ГЛАСНИК Српског географског друштва 105(2) 465-488
BULLETIN OF THE SERBIAN GEOGRAPHICAL SOCIETY 2025

Original scientific paper
UDC 728.22(65)
https://doi.org/10.2298/GSGD2502465D

Received: June 1, 2025
Corrected: July 14, 2025
Accepted: September 21, 2025

Ahmed Djouima[1]*, Assil Torkia*, Farida Naceur*

* *University of Batna 1, Institute of Architecture and Urbanism, Alleys May 19. Route de Biskra 0500 Batna - Algeria*

WELL-BEING IN SOCIAL HOUSING IN ALGERIA: THE CASE OF 800 HOUSING UNITS, BATNA

Abstract: Despite the considerable efforts undertaken in Algeria to produce social housing, the problem of well-being in these dwellings remains unsolved. Occupants of social housing continue to suffer from numerous ailments, mainly related to the quality of their housing. Based on the essential criteria influencing well-being in housing, this research aims to assess the quality of life of occupants in social housing in Algeria and examine its impact on their satisfaction. With the aim of generalizing, the 800-unit El Menchar housing project in Batna, a medium-sized city in eastern Algeria, will serve as a case study. The research adopts a qualitative survey combining a questionnaire and on-site observation. This approach yielded 293 responses, representing 36.63% of families. The results of the analysis show that of the 14 essential well-being criteria analyzed, including housing quality, environmental comfort, social interactions, and socioeconomic context, only two are taken into account in the design of social housing in Algeria. This reflects the negative impact of poorly designed social housing on occupant satisfaction and overall well-being.

Keywords: collective social housing, environmental conditions, social interactions, socioeconomic context, well-being

Introduction

Well-being in buildings is often perceived as a luxury reserved for the lite while it should be considered a universal necessity. Indeed, we spend approximately 90% of our time

[1] ahmed.djouimaa@univ-batna.dz (corresponding author)
Ahmed Djouima (http://orcid.org/0009-0001-9788-1478)
Assil Torkia (http://orcid.org/0009-0007-7613-360X)
Farida Naceur (http://orcid.org/0009-0004-1962-4937)

indoors including 69% at home (Klepeis et al.,2001). The COVID-19 pandemic has exacerbated these challenges, revealing the negative impacts of poorly designed housing, particularly for residents of collective or social housing (Akbari et al., 2021). This situation highlights the close links between living spaces, mental health, and overall well-being. In Europe, inadequate housing conditions contribute to approximately 110,000 deaths per year (WHO, 2018), illustrating the urgent need to rethink built environments to promote better physical, mental, and social health. Thus, the urgency of improving built environments goes beyond the purely aesthetic or functional: it involves a societal and environmental responsibility to guarantee each individual a living environment conducive to their development and health (Barton, et al., 2006). This reflection calls for a systemic change in the design and management of collective social housing, with an emphasis on more inclusive and sustainable approaches.

Collective social housing represents an important part of the housing program, aimed at meeting the needs of low-income populations in Algeria (Sbia & Kherchi, 2017). It is the model most adopted by the authorities to resolve the housing crisis. It offers safe and affordable housing and aims to promote the well-being of the most vulnerable populations, by fostering healthy and resilient communities. However, the COVID-19 pandemic has revealed the limitations of this housing, increasing the time spent at home and highlighting various problems related to its quality (Madeddu & Clifford, 2021). In response, many residents have modified their environment to improve their well-being, which has reinforced awareness of the importance of architectural design in social housing (Zambrano-Barragán, Hudson, & Viguri, 2022).

Well-being in Collective Social Housing in the world

The relationship between housing conditions and residents' well-being has become a significant area of research, especially in the context of social housing. Several recent studies have explored the health, psychosocial, and socio-economic impacts of different housing types across various international settings. Freund et al. (2023) examined the health disparities between Australian social housing tenants and those living in other housing types. Their analysis of the Australian National Health Survey revealed that social housing tenants experience considerably higher rates of chronic health conditions, such as mental health issues, arthritis, back problems, hypertension, asthma, and COPD. Additionally, social housing residents were more likely to report multiple health problems compared to those in private rentals or homeownership. These findings highlight the need for health-conscious housing policies and targeted support for vulnerable populations. Similarly, Zhu and Holden (2024) investigated the psychosocial impacts of housing conditions during the COVID-19 pandemic in Canada. Their study emphasized that beyond the material aspects of housing, factors such as residential stability, neighbourhood accessibility, and housing affordances played a substantial role in shaping psychosocial well-being. Interestingly, their results indicated that the differences in well-being between homeowners and renters diminished when these non-material factors were considered, suggesting that housing quality and security may be more crucial than ownership status, particularly in times of social disruption.

