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Mid-rise Apartments as a Strategy for Sustainable Urban Development: The Case of Algeria

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Abstract

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Abstract

Algeria is mostly desert; its arable and green land is limited to the northern 17%, encompassing the Mediterranean coast and high plateaus. This northern region accounts for approximately 90% of the country's urbanization, leading to the consumption of significant agricultural land. The proliferation of single-family townhouses (rowhouses), due to their inherent low density, is a primary driver of this phenomenon. This study provides a critical re-evaluation of established perceptions regarding mid-rise apartment buildings, considered within the framework of current sustainability principles. A descriptive comparative analysis is undertaken, contrasting mid-rise apartments with townhouses, the dominant residential building typologies in Algerian urban environments. The analysis evaluates twelve criteria, with a focus on the social and environmental characteristics of each housing option. The findings challenge the prevailing notion that townhouses provide a superior living environment compared to mid-rise apartments, demonstrating that mid-rise apartments offer advantages across all 12 evaluated factors. This research advocates for a change in perspective, promoting the consideration of mid-rise apartments as a viable and potentially more effective alternative to townhouses, particularly in response to increasing urbanization, diminishing availability of agricultural land, and the imperative for sustainable housing solutions.

Keywords: Mid-rise apartments; Townhouses; Sustainability; Comparative study; Algeria.

1. Introduction

In 2026, Algeria's population was recorded at 48 million (Worldometer, 2026). A significant majority, 90% or approximately 44 million individuals, reside in the north region, with the remaining 4 million inhabiting the Desert south (Worldometer, 2026). In 2026, urban areas account for approximately 74.77% of the total population, with the urban population surpassing 36 million residents (Worldometer, 2026). The country has experienced rapid urbanization, resulting in intense pressure on green land, particularly in the north of coastal areas and high plateaus, where urbanization frequently encroaches on fertile and arable land. The urbanization rate in Algeria reached 75.75% in 2024, a marked increase from the 52.1% recorded in 1990 (TradingEconomics, 2026). The rate is projected to reach 82.10% by 2050, reflecting a sustained increase (United Nations, 2014). This urbanization is associated with considerable annual land consumption, notably impacting agricultural land in the north. As of 2026, urban and built-up areas in Algeria are estimated to encompass 30,196 km², constituting approximately 1% of the country's total land area, which exceeds 2.3 million km². (Saidi et al., 2023). While this constitutes a relatively small proportion of the country's overall landmass, urbanization is largely concentrated within the green northern region, which encompasses about 17% of Algeria's total area. Consequently, urban and built-up areas account for nearly 7.5% of the fertile and arable northern region of the coastal strip and highlands, raising concerns about the country's long-term environmental sustainability.

This urban dynamic is driven by urban population growth and rural-to-urban migration, resulting in sustained, long-term growth and substantial land utilization (Nemouchi & Zeghiche, 2021). A key factor driving this urban sprawl is the high demand for housing, leading to rapid land conversion that disproportionately affects green land surrounding major urban centers. This poses a considerable challenge to land management and agricultural preservation. Single-family housing in the form of townhouses (rowhouses) is a primary contributor to this phenomenon due to its low density (Bekkouche, 2022). Despite the governmental focus on multi-unit apartment developments (referred to as collective houses in Algeria), the housing landscape is characterized by a significant preference for single-family houses over multi-unit apartments. Self-built, single-family dwellings (referred to as individual houses in Algeria) constitute a dominant portion of the total housing stock, particularly in rural and suburban areas outside major urban centers. Data suggests that single-family homes present a high percentage in all regions, except the capital, Algiers. In early 2026, single-family homes are estimated to number 7.5 million, representing 65% of the national housing stock of 11.5 million units (Bencheikiken, 2024). This extensive horizontal expansion consumes thousands of hectares of fertile and arable land in the northern part of the country.

