight access and energy use) directly influence housing form, producing a distinctive skyline of widely spaced high-rises set in green space. While this approach ensures light and ventilation – vital in the hot, humid climate – it also raises questions about land use efficiency and social life at ground level, issues that Chinese planners are actively debating.

London, UK: London's urban form has long been shaped by planning rules aimed at health, safety, and amenity, from 19th-century bylaws to modern development control. A historical example is the Public Health Act of 1875 (Great Britain, 1875), which empowered local authorities to enact housing by-laws establishing minimum standards for light and ventilation. Under these by-laws, the infamous tightly packed "back-to-back" houses were outlawed; instead, every new dwelling had to have its own yard or open space and windows of a certain size for adequate daylight (Hall, 2002). These standards gave rise to the characteristic Victorian terraced house layout with narrow, through-plan houses each having a small rear yard – a direct result of regulations ensuring no house was without fresh air and natural light. The legacy of those byelaw terraced houses (1875–1914) is still apparent in London's urban fabric and was a marked improvement in public health terms over earlier slum housing (Rosenfeld, Allen, & Okoro, 2011). In the contemporary era, London's planning system uses explicit guidelines to prevent new buildings from blocking their neighbors' light. A common rule of thumb is the "45-degree rule", used by many councils when assessing extensions or infill developments ((BRE), 2011). In essence, an imaginary 45° line drawn from the mid-point of a neighbor's nearest window should not be breached by the proposed construction, thus safeguarding a reasonable amount of sky view and daylight for existing homes. While not a hard law, this guideline (outlined in the UK's BRE Guide to Daylight and Sunlight) is widely applied to shape massing of additions. Moreover, London's recent housing design guides stipulate minimum daylight factors for habitable rooms and often require sunlight analysis for large projects. The cumulative impact of these policies is a city where even in high-density redevelopments, attention is paid to spacing, height, and orientation to maintain liveability – a practice rooted in London's long planning tradition of balancing growth with environmental quality.

Mediterranean and Middle Eastern cities: In many historic cities of the Mediterranean basin and the Middle East, traditional urban form was governed not by modern zoning, but by a mix of customary rules and incremental codes that evolved over centuries. Researchers like Besim Hakim have documented how, under Byzantine, Islamic, and Ottoman influences, informal but remarkably consistent codes guided the layout of streets and homes (Hakim, 2008). A quintessential feature was the courtyard house – a typology that naturally provided privacy, daylight, and cooling ventilation in a hot climate. Rather than mandating front and rear yards as in European codes, these traditional codes encouraged inward-oriented courtyards and close clustering of buildings along narrow streets, with mutual agreements to protect views and solar access to the courtyards. For example, medieval Arab cities had rules about not overshadowing a neighbor's courtyard; in some cases a homeowner's right to light was expressed through limits on the height of the opposite wall relative to the width of the street or courtyard between (Hakim B. , 1986). An interesting element in Mediterranean Islamic cities was the concept of *"fina"* – a small strip of public-right-of-way directly along private walls. While the fina (about 1–1.5 meters) was public, the adjacent owner had conditional use of it, effectively setting buildings back a bit to ensure passage and light. Another feature was the *"sabat"* (Mirmoghtadaee, 2009), a room built to span over a street or alley, connecting upper floors of a house – these were allowed only if a certain clearance was kept and if it didn't unduly darken the lane (Hakim B. , 2008). Similar ideas also observed in Yazd, kashan and many other Iranian cities (Kiani, 1999; Memarian & Brown, 2003) Such rules, though not written in a single code, were maintained by local tradition and jurists and resulted in organically evolved urban layouts: shaded, sinuous streets with the occasional covered passage, and residential quarters that maximized interior comfort. Importantly, these indigenous coding practices achieved high-density, climate-responsive environments long before modern planning (Memarian & Brown, 2003). Contemporary scholars draw lessons from them, suggesting that flexible form-based codes inspired by traditional principles could produce more sustainable outcomes than rigid zoning (Hakim B. , 2008). The Mediterranean example thus broadens the perspective on urban policy: it shows that urban form can be guided by culturally embedded "rules of the game" that balance private interests (light, privacy) with collective form (cohesive streetscapes), offering a contrast to the top-down regulatory regimes elsewhere.