In New Zealand, Grimes et al. (2024) explored the impact of housing tenure on subjective well-being. They found that public housing tenants reported higher levels of life sat-

isfaction and mental well-being compared to private renters, and similar levels to homeowners. These results are attributed to the relative stability provided by public housing, which seems to mitigate some of the negative well-being effects commonly associated with renting in the private market. From a socio-economic perspective, Visagie et al. (2023) assessed the potential of social housing to promote upward mobility in South Africa. Their evaluation of ten social housing projects found only modest evidence of household advancement and racial integration. Despite the ambitious goals of the South African social housing program, the study noted that its implementation often prioritized other considerations over the deliberate pursuit of socio-economic transformation.

As a regional example, Filali (2012) analyzed housing conditions in Tunisia, focusing on both the quantity and quality of housing. By developing a multidimensional housing adequacy indicator, the study identified significant disparities between coastal and inland regions, as well as between urban and rural areas. The findings emphasized the need for quality-based improvements to reduce housing deprivation and its associated public health risks, particularly among vulnerable and geographically disadvantaged households. Together, these studies emphasize that social housing plays a critical role in shaping health, psychosocial well-being, and socio-economic mobility. However, persistent challenges remain, including health disparities, housing insecurity, and regional inequalities. The evidence suggests that future housing policies should holistically address both material and non-material housing dimensions, with particular attention to regional disparities and public health impacts.

Well-being in Collective Social Housing in Algeria

In Algeria, housing policy prioritizes quantity over architectural quality (Haraoubia, I. 2017), in response to rapid population growth (1.7% in 2020 according to ONS National Office of Statistics) and rural exodus. According to the Ministry of Housing, Urban Planning and the City (MHUV) the national housing program for 2024 plans for the construction of 460,000 units, 45.7% of which will be social housing (Laribi, 2023). Well-being in collective social housing in Algeria relies on the concerted action of institutions, technical standards, and urban strategies. The MHUV oversees social housing policies, supported by the AADL (National Agency for Housing Improvement and Development) and the OPGI (Office for Real Estate Promotion and Management), which manage housing and create common spaces while ensuring infrastructure maintenance. The CNERIB (National Center for Integrated Building Studies and Research) develops technical standards to optimize thermal and acoustic comfort and ventilation.

Critics of this housing model highlight the massive production of housing that primarily meets quantitative requirements, without satisfying qualitative expectations. Social housing is often unsuitable for family life, forcing many residents to make modifications (Benyamina, & el Habib, 2024). These shortcomings have been accentuated by the COVID-19 pandemic, which has revealed the rigidity of architectural designs in the face of changing lifestyles (El hamaida, et al., 2021).

A sociological survey conducted in Oran City in Algeria in 2022 classified residents into three groups: those who were able to adapt their homes to their needs, those who were dissatisfied but unable to modify their homes, and those deeply dissatisfied due to limited financial means (Benyamina, & el Habib, 2024). Current approaches to housing design do

not sufficiently take into account the interconnected criteria of well-being, limiting their ability to meet the qualitative needs of populations. In Batna, in the El Menchar housing neighborhood (800 social housing units), similar problems were observed, already very evident through the deterioration of common spaces and the feeling of insecurity within the neighborhood. This research aims to promote improvements in the architectural design of collective social housing to raise the resident's life quality and contribute to the promotion and rehabilitation of the image of social housing. This work aims to identify and analyze the factors influencing the well-being of residents in Algerian social housing through an in-depth case study analysis "case of 800 housing units, El Menchar, Batna, Algeria".