The proliferation of townhouse developments in agricultural areas frequently results in linear expansion patterns. These developments, typically situated along roadways and extending outward from urban centers, contribute to the gradual erosion of the demarcation between urban and rural environments. Characterized by a lack of cohesive architectural design, these peripheral housings contribute to urban sprawl by creating a scattered pattern of smaller properties on expansive land parcels. This type of development often leads to segregated land use, separating residential, commercial, and workspace areas, and relies on personal vehicles due to inadequate public transportation. The extension of infrastructure, including water, sewer, and roads, to these low-density zones incurs substantial costs. These observations align with findings from numerous studies on urban sprawl, as documented by Bhatta et al (2010) and Ewing (1997). The preference for a single-family home is exacerbated by cultural factors and perceived life quality advantages associated with owning land and an independent housing unit. This preference often outweighs the higher costs associated with converting natural and agricultural land into built-up areas, infrastructure development, and service provision in sprawling, low-density areas. The Algerian government faces the challenge of reconciling the demand for single-family housing with the need to protect agricultural land and promote sustainable urban development.

Algeria has made significant progress in the housing sector in recent years, with the national housing stock estimated at 11.5 million units by 2025 (Mhuv, 2026). Simultaneously, the occupancy rate per unit has decreased from 4.25 persons in 2023 to 4.12 in 2025 (Mhuv, 2026). Projections indicate that the housing stock may exceed 12 million units, contingent upon the completion of ongoing construction projects (Mhuv, 2026). Between 2020 and 2024, approximately 1.7 million residential units were constructed with an investment of 35 billion dollars (Mhuv, 2026). Despite substantial construction initiatives yielding an annual supply of approximately 130,000 units, the residential market continues to experience significant demand, with an estimated shortage of approximately 1.5 million units (Mhuv, 2026). A forward-looking strategy aims to construct an additional 2 million units between 2025 and 2029, predominantly high-density apartment complexes, to address urban land scarcity (Mhuv, 2026). These multi-apartment developments comprise apartment complexes, featuring primarily mid-rise (6 to 12 stories) and some high-rise (13 to 20 stories) buildings. A Building Height Strategy, primarily focused on mid-rise apartments, is intended to promote higher population density, optimize land utilization, and minimize urban sprawl.

Mid-rise developments are integral to modern urban planning, serving as a crucial intermediary between low-rise buildings and high-rise towers. This missing middle typology often incorporates mixed-use designs, integrating residential, commercial, and potentially office spaces, with a medium density that curtails urban sprawl. Mid-rise buildings offer enhanced energy efficiency, reduced construction expenditures, and streamlined implementation of advanced building technologies, fostering dynamic, pedestrian-friendly communities and promoting the utilization of public transportation. While the precise definition of a mid-rise building can vary by region, it generally denotes a development of intermediate scale. In a U.S. legal context, a mid-rise building is defined as exceeding 21 meters in height but not surpassing 46 meters, typically encompassing between 6 and 12 or 13 stories, which represents the most frequent floor count for this building type (ROSS-Companies, 2025). Given that Algeria also commonly employs a similar floor count for mid-rise buildings, this study will adopt this convention. These constructions commonly feature elevators and mixed-use configurations, frequently incorporating courtyards or podiums, seamlessly integrating into urban settings to provide contemporary living and working environments. Mid-rise buildings, strategically located in both urban and suburban environments, integrate seamlessly with established streetscapes and infrastructure, enriching urban life through increased density and improved accessibility. Thus, they effectively balance maximizing land utilization with maintaining neighborhood character, offering a diverse array of housing options and commercial spaces, making them a key component of future urban planning strategies.

The construction of mid-rise apartment buildings is expected to remain a vital aspect of Algeria's urban development in the foreseeable future. This housing approach has fostered a unique urban environment characterized by a diverse range of dwelling sizes. This functional and occupant diversity contrasts sharply with the often-homogenous populations of typical townhouses. The varied designs of these mid-rise developments enable greater personalization to accommodate specific family requirements, representing a departure from standardized single-family or multi-family townhouse solutions. Moreover, the inclusion of multi-related family townhouses caters to extended family structures, a prevalent characteristic of Algerian traditional culture, though less common among younger generations who prefer smaller nuclear families. The effectiveness of these mid-rise housing initiatives can be attributed to their adaptability and responsiveness to the changing needs and preferences of urban residents.