Housing Layout Evolution in Tehran under Policy Constraints

Focusing on Iran and Tehran in particular, a rich vein of scholarship examines how urban policies over the past century have reshaped housing morphology. Tehran's residential landscape transitioned dramatically from low-rise, courtyard-centered neighborhoods to dense grids of apartments – a change deeply entwined with planning decisions (Mohajer Milani, 2021; Shayesteh & Steadman, 2013). Shayesteh and Steadman (2013) trace this co-evolution of regulations and built form in Tehran. Early Pahlavi-era interventions (1930s–1960s) imported modern planning concepts into the traditionally organic city fabric. For example, in the 1930s a new building code limited houses to 40% plot coverage (with the building positioned on the northern edge of the lot) – the rest was to remain open yard (Shayesteh & Steadman, 2013). This was a radical departure from the virtually 100% courtyard coverage of traditional houses, and it was intended to improve sanitation and access. Additionally, a law required every

dwelling plot to have direct street access, largely to accommodate the burgeoning use of private cars (National Building Code office, 2017). This mandate led to the carving of new streets and alleys so that no plot was landlocked. While these policies had modernizing intentions, their impact on the historic fabric was severe: *"it is easy to see the devastating impact of these imported regulations on the historical fabrics of Iranian cities by comparing 1950s aerials with today"*, notes Shayesteh (2013). Similarly, Habibi (1996)and Madanipour (2006) emphasize how the introduction of street-access laws dismantled cohesive traditional neighborhoods and fragmented the courtyard-based fabric into isolated plots with poor spatial logic. Whole swaths of Tehran's dense traditional quarters were subdivided or disrupted – large courtyard estates were split so each piece touched a new access lane, and the continuous street fronts of old neighborhoods gave way to patchier, disparate constructions.

In 1968, Tehran's first comprehensive Master Plan further altered housing development. Among other changes, it increased allowable plot coverage to 60% and set new height limits and projection rules, accelerating a move toward multi-story buildings (Madanipour A. , 1998). Over the subsequent decades (1970s–2000s), as urban land values surged, these regulations in combination with market pressures led to the demolition of many one- or two-story houses and their replacement by maximally sized apartment blocks. It is observed by many scholers (Shayesteh & Steadman, 2013; Mohajer Milani & Einifar, 2020; Mohajer Milani & Eynifar, 2019; Sultanzade, 2005; Madanipour A., 2006) that planning and building controls not only constrained traditional construction but *"encouraged the introduction of new generic housing typologies"*, fundamentally changing Tehran's urban form. The typical outcome was the *"row apartment"*: a multi-unit residential building built on a narrow plot, directly abutting neighbors on either side, with a small projection in front – effectively a modern vertical version of the row house. Researchers Mohajer Milani and Einifar (2019) document how Tehran's common housing type evolved from courtyard houses to these row-type apartments over the late 20th century. As they describe, first the traditional central-courtyard homes were replaced by linear "row" houses (attached houses with no side yards) as an intermediate step; later, those two-story row houses gave way to 4–6 story walk-up apartments and eventually elevator buildings, all following the row alignment. This progression was fueled by rapid population growth, modernization, and the real estate market's response to new regulations that permitted higher densities (Mohajer Milani & Einifar, 2019).

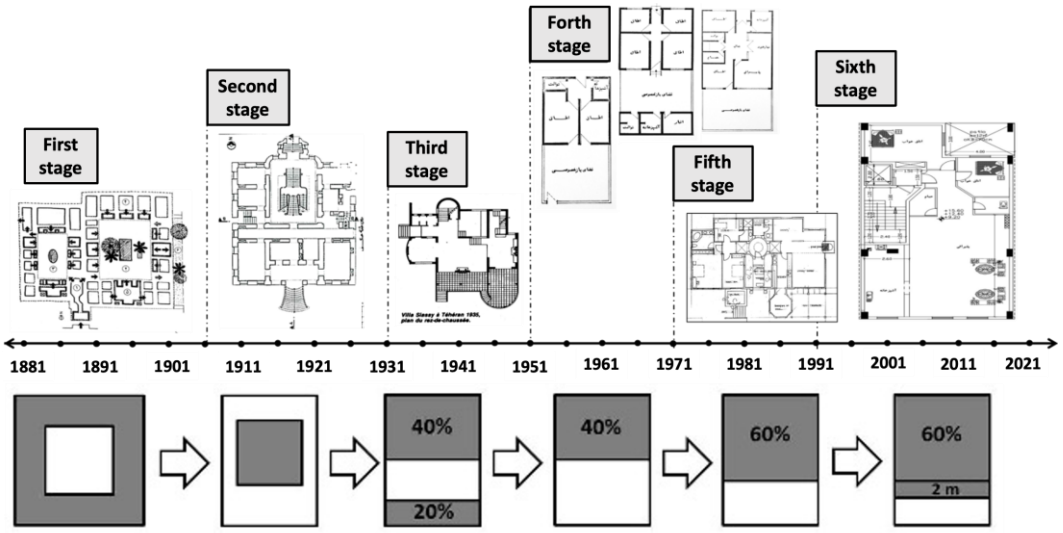

Figure 1. Typological evolution of residential units in Tehran (1881–Present)