Methods

The work is divided into two main parts: The first part is an in-depth investigation of the provided literature review, and the government guidelines that identified recommendations aimed at improving well-being in collective social housing around the world. Reports from global organizations, including: UN-Habitat - "The Right to Adequate Housing" (2014), The New Urban Agenda (Habitat III) - United Nations (2016), World Health Organization (WHO) - "Housing and Health Guidelines" (2018), OECD - "Brick by Brick: Building Better Housing Policies" (2021), European Union - "Housing 2030: Effective Policies for Affordable Housing in the UNECE Region" (2021), and National Low Income Housing Coalition (NLIHC) - "Out of Reach" (2022), offer approaches, design principles, and case studies to promote well-being in collective social housing. As the relationship between well-being and collective social housing is complex and multidimensional, influencing the physical, mental, and social quality of residents' lives, the interaction between various approaches is essential. The parameters of well-being derived from the approaches of global government directives, including the environmental, psychosocial, IEQ (Indoor Environmental Quality), ergonomic functional, and temporal approaches, were cross-referenced with national parameters from the literature review, to determine the common parameters adopted and applied to the case study. The second part of the study is based on both quantitative and qualitative analysis, aimed at validating the theoretical criteria identified and assessing their influence on the well-being of residents of collective social housing in Algeria. The survey conducted on the case study uses a combination of several research instruments: in situ observation, interviews with residents, social media content analysis, as well as questionnaires, both online and in person. This methodological approach provides an in-depth and complementary view of living conditions within the neighborhood.

Case study

The El Menchar housing project, comprising 800 social housing units, is located in the new northern extension of the city of Batna, in eastern Algeria, 5.34 km from the city center. It is accessible via the RN3 National Road, Fig. 1 (A and B). It is bordered by: Djebel El Menchar (mountain) to the west and north, the AMOURI real estate development to the north and east, and the industrial zone and business park to the east and west.

Occupying an area of 98,943.4 m² and presenting a rectangular configuration, the studied neighborhood includes 800 housing units of 2-bedroom type dwellings, each with an area of 67 m². These dwellings are distributed within 53 blocks, including 35 buildings of 5 floors in height and 18 with 6 floors in height (Fig. 2). The majority of residents come

from older neighborhoods of the city, notably Z'mala, Bouakal, and Kechida, which induces certain social tensions linked to variations in lifestyles.

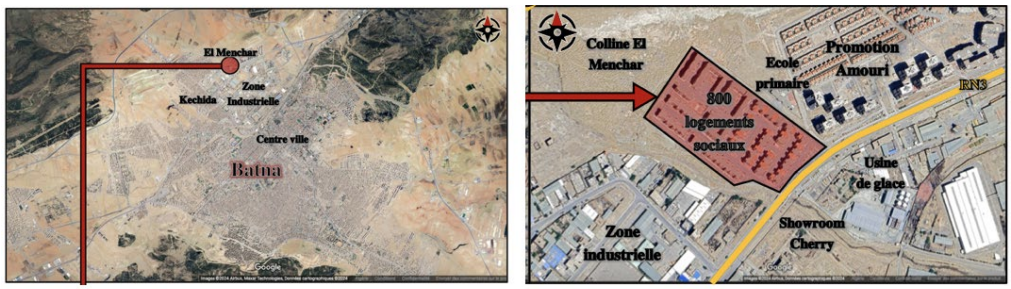


Fig. 1. (A) location relative to the neighborhood (B) immediate environment

Fig. 2. Site plan of the 800 social housing units in El Menchar (Source: BET Boukhalfa, 2015)

Investigation

Launched in February 2015 as part of the 2010-2014 five-year plan, this project was completed in 2020. Considered one of the recent achievements in Batna city, the complex has undergone several modifications, both architecturally and in terms of its exterior design. However, field observations revealed various anomalies, prompting an in-depth study. This study, supported by various investigative techniques, took place over two years. It included daily visits conducted throughout 2024. These visits were planned to cover various usage scenarios for the complex, including daytime and nighttime periods, weekdays and weekends, as well as school and holiday periods. The analysis was enhanced by photographic documentation of the observations. In addition to the observations, interviews were conducted with the neighborhood residents, covering a wide range of ages and including people of both genders. In addition, a questionnaire was distributed online via

Google Forms. Due to the low initial response rate, this questionnaire was then distributed in person within the neighborhood. Out of the 400 questionnaires distributed, 293 were completed and returned, representing a response rate of 73%. These responses reflect the opinion of 36.62% of families residing in the neighborhood, of which 68% are men and 32% are women. The questionnaire was structured around six axes: housing, participant identification, family composition, physical conditions, social interactions, and security. Combined with field observations, photographs, and interviews, it created a rich and relevant body of data for analyzing living conditions in the project. The analysis focused on exterior design, street layout, public lighting, facades, and waste management, also revealing olfactory and noise nuisances.