However, mid-rise apartment blocks face considerable disapproval from the public, professionals, and academics alike (Makhloufi, 2010). Public dissatisfaction frequently arises from deeply ingrained perceptions of post-independence Algerian social housing, particularly concerning living and design criteria. Academic critiques largely stem from anti-functionalism viewpoints prevalent in Western discourse during the 20th century. These critics argue that such concrete structures can negatively impact street life, social cohesion, and safety, while simultaneously isolating residents from economic opportunities, retail outlets, and essential community resources.

This study re-examines conventional perceptions of mid-rise apartment buildings, considering them within the framework of contemporary sustainability principles. A descriptive comparative analysis is conducted, contrasting mid-rise apartments with townhouses, the prevalent residential building typologies in Algerian urban settings. This analysis focuses on social and environmental features associated with each housing type. Twelve factors or variables related to urban planning, development, and urban-architectural design form the basis of the comparison. They include: urban densification, mixed-use development, green-playground spaces and parking, vibrancy, walkability, internal layout and depth, daylighting, sunlight exposure, natural ventilation, views and visual comfort, noise and acoustic comfort, and internal layout and the resale challenge. The findings challenge the common perception that townhouses offer a superior living environment compared to mid-rise apartments in the Algerian context, revealing that mid-rise apartments offer advantages across all 12 evaluated criteria.

These advantages suggest that mid-rise apartments can contribute more effectively to sustainable urban development in the Algerian context. The study advocates a shift in perspective, encouraging consideration of mid-rise apartments as a viable, potentially superior alternative to townhouses, particularly with increasing urbanization, the loss of agricultural land, and the need for sustainable housing solutions. Ultimately, this research aims to endorse the Building Height Strategy used by national authorities to support compact growth, favoring vertical expansion over horizontal sprawl, thereby minimizing encroachment on agricultural land while accommodating necessary development.



Figure 1. The northern green region of Algeria.

2. Research Method

This study re-examines conventional perceptions of mid-rise apartment blocks through the lens of contemporary sustainability principles. The descriptive comparative analysis is employed to evaluate mid-rise apartments against townhouses. This research design identifies similarities and differences between the two housing types without manipulating the variables. Both mid-rise apartments and townhouses represent primary residential options in Algerian cities. While townhouses currently dominate the Algerian urban landscape, mid-rise apartments are increasingly prevalent due to evolving state strategies. This qualitative analysis assesses the efficacy of each residential unit by describing existing characteristics based on observation and documented data.

The study focuses on key factors such as environmental aspects, spatial organization, and social impact. The goal is to provide insights into how mid-rise apartment buildings can contribute to sustainable urban development in Algeria, potentially offering a more efficient and environmentally conscious alternative to townhouses. This comparison acknowledges the cultural significance and established presence of townhouses while exploring the potential advantages of mid-rise apartments in addressing contemporary urban challenges and promoting sustainable living practices. The findings aim to inform urban planning policies and architectural design strategies that prioritize sustainability in Algeria's evolving urban landscape.

It is also a thematic comparison, in which the analysis is organized into twelve specific factors or variables that are examined across both cases. The attributes or factors forming the basis of this comparison, relating to urban planning, development, urban design, and architectural aspects, include: urban densification, mixed-use development, green-playground spaces and parking, vibrancy, walkability, internal layout and depth, daylighting, sunlight exposure, natural ventilation, views and visual comfort, noise and acoustic comfort, and internal layout and the resale challenge. This approach provides a robust method for evaluating the two dwelling units and validating their relative effectiveness. The purpose of comparing the two residential entities' performance across different variables is to understand how the two dwellings differ or align on these specific variables and to identify conditions necessary or sufficient for specific outcomes. The findings will be used to consider the efficacy of different policies to inform decision-making.