A major challenge noted in Iranian scholarship is reconciling new housing layouts with cultural norms. Traditional Iranian houses had clearly defined private and semi-private domains (e.g., *andaruni* vs *biruni* spaces) and were well-suited to extended family living, with courtyards as central social spaces. The shift to compact apartments disrupted these patterns. Milani and Einifar (2019) and Haeri Mazandarani (2008) emphasize that the internal organization of today's typical Tehran apartment unit – often a small, single-level flat – differs greatly from the Iranian archetype, lacking features that used to accommodate privacy gradations, seasonal room use, and domestic flexibility. Residents and designers have had to adapt cultural practices to fit the new layouts. For instance, the concept of a private open space shifted from an inner courtyard to perhaps a balcony or nothing at all; likewise, maintaining visual privacy from neighbors became more difficult in closely spaced apartments. Some studies point to a loss of social cohesion and identity as neighborhoods redevelop piecemeal; the fine-grained mosaic of courtyards and alleyways that fostered close-knit communities has been replaced in places by anonymous apartment blocks (Pourjafar & Hakimian, 2011). As one study notes, densification has been a "place-undermining process," erasing collective memories attached to older forms and leading to weaker place attachment among residents (Shirazi &

Keivani, 2018). Shayesteh and Steadman describe how *"the lack of an overall plan for street facades"* during the boom in private apartment construction left many streets with chaotic skylines and haphazard aesthetics, as each building was designed in isolation (Rabbani & Soltanzadeh, 2014). This reflects a gap in Iran's urban management: while certain quantitative aspects (like density or shadow casting) were regulated, qualitative aspects of urban design (harmony of facades, public realm design) were often neglected until recently.

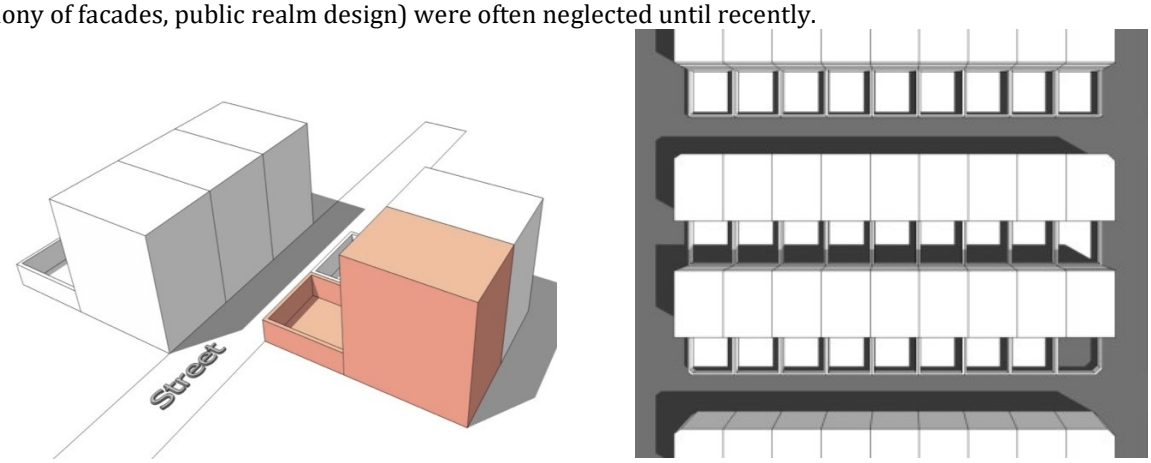

Figure 2. a typical standardized layout that emerged from rigid urban policies—especially the ones tied to the 60% + 2-meter rule

On the other hand, the Tehran case also highlights some positive outcomes of policy. The introduction of modern building codes improved housing in terms of structural safety, access to infrastructure, and provision of light and air to each unit. Tehran today has far less of the substandard, overcrowded housing that plagued it a century ago; much of that can be credited to enforcement of minimum standards and the redevelopment process (notwithstanding issues of displacement and heritage loss) (Piran, 2000). Moreover, as newer plans incorporate concepts like smart growth and sustainability, there is an opportunity to correct earlier problems. For example, current Tehran master plan revisions and design guidelines are beginning to emphasize context-sensitive design, historical preservation, and mixed-use development, in line with global best practices (Tehran Municipality, 2020). Local researchers argue for tailoring regulations to Iran's diverse climatic regions and cultural contexts – suggesting that a more context-sensitive, typology-based code could mitigate the one-size-fits-all approach of the past (Shayesteh & Steadman, 2013; Mohajer Milani & Einifar, 2020; Mohajer Milani & Eynifar, 2019; Sultanzade, 2005; Madanipour A. , 2006; Mirmoghtadaee, 2009). There is also a growing discourse on participatory planning in Tehran, aiming to involve communities in shaping redevelopment so that new housing projects better reflect residents' needs (for open space, communal areas, etc.) and maintain social networks.