In order to understand the issues that residents are facing in these social houses, the research team conducted a social media content analysis by examining posts and comments shared by residents in private Facebook groups. Among the available social media platforms, Facebook is the most commonly used in Algeria. The residents spontaneously and freely discussed problems related to their neighborhoods, which provided authentic, user-generated data. This approach allowed the researchers to access naturally occurring conversations without interference, offering valuable insights into the lived experiences of social housing residents. Social media content analysis covered 5 private FaceBook groups all under the name of the neighborhood under analysis, these groups are as follows:

- Group 1 with 3100 memebers (https://web.facebook.com/groups/933606077108156)
- Group 2 with 2500 memebers (https://web.facebook.com/groups/212671970160319)
- Group 3 with 2400 memebers (https://web.facebook.com/groups/1111635093013293)
- Group 4 with 778 memebers (https://web.facebook.com/groups/944093826811594)
- Group 5 with 97 memebers (https://web.facebook.com/groups/1581446012786425)

Results and Analysis

Cross-referencing criteria

Cross-referencing well-being parameters from global government guidelines with national parameters from the literature review determined the common criteria adopted and applied to the case study.

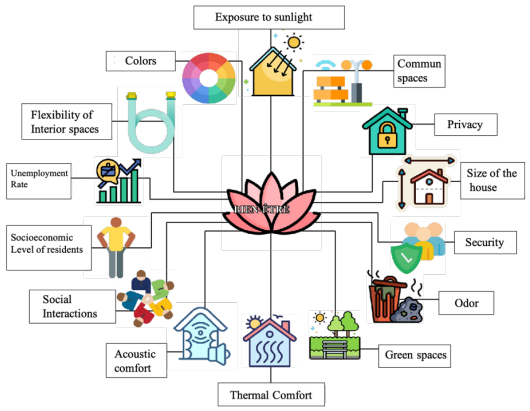


Fig. 3. Diagram of the criteria for the integrated and multidimensional approach to well-being in collective social housing to be adopted

The result of this cross-referencing revealed 14 interconnected criteria that have the greatest impact on the perception of well-being in collective social housing. These criteria, adapted to the Algerian sociocultural context, will serve as parameters for assessing residents' well-being in the case study (see Fig. 3). They are grouped into three categories: housing characteristics, environmental conditions, and social organization (see Fig. 4 and 5).

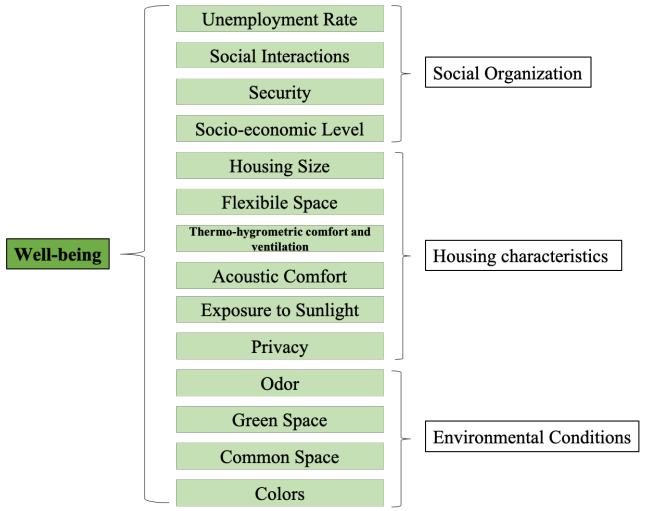


Fig. 4. Representative diagram of the criteria for well-being in collective social housing adopted