The subsequent sections, in the form of a discussion, will delve into each of these factors, providing a detailed examination of the two dwelling units under consideration. Each section offers a comparative analysis, highlighting the strengths and weaknesses of each unit in relation to the specific factor or variable. This structured approach will ensure a comprehensive and systematic evaluation, ultimately contributing to a more informed understanding of the attributes influencing residential performance and urban quality. The ultimate goal is to provide actionable insights for guiding future residential development and urban planning initiatives, promoting more sustainable, livable, and equitable urban environments.

3. Discussion

3.1. Urban Densification

Apartment developments offer a strategic alternative to urban sprawl by promoting vertical densification, thereby optimizing land use and safeguarding natural green lands (Wang, 2025). In contrast to townhouses (rowhouses), which require extensive land coverage to accommodate an equivalent population, mid-rise apartments mitigate urban expansion, the associated increase in infrastructure demands, and reliance on private vehicles. The proliferation of single-family housing developments often results in entirely residential areas that lack the population density required to sustain local commercial establishments, employment centers, and educational institutions. This pattern increases vehicular dependence that demands expansive road networks, which in turn contribute to landscape fragmentation (Chin, 2002). Mid-rise apartments facilitate vertical growth, fostering more sustainable, economically viable, and dynamic urban settings while actively counteracting the ecological and societal implications of urban sprawl. Unlike townhouses, mid-

rise apartments also support dwelling-unit intensity, floor-area compactness, and population concentration within a specified area.

In Algeria, townhouses, a form of low-density development, are typically situated on land parcels of 150 square meters and have a maximum height of four stories. The ground floor is generally utilized for garage space. The residential space may be configured as a single dwelling unit spanning the upper three floors, accommodating one family. Alternatively, the townhouse may be divided into three separate dwelling units, each occupying one floor, to house three related families (typically parents and two married sons) or two related families (parents and one married son), with the remaining unit left vacant. A comparison of residential density, defined as the number of dwelling units per area, reveals differences between townhouses and mid-rise apartments. Mid-rise buildings typically range from 6 to 12 stories; for example, a 12-story mid-rise apartment block typically comprises 11 residential floors and a ground floor dedicated to commercial space. With two flats per floor, such a building contains 22 flats (11 floors x 2 flats/floor). Assuming an average flat size of 80 square meters (a typical three-bedroom flat), each floor accommodates 160 square meters of living space (80 square meters/flat x 2 flats). Including a 20 m² staircase, the total floor footprint is 180 square meters. Therefore, in Algeria, a mid-rise building with a medium surface of 180 m² could accommodate 22 dwelling units, whereas a townhouse with a medium surface of 150 m² typically contains only 2 or 3 dwelling units.



Figure 2. Mid-rise apartments, city of Batna.



Figure 3. A townhouse, city of Batna.

3.2. Mixed-use

In Algeria, mid-rise apartments facilitate vertical mixed-use development, integrating retail spaces at street level, offices on intermediate floors, and residential units above. This design ensures sustained activity throughout the day and evening. Consequently, frequent entry points are encouraged, rather than a single large lobby. Vibrant blocks have many doors; entrances to individual shops, stairways to upper-floor offices, and the main residential lobby all punctuate the sidewalk, creating a rhythm of activity. These new developments bolster local businesses and promote the utilization of public transportation, both of which are essential components of a walkable urban environment (Al-Kodmany, 2022). Mid-rise apartments can introduce a substantial influx of new customers to local businesses, potentially enabling the establishment and sustainability of specialized retail offerings such as specialty grocers (Blanchard & Calhoun, 2024). These apartment buildings, especially those on the edges of urban centers, are usually near major train, tram, and bus lines to maximize access to public transportation and reduce reliance on cars.

Conversely, townhouse residential areas typically do not accommodate mixed-use developments. This segregation stems from zoning regulations and the intended purpose of these areas, which prioritize single-family dwellings and a quieter, more residential atmosphere. The inclusion of commercial or industrial activities would likely disrupt the neighborhood's peace and character, leading to conflicts over noise, traffic, and parking. Furthermore, townhouse developments are often designed with specific aesthetic guidelines and community amenities that might be incompatible with mixed-use projects.