In summary, the Iranian experience – and Tehran's in particular – vividly illustrates the double-edged role of urban policy in housing evolution. Top-down regulations were instrumental in moving the city towards modern infrastructure and higher density to accommodate growth, but they also inadvertently disrupted traditional urban form and social patterns. The literature from Tehran's scholars like Shayesteh, madanipour and Mohajer Milani provides a nuanced understanding that can inform other fast-urbanizing cities: it underlines the importance of balancing quantitative development goals with qualitative, cultural, and climatic considerations in policy-making.

Synthesis: Spatial and Economic Consequences of Policy Decisions

Bringing together insights from these theoretical frameworks, global cases, and local studies, we can better comprehend how urban policies reverberate through both the spatial configuration of cities and their economic dynamics. A clear thread in the literature is that urban form is not a passive outcome – it is actively produced by design choices and planning rules, which in turn create certain economic conditions. Policies that dictate lot sizes, building heights, street layouts or open-space ratios will determine the physical structure of neighborhoods (the "reading" of urban form), but they also set the stage for how land markets operate and for who benefits or loses. For example, a decision to lower allowable density in a city center can preserve light and reduce congestion, but it may also constrain housing supply, driving up prices – an economic consequence noted by many scholars (Gyourko & Molloy, 2014). Conversely, upzoning or relaxed codes might spur development and improve affordability, yet if done without urban design guidance it could degrade environmental quality or heritage character. Thus, spatial and economic outcomes are two sides of the same coin in urban policy.

The literature emphasizes that careful policy design can yield win-win outcomes. One example is the integration of environmental design principles (like solar access or energy efficiency) into zoning – as seen in Tokyo and Shanghai – which aims to ensure that higher density does not come at the cost of liveability. Another example

is the use of form-based codes and typomorphological analysis in cities like those in the Mediterranean: by understanding traditional patterns, planners can craft regulations that allow incremental growth while respecting historical morphology, thereby maintaining social continuity and property values (Hakim B. , 2008). In economic terms, this can make neighborhoods more attractive and resilient, preventing the blight or value decline that sometimes accompanies insensitive redevelopment. Knowles's solar envelope concept demonstrates how translating a spatial theory into a regulatory tool can protect access to sun and sky in dense cities, potentially boosting long-term property values and energy savings. Likewise, Jacobs' advocacy for mixed-use, human-scale blocks has informed policies that revitalize urban economies (e.g., through adaptive reuse incentives for old buildings and fine-grained zoning that fosters local businesses).

Crucially, multiple authors stress feedback loops between space and economy. Hillier's space syntax research on the "movement economy" posits that well-integrated street networks naturally attract more pedestrian flows and commerce, which increases land value – a virtuous cycle if reinforced by supportive policy. On the flip side, if a policy (say, superblock planning or single-use zoning) disrupts connectivity, it can deaden street life and reduce economic opportunity in an area. Empirical studies in housing economics further confirm that restrictive policies often create scarcity that benefits a few (landowners) at the expense of overall affordability, illustrating how market effects of policy can exacerbate spatial inequality. This underscores a lesson echoed throughout the literature: urban policies must be evaluated not only for their physical design intentions but also for their socioeconomic consequences.

All in all, the bodies of literature reviewed – spanning theoretical frameworks, global exemplars, and Tehran's local narrative – collectively inform a deeper understanding of how urban policies shape housing layout and market trends. They teach us that reading urban form is essentially reading the imprint of rules, norms, and interventions over time. A policy aimed at improving one aspect (like daylight, density, or traffic flow) will have ripple effects on spatial configuration (street patterns, building forms) and on economic factors (housing availability, prices, urban vitality). By synthesizing space syntax analysis, typo-morphological studies, and real-world case evidence, we gain a powerful interpretive lens: we can discern how a given policy decision – be it a zoning change, a new building code, or a master plan directive – is likely to reconfigure the geometry of communities and alter the economic landscape for residents and investors. Such insight is invaluable for contemporary urbanism, where the goal is to craft policies that harmonize spatial quality with market viability, fostering urban forms that are both socially sustainable and economically inclusive. The literature ultimately advocates for integrative approaches: using spatial analytics to guide policy (so that design is evidence-based), and using economic understanding to fine-tune design regulations (so that they achieve desired outcomes without unintended market distortions). This integrated perspective will be crucial in reading and shaping urban form in the face of ongoing challenges, from rapid urban growth to housing affordability crises, in cities worldwide.