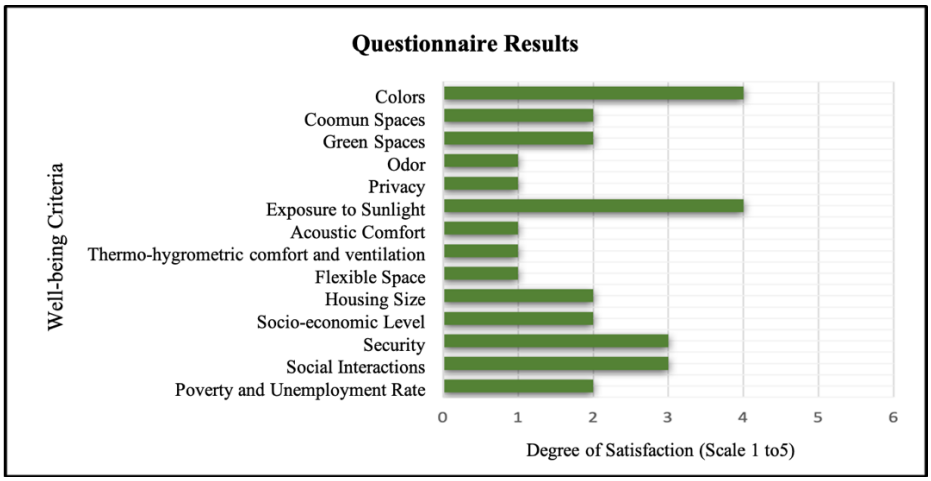


Fig. 5. Levels of satisfaction of residents according to the criteria of well-being in collective social housing at the 800 housing units El Menchar in Batna

Table 1. Crossing the criteria of well-being in collective social housing from different approaches in the world and Algeria

		Approaches					
Categories	Criteria	Environmental	Ergonomic and Functional	IEQ	Psycho-sociology	Temporal	Research in Algeria
Aesthetics	Arranged spaces	✓					✓
	Significant objects	✓					✓
	Identity/Homogenization of facades						✓
	Textures		✓	✓			✓
	Color	✓	✓		✓	✓	✓
Housing quality	Common areas			✓	✓	✓	✓
	Security	✓		✓	✓	✓	✓
	Housing size		✓	✓	✓	✓	✓
	Odor	✓	✓	✓	✓	✓	✓
	Green space/Visual comfort/Lighting	✓	✓	✓	✓	✓	✓
	Cleanliness			✓		✓	✓
	Balcony/Terrace		✓		✓	✓	
	Ceiling Height		✓		✓		✓
	Type of accommodation, age of construction, and floor level			✓	✓		✓
	Quality of materials			✓		✓	✓
	Obsolescence/precariousness				✓		✓
	Equipment/Drinking Water and Technical Disorder				✓	✓	✓
	Circulation				✓		
Housing characteristics	Space design/Adequate living space in the home		✓	✓	✓	✓	✓
	Office Space			✓	✓	✓	
	Legal Status of Housing						✓
	Geometry of space		✓		✓		✓
	Outdoor Spaces for Women				✓	✓	✓
	User Control			✓		✓	
Social and Cultural Characteristics	Social Interactions	✓		✓	✓		✓
	Poverty/Unemployment Rate	✓		✓	✓		✓
	Population gender and age				✓		✓
	Occupation/Household Composition/Socioeconomic Level			✓	✓	✓	✓
	Culture and Values	✓					✓
	Privacy			✓	✓	✓	✓
	Familiarity	✓			✓		✓
	Social practices				✓	✓	✓
	Environmental racism	✓			✓		✓
	Covid 19				✓	✓	
IEQ Parameters	IAQ			✓	✓	✓	
	Thermo-hygrometric comfort and ventilation	✓		✓	✓	✓	✓
	Acoustic Comfort	✓	✓	✓	✓		✓
	Pollution	✓		✓		✓	
	Presence of toxins inside the home	✓		✓		✓	
	Improving energy efficiency / using smart systems	✓		✓	✓		
Climate	Amount of sunlight	✓	✓	✓		✓	✓
	Exposure to natural disasters	✓					
	General temperature	✓		✓		✓	✓
	Climate Change	✓		✓		✓	