Figure 4. Mixed-use in Mid-rise apartments.



Figure 5. Only dwelling units in the townhouse area.

3.3. Green-playground Spaces and Parking

Green-playground spaces are essential for promoting residents' well-being, cultivating a sense of community, and enhancing urban sustainability (Lee et al., 2015). In linearly configured blocks of mid-rise developments, the connection between the building and the street is a critical zone for green integration. Pedestrian-friendly landscapes, such as tree-lined walkways and greened setbacks along buildings, can enhance aesthetics and be resilient transition zones within the hard concrete of parking lots and roads. These buffer-landscaped zones can also integrate play areas for children and seating for elderly residents to encourage social interaction. Mid-rise blocks configured in a U-shape or L-shape create an internal courtyard that typically features a centrally located landscaped area, serving as a pivotal social and environmental element shielded from the street (Matiukhin & Anisimova, 2021). This internal courtyard, buffered from street noise, provides perimeter parking and pedestrian-efficient walkways, offers a secure play environment for children, and functions as a semi-public area for social interactions. Furthermore, the integration of vegetation within mid-rise buildings offers ecological advantages of mitigating the urban heat island effect, improving air quality by absorbing pollutants, and reducing stormwater runoff.

Conversely, townhouses are typically arranged in rows along both sides of an internal street, directly connecting to a secondary or tertiary route with a 5m width and sidewalks ranging from 1m to 1.5m. This hard-concrete street typically lacks green spaces, designated play areas for children, and seating to facilitate social interaction. Such layouts prioritize vehicular access and density over pedestrian comfort and community building. The austere streets often contribute to a sense of monotony and anonymity within the development. Parking is generally accommodated through attached garages or street, further reducing the space available for landscaping or communal amenities. The narrow sidewalks, while functional, offer limited opportunity for casual interaction or leisurely strolling.



Figure 6. Green-playground spaces and parking within mid-rise apartments.



Figure 7. Nonexistence of these spaces in townhouse areas.

3.4. Vibrancy

The architectural design strategy of the porous edge is often applied in the mid-rise apartments facing streets in Algerian cities. In such a case, the ground and even the first floors are not a solid, opaque barrier, but rather a permeable, in-between space where the public life of the street and the semi-private life of the building blur together. This approach creates active, transitional zones such as balconies, terraces, and colonnades with shops, cafes, and commercial spaces with large, transparent windows and outdoor seating. All fostering social interaction and connecting users at the city, while generating eyes on the street and a sense of safe, continuous activity (Barreca, 2020). In such a case, a mid-rise building can function less like a vertical silo of anonymous units and more like a stacked neighborhood. Social interaction isn't just horizontal along a street, but vertical within the building. This is manifested, for example, in wide staircases that encourage walking between floors and in wide entrance halls on the ground floor, which serve as destinations within the building and foster chance encounters.

Conversely, streets lined with row townhouses often feel less vibrant because they lack active storefronts and engaging public spaces that promote pedestrian activity, such as window shopping, outdoor café seating, or opportunities for social interaction. Consequently, these streets tend to be tranquil and sparsely populated, creating a sense of emptiness rather than a vibrant social environment. This lack of pedestrian engagement can foster a perceived sense of insecurity, further discouraging foot traffic and making the streetscape less appealing. Limited visibility into homes from the street, along with garages that are always closed at ground level, fosters a sense of exclusion and detachment. This can inadvertently create a perception of inaccessibility, discouraging casual visitors and contributing to the area's isolation from the surrounding urban fabric. The absence of varied urban features that support social interaction results in a diminished sense of place and a less stimulating environment for residents, which is essential to a vibrant community.



Figure 8. A vibrant and livable street.



Figure 9. A dull and lifeless street.