Materials and Methods

This study builds upon previous research that analyzed the spatial impact of urban design regulations on Tehran's residential architecture using typo-morphological and space syntax approaches (see Mohajer Milani, 2021; Mohajer Milani & Einifar, 2019; 2020). These earlier works examined 150 apartment floor plans from across Tehran and demonstrated how standard regulatory tools—especially the 60% plot coverage rule and the 2-meter frontal projection requirement—shape internal housing layouts. They revealed that such regulations consistently produce dual-unit-per-floor layouts, with distinct differences between front (south-facing) and rear (north-facing) units. The present paper does not repeat that spatial analysis but builds upon it to evaluate a different dimension: economic consequence. Specifically, it investigates whether the spatial disparities created by regulatory design rules are recognized and priced by the housing market.

A comparative market analysis was conducted to examine pricing differences between front-facing (south-oriented) and rear-facing (north-oriented) apartment units. Drawing from the earlier spatial research, it is established that front units typically benefit from better sunlight exposure and higher spatial integration, while rear units experience reduced daylight and often more fragmented layouts.

To test whether these orientation-based differences correlate with economic value, a simulated dataset of ten matched case pairs was constructed. Each pair consists of two apartments within the same building or immediate neighborhood, matched by key attributes such as floor area, floor level, building age, and construction quality. The primary differentiating factor is unit orientation. This matched-pair design allows for controlled, internal comparisons and has been widely used in housing valuation studies to isolate specific spatial features (Rosen, 1974; Gyourko, Mayer, & Sinai, *Superstar Cities*, 2013).

Property price data were collected from online real estate platforms commonly used in Tehran (Divar.ir, Iranfile.ir), covering listings from 2018 to 2024. Listings were included only if they offered clear details on unit orientation, size, and building specifications. These were cross-referenced for consistency and corrected where necessary based on average regional price benchmarks.

While the sample size does not aim for statistical generalization, it allows a qualitative-comparative evaluation of pricing logic under Tehran's regulatory housing design. Such a qualitative-comparative approach is commonly employed in urban morphology and real estate valuation studies when the goal is not to generalize statistically but to identify consistent patterns or economic signals (Yalciner & Erkip, 2016; Manganelli, 2022). Moreover, due to practical limitations such as data availability, comparable housing stock, and reliability of listing information, this scale was determined to be optimal for ensuring internal validity without overextending the inference.
This method provides insight into how regulations—notably those affecting building orientation, unit positioning, and layout constraints—translate into observable market behavior. It captures the pricing impact of spatial inequality without requiring qualitative interviews or inferred opinion data. Although the sample is not representative in a statistical sense, it reflects plausible mid-market behavior in Tehran and serves to test whether spatial differences embedded in regulated housing design are recognized and priced by the market.

Regulatory Form and Spatial Outcome

Tehran's prevailing housing layouts are a direct spatial outcome of urban regulations—particularly the "60% plot coverage + 2-meter frontal projection" rule and the widespread use of narrow, north-oriented plots. The dominance of north-oriented plots is largely a result of historical subdivision patterns and municipal building codes that position buildings on the northern edge to maximize southern exposure for front units (as explained in Shayesteh & Steadman, 2013; Mohajer Milani & Einifar, 2020; Mohajer Milani & Eynifar, 2019; Sultanzade, 2005; Madanipour A. , 2006). These constraints shape a consistent internal logic: two residential units per floor arranged in a front-and-back pattern, divided by a central stairwell. As a consequence, one unit faces south with broader exposure to daylight and view corridors, while the other is positioned toward the north, relying on narrow light-wells for illumination. Figure 3 show this logic as the front (south-facing) unit benefits from direct sunlight and broader street exposure, while the rear (north-facing) unit relies on a small internal lightwell for illumination. This spatial configuration—mandated by the "60% + 2m" rule and north-oriented plot norms—structurally embeds environmental disparity within a single floor, leading to differentiated market values.