Table 1 shows that among the 44 criteria, the most significant ones influencing well-being (colored in orange) are: exposure to sunlight, common spaces promoting social interactions, privacy, and size of the dwelling impacting satisfaction and quality of life. Security, real or perceived, plays a crucial role in the comfort of residents, while the integration of green spaces, thermo-hygrometric comfort, and ventilation, ensuring good air quality, reinforces well-being. Finally, acoustic comfort remains central, particularly in dense urban areas. The well-being of residents in collective social housing is also influenced by socio-economic factors such as standard of living, unemployment rate, and poverty. In terms of interior design, the flexibility of spaces and the choice of colors play a key role in meeting the specific needs of residents and creating a soothing environment. An integrated and multidimensional approach to these 14 criteria in the design of social housing is necessary (see Fig. 3).

Studies on well-being in social housing in Algeria indicate that residents' quality of life is determined by three main categories: housing characteristics, environmental conditions, and social organization. Cross-analysis of the data made it possible to identify in detail the specific criteria for each of these categories, thus highlighting the need for an integrated approach to improving residents' well-being (see Fig. 4).

Analysis and results of the 14 criteria applied to the case study

Resident opinions, collected through the questionnaire, were assessed on a satisfaction scale of 1 to 5, where 1 indicates a low level of satisfaction, and 5 indicates a high level of satisfaction, considered very satisfactory.

The results presented in Fig. 5 highlight occupant perceptions and potential areas of intervention to improve well-being in the case study. The satisfaction scale highlighted the areas requiring priority improvements to ensure an optimal living environment in this housing project.

The results highlight notable varieties in residents' perceptions of well-being. While criteria such as sunlight exposure and color schemes are rated positively, others, particularly those related to the quality of indoor space and socioeconomic aspects, require substantial improvements. It is imperative to integrate these results to develop targeted improvement strategies.

The analysis shows that 5 out of 14, or 35.7%, of the essential well-being criteria, including Flexible Space, Thermo-Hygrometric Comfort and Ventilation, Acoustic Comfort, Privacy, and Odors, are perceived as highly unsatisfactory, with a satisfaction rating of 1/5. These results suggest major difficulties related to the adaptation of spaces, indoor air quality, sound insulation, odor nuisance management, and privacy.

5 out of 14, or 35.7%, of the well-being criteria, obtained a satisfaction rating of 2/5, indicating a feeling of dissatisfaction. This includes Unemployment Rate, Poverty, Socioeconomic Level, Housing Size, Green and Common Spaces. These results reveal concerns related to residents' socioeconomic situation and the quality of community infrastructure, particularly housing size and access to green spaces, which could affect the quality of life.

The results show that two out of 14 criteria, or 14.3%, received a satisfaction rating of 3/5, reflecting a moderate level of satisfaction. These criteria primarily concern security and social interaction. The analysis reveals that concerns related to security and social in-

teraction remain moderate, with security being managed by residents themselves depending on the available means. Furthermore, varieties in residents' lifestyles tend to limit social interaction, suggesting that improvements could be considered to strengthen the perception of security and encourage interaction between residents.

Finally, the two criteria - Exposure to Sunlight and Colors - received a satisfaction rating of 4/5, indicating a satisfactory assessment of lighting conditions and visual ambiance. These elements should be preserved and strengthened, as they improve the quality of life and attractiveness of residential spaces.

All responses, supplemented by observations and interviews, reveal that 10 of the 14 well-being criteria, or 71.4%, are not sufficiently addressed in these housing units, with a very low satisfaction rate (1 or 2 out of 5). These results highlight a significant gap between residents' needs and the design standards of social housing in Algeria. The results reveal significant information on areas requiring improvement and those already satisfactory.

Analysis and results of criteria relating to social organization

The analysis of data from questionnaires, semi-structured interviews, and social media content analysis on a private Facebook group provides a better understanding of the challenges faced by residents and identifies areas for improvement to strengthen social cohesion and life quality in the community.

Social Interactions

The moderate satisfaction level, rated at 3/5 according to the questionnaire results, does not necessarily reflect harmonious social interaction between residents of the social housing units under investigation. Indeed, several uncivil behaviors were observed, including the inappropriate dumping of waste in front of the blocks. Furthermore, the geographic distance of the neighborhood from the city center contributes to its "Dormitory neighborhood" character, which significantly limits opportunities for interaction and social integration. This situation is exacerbated by disparities in lifestyles, as evidenced by the fact that 77% of residents reported knowing little of their neighbors. Furthermore, the poor quality and uneven distribution of the few gathering spaces hinder social diversity and cohesion (see Fig. 6).