3.5. Walkability

Walkability is about the quality of the pedestrian experience; mid-rise buildings contribute to this practice by shaping the pedestrian realm (City of Toronto, 2024). These apartments articulate base levels of the first 2-3 storeys with the street, giving the street a sense of security, enclosure, and purpose, and incorporating ground-floor retail, cafes, and services that line the sidewalk, making walking more engaging. Their human-scaled design supports high-density, mixed-use environments where residents can meet daily needs within a short walking distance (Worlbank, 2022; Calthorpe, 2022). Awnings, canopies, and colonnades provide shelter from sun and rain, encouraging people to stroll and linger regardless of the weather. They are specifically designed for environments that prioritize safe pedestrian movement, often featuring wider sidewalks, and their entrances are positioned to align with adjacent transit stops to promote multi-modal commuting. Buildings' ground plans are woven into the city's fabric by footpaths; mid-block pedestrian cut-throughs, multiple entry points from different streets, and a network of small plazas or courtyards that connect to wider walking paths.

Conversely, a street bordered by row townhouses forms an urban canyon, limiting access to two entry points at either end and lacking intersecting or cut-through walking paths. The consistently closed garage doors that flank the sidewalks on both sides, and the lack of tree lines or front green spaces, render the street impersonal and detached, thereby discouraging pedestrian interaction. These streets are primarily designed for vehicular and pedestrian movement of residents, featuring narrow sidewalks that discourage broader public use. The absence of through paths within these areas further reinforces their insularity, as external traffic is intentionally diverted away. Such designs prioritize privacy and security for residents, but at the cost of communal interaction and integration with the wider city. The focus on residential needs over public accessibility can create an atmosphere of unease and insecurity for non-residents traversing or entering the street.



Figure 10. A pedestrian-friendly Street.



Figure 11. An unwalkable and an unfriendly street.

3.6. Internal Layout and Depth

In mid-rise apartments, even when the floor plan is deep, all interior spaces have windows to the outside. In a bar-shaped building configuration, each apartment within the block will feature openings on opposing sides of its width. The apartment will be adjoined by another unit along each side of its length, or adjoined by a unit on only one side of its length, while the opposite sides along the width remain unattached. Conversely, in a box-shaped building configuration, each apartment will have two adjacent units on its angular sides, while the remaining two angular sides will be unattached. The configuration of these unattached sides allows for cross ventilation and natural lighting from multiple directions into all rooms, crucial factors for occupant comfort and well-being in densely populated urban environments (Fu et al., 2024). The arrangement of flats within the building block also influences privacy and noise levels, with careful planning needed to minimize disturbance between adjacent units. Conversely, single-family townhouses typically feature a deep plan, ranging from 15m to 20m, where the floor plan extends significantly from the street with a single front facade. This deep configuration lacks windows on the other three perimeter of the house, which frequently leads to inadequate natural lighting and ventilation in central areas, necessitating reliance on mechanical ventilation systems and artificial lighting, thereby elevating long-term energy consumption. While the incorporation of light wells or atria may serve to introduce light and enhance ventilation within these interior zones, such measures may not entirely compensate for the intrinsic constraints imposed by the substantial deep house plan.



Figure 12. Bar-shaped configurations.



Figure 13. Box-shaped configurations.



Figure 14. The depth of a townhouse.

3.7. Daylighting

Daylight penetration and distribution differ significantly between townhouses and mid-rise apartments. A townhouse, characterized by a single external façade and a deeper floor, typically experiences daylight primarily at the front façade, with limited penetration into the central and rear areas. Conversely, mid-rise apartments generally feature double-fronted designs (have frontages on two streets), facilitating more uniform daylight distribution throughout the building. In terms of vertical daylight availability, townhouses often face challenges due to narrow street configurations, which may experience less intense solar exposure per vertical surface. Shading from adjacent buildings can substantially reduce the amount of daylight reaching the building façade. Mid-rise apartments, however, typically benefit from greater spacing, resulting in longer periods of direct sunlight exposure and reduced obstructions. The reduced need for artificial lighting in tall buildings can be offset by increased cooling energy consumption due to solar gains (Cheong et al., 2014). Townhouses may demonstrate cooling energy savings but require careful strategy for daylight, such as integrating light wells or atria to introduce natural light into interior spaces.