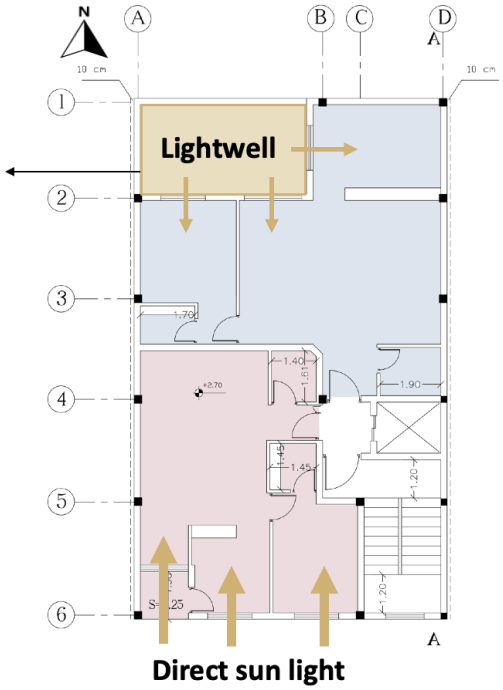

Figure 3. Typical dual-unit floor plan in Tehran shaped by regulatory design logic.

Price Disparities Based on Orientation

While the regulatory code ensures a standard building form, its spatial outcomes introduce a critical variable—orientation—that directly affects housing value. In the front-and-back arrangement produced by the "60% + 2m" rule, one apartment receives optimal daylight and visual access to the street, while the other is relegated to rear-facing conditions with limited light and privacy. These conditions are not incidental; they are structurally embedded in Tehran's housing fabric, and their economic consequences are consistently reinforced in real estate practice. Buyers implicitly recognize orientation as a proxy for livability—favoring south-facing units with greater sunlight,

visual openness, and better thermal comfort. Developers, in turn, price these units accordingly, resulting in a recurrent value gap even within the same building.

Based on this argument, we conducted a matched-pair comparative analysis of ten apartment cases—where all variables were held constant except orientation. Across all ten pairs, we found that the price premium for front-facing (south-oriented) units ranges between 10% and 18%. For example, in Pair 1, the south-facing unit was priced at 1,100 million IRR/m^2, while its north-facing counterpart was listed at 930 million IRR/m^2—a 15.45% difference. This pricing gap is not merely anecdotal: it is consistently visible in listings from platforms such as Divar and Iranfile and corroborated by Tehran's pricing benchmarks. To further validate these findings, we engaged in a series of consultations with active real estate brokers in Tehran. Although formal interviews were not part of the study design, these field-based expert conversations served to contextualize the observed trends. This informal triangulation adds practical weight to the claim that buyers actively prefer front units for their better light, ventilation, and ambiance. Figure 4 visualizes the average price per square meter across all case pairs. The difference between orientations confirms that southern exposure remains a major driver of unit valuation.

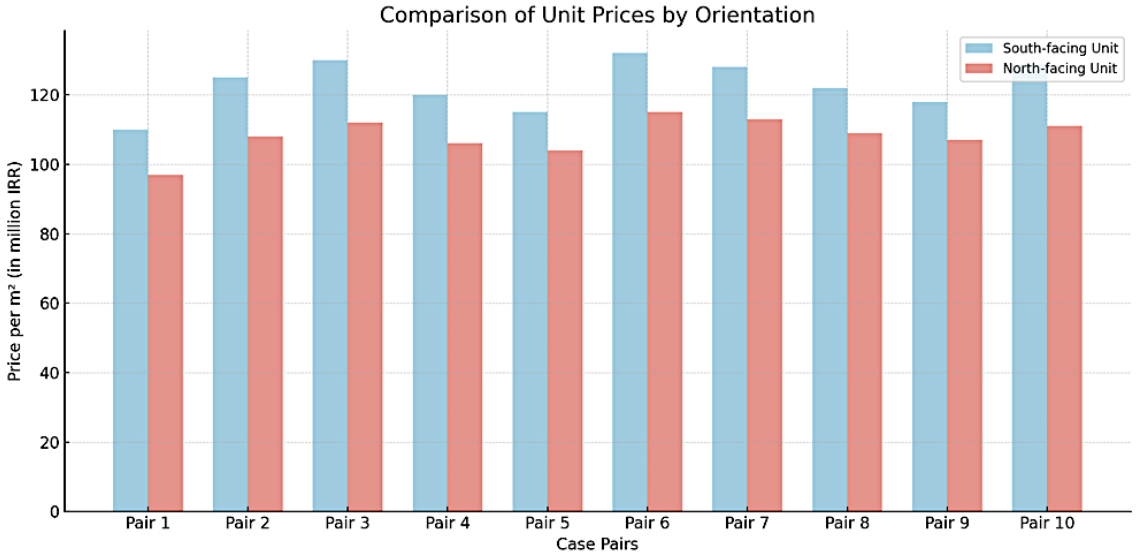

Figure 4: Bar chart showing average market prices for south- vs. north-facing units

The chart shows that front units consistently achieve higher prices, with an observed 10–18% premium for the street-facing orientation. This price disparity is directly attributed to qualitative differences: front units benefit from better natural light and view corridors, whereas rear units are disadvantaged by lower daylight and privacy issues (overlooking narrow courtyards or light-wells). Expert interviews corroborate that buyers consider south-facing units as more valuable investments, driving up their market rate. Table 1 complements this by detailing each case in the matched-pair analysis. Each pair includes a south- and north-facing unit with matched characteristics.