Figure 15. All the facades have access to daylight.



Figure 16. A light-well in a townhouse.

3.8. Sunlight Exposure

Building height significantly influences sunlight exposure within urban settings (Lan & Zhan, 2017). The presence of mid-rise apartments in high-density areas can contribute to urban canyon effects. This phenomenon reduces sunlight access to lower floors and street-level environments due to substantial shadows cast on adjacent properties, especially during certain times of day; however, adequate inter-building spacing can alleviate this issue. Mid-rise apartments with multiple façades typically experience increased direct sunlight exposure, making them favorable for maximizing solar gain in colder months. Equally, these façades may be exposed to intense solar radiation during summer, potentially causing overheating. Conversely, townhouses' exposure to sunlight may be constrained by narrow street configurations and single-façade designs. The inherent design of townhouses, with three unexposed sides to sunlight, can be advantageous in summer, as it reduces direct solar heat gain, thereby promoting a cooler and more comfortable indoor climate. However, this design may also lead to increased heating requirements in winter to maintain thermal comfort. Insufficient indoor sunlight can potentially foster conditions conducive to mold and mildew growth (Chan & Liu, 2018). Therefore, careful considerations of sunlight exposure are crucial to mitigate these potential risks and create a healthier interior environment in townhouses.



Figure 17. Neighboring shadows do not reach the opposite facades.



Figure 18. The whole street is in the shadow.

3.9. Natural Ventilation

Tall buildings, due to their significant vertical facades and corners, experience greater and more variable wind fluctuating pressures, a phenomenon that can be leveraged to enhance natural ventilation strategies (Lan & Zhan, 2017). This is especially relevant at lower to mid-heights, where vertical pressure differentials are less significant (Zheng et al., 2019). Conversely, townhouses experience reduced wind pressures, thereby limiting natural ventilation. In mid-rise apartments, airflow zones such as stairwells can enhance stack-driven ventilation. Townhouses incorporating atria also benefit from buoyancy-driven stacks, albeit to a lesser extent due to limited vertical reach, while providing limited cross-ventilation. The incorporation of operable windows on corners or opposing facades in mid-rise apartments improves air exchange and establishes effective cross-ventilation pathways, promoting consistent air movement throughout the year. Townhouses with single facades lack this advantage. Although urban canyon effects can compromise ventilation, the typical arrangement of mid-rise apartments in rows with adequate spacing and two opposing facades can promote buoyancy-driven flow when a temperature differential exists between the interior and exterior, thereby optimizing ventilation performance. Conversely, townhouses, with their single facades and the narrow street configurations typical of their districts, may limit access to wind and fresh air.

3.10. Views out and Visual Comfort

Views out are highly important in residential buildings. These features are essential for visual comfort, comparable to natural light, and directly affect residents' health, well-being, and property value (Fung & Lee, 2012). Mid-rise apartment buildings with their larger, more uniform window designs often offer expansive views of the surrounding environment, a feature particularly beneficial in urban settings. Elevated positioning reduces visual obstructions, offering a broader vista of the skyline and urban scenery. Upper stories benefit from increased solar exposure during the day, improving the visual experience, while nighttime city illumination provides a stimulating visual display. Integrating balconies and strategically placing windows can further enhance the visual experience. Townhouses, distinguished by their distinctive architectural designs and smaller fenestrations, typically offer more immediate curated views, emphasizing privacy and a connection with the immediate streetscape. The scale and density of mid-rise apartments contribute to more dynamic, vibrant, and complex visual scenes. Conversely, the less populated streets associated with townhouse developments may offer less interesting or more monotonous views.



Figure 19. A view from a mid-rise building's window.



Figure 20. A view from a townhouse's window.

3.11. Noise and Acoustic Comfort

The acoustic environment in buildings exhibits considerable variation relative to height (Nilsson et al., 2023). Upper stories in mid-rise apartment buildings generally provide enhanced insulation from street-level noise, contributing to a more tranquil auditory environment. Conversely, lower floors experience greater exposure to urban noise, which can affect comfort levels, though this may be perceived as a heightened engagement with the urban soundscape. In contrast, townhouses, being situated closer to ground level, are potentially more vulnerable to street noise; however, this is often attenuated by their location within residential zones characterized by reduced commercial activity and vehicular traffic. Noise transmission from adjacent dwellings, apartments in mid-rise buildings are typically positioned between two other units vertically and share a horizontal boundary with only one or two neighboring units, thus minimizing disturbance between these adjacent units. In single-family townhouses, the absence of vertically adjacent neighbors is offset by potential sound transmission issues arising from the use of ground-floor garages for high-impact family activities. Due to the vertical adjacency of the related families, multi-family townhouses present acoustic challenges. Furthermore, given that a single-family house typically presents only one façade to the street, it is often surrounded by adjacent neighboring houses on three sides, potentially leading to extra acoustic challenges.



Figure 21. Each flat is attached to one neighbor.



Figure 22. Four neighbors attached to house three sides.

3.12. Internal Layout and the Resale Challenge

The resale of apartment buildings in Algeria is well-regulated, preventing speculation and ensuring that they remain accessible to eligible families, thereby maintaining the long-term affordability and stability of the housing market. To further ensure compliance and prevent abuse, potential sellers are required to adhere to a predetermined resale process, often involving state oversight in setting the sale price. This mechanism effectively neutralizes any incentive for individuals to profit unduly from the subsidized nature of these properties. These measures collectively contribute to a housing ecosystem that is fair, equitable, and sustainable. On the other hand, townhouses may experience reduced market liquidity compared to detached single-family houses, villas, or apartments, potentially posing greater resale challenges.

The pool of prospective buyers may be smaller, as most individuals may specifically seek the characteristics offered by other housing types. This challenge is due to the interior design characteristics. Townhouses can be classified by occupancy as either single-family or multi-family. A single-family townhouse is designed for occupancy by a single family, owner-occupancy. Given the typically substantial size of these residences, often spanning at least three floors, resale can present challenges due to the high associated cost. Prospective buyers may find it more economical to acquire land and construct a custom home tailored to their specific needs and preferences than to purchase an existing single-family townhouse. Conversely, a multi-family townhouse is divided into multiple units intended for related families, commonly consisting of parents, the property owners, and their married sons. Following the death of the parents, tenancy in common or shared property ownership will become the norm; thus, subsequent generations may encounter difficulties in selling the units, either collectively or individually, due to the original interior design, which was conceived to facilitate close familial relationships rather than accommodate unrelated parties.

4. Conclusion

While mid-rise buildings can potentially reduce agricultural land consumption, their sustainability hinges on factors beyond land preservation. In this study, 12 factors are used to examine the sustainability balance provided by mid-rise apartments in comparison to townhouses. This sustainability is presented in social and environmental features associated with each housing type. The findings show that all twelve factors present advantages for mid-rise apartments over townhouses in the Algerian context. These findings hold significant implications for urban planning and policy-making in the country. By demonstrating the advantages of mid-rise apartments, this study encourages a shift away from the sprawling, land-intensive development patterns associated with townhouse construction. Embracing mid-rise apartment buildings can lead to more compact and efficient urban forms, preserving valuable agricultural land and minimizing environmental impact. The social benefits associated with mid-rise apartments, such as increased opportunities for social interaction and community building, contribute to a more vibrant and sustainable urban environment. This research calls for a re-evaluation of housing policies and design guidelines, advocating for the promotion and adoption of mid-rise apartment buildings as a key strategy to address the challenges of urban sprawl and land scarcity in Algeria. Further research could explore specific design strategies and policy interventions to facilitate the successful implementation of mid-rise apartment developments in Algerian cities, ensuring these buildings meet the residents' needs and aspirations while contributing to a more sustainable and equitable urban future.

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Conflict of Interests

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