Table 1. Orientation-Based Price Differences (Matched Pairs)

Case Pair	Floor Area (m^2)	Floor Level	South Unit Price (M IRR/m^2)	North Unit Price (M IRR/m^2)	% Difference
Pair 1	105	2nd	1,100	930	−15.45%
Pair 2	92	3rd	1,050	880	−16.19%
Pair 3	87	4th	990	860	−13.13%
Pair 4	110	1st	1,150	970	−15.65%
Pair 5	100	2nd	1,070	910	−14.95%

The primary cause of this disparity lies in environmental quality. South-facing units receive extended hours of direct sunlight, particularly in winter months, improving thermal comfort, interior brightness, and visual connection to the outside. These factors enhance residential desirability, which the market translates into higher property values. Conversely, north-facing rear units suffer from limited daylight, poor natural ventilation, and reduced spatial integration, as previously shown in space syntax analyses. These factors lead to a consistent price devaluation of the rear half of the typical building layout.

Importantly, this pricing pattern is not a result of consumer taste alone but a structural consequence of the regulatory regime. The mandated configuration effectively produces a bifurcated housing product within each floor: one spatially and environmentally privileged, and the other disadvantaged. Attempts to mitigate this disparity—such as adding side windows, using split-level units, or shifting the stair core—are often constrained by code

limitations or cost considerations. As a result, the majority of developers default to the standard configuration, further entrenching this built-in hierarchy.

Spatial Inequality and Embedded Value Gaps

The observed price gap between front- and rear-facing units is not a superficial market anomaly but the product of deeply embedded spatial asymmetries generated by Tehran's regulatory design framework. While Section 4.2 quantified the economic effects of unit orientation, this section examines how such effects are rooted in systematic environmental inequities shaped by regulatory geometry.

As illustrated earlier, regulations such as the "60% + 2m" rule enforce a dual-unit-per-floor layout, with one unit facing south and the other relegated to the rear. This layout inherently privileges the front unit with better solar access, thermal gain, ventilation, and visual connectivity to public space. In contrast, the rear (north-facing) unit is environmentally disadvantaged—often enclosed by neighboring buildings, dependent on small lightwells, and deprived of long-duration sunlight. Over time, these spatial disadvantages are capitalized into the real estate market, creating consistent pricing differentials.

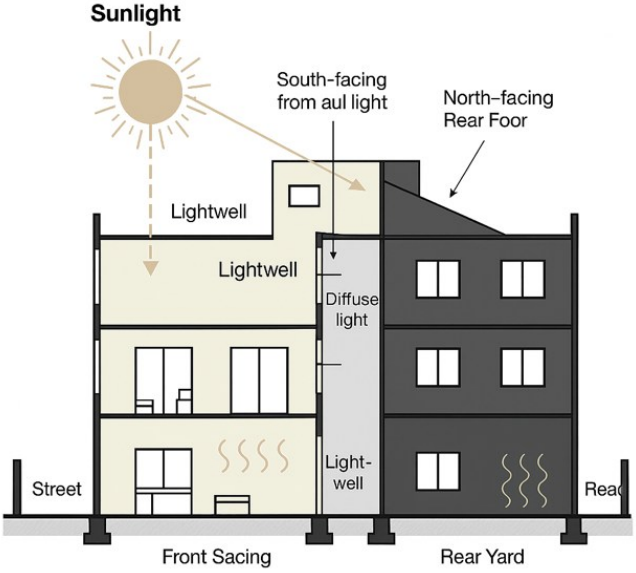

Figure 5. Sectional representation of daylight disparity in Tehran's regulated dual-unit apartment layout.

This architectural section illustrates the environmental hierarchy created by regulatory form. The south-facing front unit benefits from direct solar exposure and visual openness to the street, while the north-facing rear unit receives limited diffuse light via a narrow lightwell. This disparity in daylight access underpins the persistent market value gap between front and rear apartments.

This spatially enforced hierarchy has become a normalized feature of Tehran's housing stock. Although some developers attempt minor design modifications (such as adding side windows or reorienting internal layouts), these adjustments are typically limited by zoning codes, setbacks, and structural considerations. As a result, spatial inequality is not only replicated but reinforced by the regulatory framework itself.

Table 2. Summary of Regulatory Impact Pathway

Regulatory Tool	Spatial Outcome	Environmental Impact	Economic Effect
60% Coverage Rule	Narrow footprint; Deep plans	Low daylight in deep spaces	Lower rear unit valuation
2m Frontal Projection	Increased front articulation	Enhances front daylight or view	Higher front unit value
North-Oriented Plot Norms	Staircase-centered, front or back split units	South = sun; North = shaded	Embedded price hierarchy
Dual-unit per floor logic	Rear units rely on side setbacks or lightwells	Unequal daylight access	10–18% price gap (avg.)

These findings highlight that what appears as architectural uniformity is in fact embedded economic inequality. Sunlight, once treated as a technical concern in building codes, becomes a form of currency in Tehran's housing market—an asset distributed unequally by design. Several key implications emerge:

- **Regulations create unintended hierarchies.** The uniform application of spatial rules (e.g. north-side building logic, frontal projection constraints) indirectly create two types of residential products within the same building footprint: one favored by the market, and one discounted.
- **Buyer preferences confirm spatial logic.** Interviews with brokers and listings confirm that buyers consciously seek south-facing units, and price their preferences accordingly. While not always stated in advertisements, this information is widely communicated in informal real estate networks.
- **Design compliance limits innovation.** Developers rarely deviate from the "safe" typology, even if better daylight solutions exist, due to regulatory and financial limitations. As a result, spatial inequality becomes normalized.

In summary, the results show a direct causal chain from regulatory form to spatial arrangement to economic value. Tehran's design codes—especially the coverage rules and orientation constraints—systematically shape apartment layouts that yield unequal outcomes. The market responds by rewarding daylight access and penalizing its absence.

Discussion and Conclusion

Tehran's residential fabric, as examined in this study, reflects the spatial imprint of decades of regulatory planning. Repeated application of the "60% plot coverage + 2-meter frontal projection" rule, together with the prevalence of north-oriented plots, has produced a dominant housing layout: a dual-unit floor plan split front to back along a central core. While this form appears standardized and neutral on the surface, it encodes a deep structural imbalance. Through spatial analysis and market comparison, this study has shown that orientation—though never explicitly priced in regulation—is materially valued by the housing market, with front-facing (south-oriented) units commanding consistent price premiums.

This spatial-economic pattern is not incidental; it emerges from the very logic of Tehran's urban design code. Regulations originally intended to ensure basic access to light and air have unintentionally crystallized a hierarchy of value within the same building footprint. Units facing the street benefit from environmental advantages—sunlight, ventilation, thermal comfort—that rear units cannot replicate due to lightwells and constrained boundaries. As demonstrated in our matched-pair pricing analysis, this asymmetry translates into an average 10–18% price gap, repeatedly affirmed by market data and corroborated through professional insight.

By closely reading the relationship between built form and regulation, the study underscores how housing inequality can be spatially manufactured. The regulatory script not only defines building envelopes but also structures patterns of desirability and exclusion. Buyers respond accordingly, with orientation becoming a proxy for livability, and thus for value. As such, the paper contributes to a growing understanding of how urban policy does not merely shape the skyline—but also the social and economic geography of housing access.

To mitigate these embedded disparities, there is a clear need to rethink rigid building templates and allow for more adaptive typologies—those that better distribute daylight, frontage, and environmental quality. Design incentives encouraging dual-aspect layouts, adjustable stair cores, or alternative massing strategies could begin to challenge the regulatory assumptions that now divide units into high-value and low-value categories by default.

Ultimately, the findings illustrate that **urban form is not merely the outcome of architectural decisions—it is a built record of policy choices, and their consequences ripple through the city's housing market**. Addressing spatial inequality, therefore, begins with acknowledging how deeply it is rooted in the rules that shape what gets built, where, and for whom.

The evidence presented calls for a revaluation of Tehran's urban design regulations through a more equity-oriented and performance-driven lens. Rather than relying on prescriptive spatial formulas—such as the dual-unit layout enforced by the "60% + 2m" rule—urban policy should shift toward form-based and outcome-sensitive codes that prioritize environmental equity across all units. This could include incentivizing dual-aspect apartments, permitting staggered massing that improves rear light access, or relaxing frontal projection limits in exchange for daylight optimization. Regulatory frameworks should also integrate daylight simulation metrics and livability indicators into the approval process, ensuring that spatial quality is not sacrificed in the name of uniformity. By embedding flexibility and performance standards into building codes, Tehran's urban development can better align with goals of social inclusion, environmental justice, and long-term market sustainability.

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Conflict of Interests

The author(s) declare(s) no conflict of interest.

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