Fig. 6: Spaces for social interaction in the city

These results are consistent with the findings of (Gehl 2011), who emphasized the role of common spaces and pedestrian-friendly environments in fostering social interactions and community cohesion. In his study of urban public life, Gehl demonstrated that when residents are provided with accessible and inviting common spaces, their opportunities for

spontaneous social interaction significantly increase. This suggests that not only the architectural design but also the spatial distribution of social housing has a critical impact on residents' quality of life and their sense of belonging.

Security

According to Newman (1972), design elements such as access control, territoriality, natural surveillance, urban image quality, and hierarchical spatial organization are essential to enhance the sense of security in outdoor environments. However, analysis of the El Menchar neighborhood reveals a widespread absence of these protective urban features. In response, residents have adopted informal adaptation strategies, including the installation of fences and bars on facade openings (see Fig. 7 A and B), illustrating a response to a subjective perception of insecurity to compensate for these deficiencies. The neighborhood exhibits significant lighting disparities. Within the blocks, lighting is generally sufficient and contributes to an objectively safer environment (see Fig. 8 A). In contrast, the periphery, particularly the northern and eastern facades, suffers from insufficient lighting. The northern facade, adjacent to an isolated hill, remains dimly lit and isolated, which objectively increases the risk of crime and contributes to a heightened perception of insecurity (see Fig. 8 B).

(A) **(B)**

Fig. 7. (A) and (B) Closure of block groups with conventional fences (Source: Author, 2024 survey)

(A) (B)

Fig. 8. (A) Lighting of block entrances, (B) Total absence of exterior lighting

On the other hand, subjective security is shaped by residents' personal experiences and perceptions. Semi-structured interviews and content analysis of social media (particularly private Facebook groups) reveal a persistent sense of insecurity. Frequent reports of thefts, of water pumps, meters, gas equipment, and car parts, contributed to a widespread climate of fear and distrust among residents, regardless of actual crime statistics.

These findings are consistent with those of Cozens and Love (2015), who emphasize that environmental design, particularly appropriate lighting and surveillance, plays a criti-

cal role not only in reducing crime (objective security) but also in alleviating fear and improving residents' perceived security (subjective security). It is essential to take these two dimensions into account to create a safe and resilient living environment.

Socioeconomic Level and Unemployment Rate

Analysis of the questionnaire results highlights a worrying socioeconomic situation within the housing units, characterized by a high unemployment rate of 68%. This figure reflects structural barriers to employment, particularly a skills deficit. Furthermore, only 17% of residents work in liberal or independent professions, reflecting low economic diversification. The population appears relatively stable, with 89% of the households over the age of 35, although this stability is associated with reduced economic mobility.

Educational level is a key factor influencing professional integration. Indeed, 43% of residents have a secondary education, while 36% have received no schooling, thus limiting their employment opportunities. These socioeconomic conditions have a direct impact on the quality of life within housing projects. As highlighted by Huteau et al. (2020), low income significantly limits access to essential services, which can hinder residents' ability to maintain and improve their living conditions. Additionally, unemployment is closely linked to social exclusion and deteriorating health, as shown by Vaalavuo (2016), further contributing to the decline in housing quality. Social isolation, often exacerbated by economic inequality, can also foster tensions in common spaces and negatively affect mental well-being (Amate-Fortes et al., 2023).

Analysis and results of criteria relating to housing characteristics

The analysis identifies the strengths and weaknesses of the social housing units studied, to improve their design and better meet residents' expectations.

Housing size

The analysis of the 2-bedroom housing typology reveals a mismatch between the spatial configuration and the needs of a family with several children. With an average occupancy rate of 6 per unit, these units generate conflicts in the use of interior spaces, affecting residents' comfort. The combined use of the living room as a lounge and bedroom illustrates this constraint, while the second bedroom, with a surface area of 11.25 m² (see Fig. 9), does not accommodate essential functions such as an office. Faced with this mismatch, residents reassign spaces, altering their initial use and reducing their quality of life.

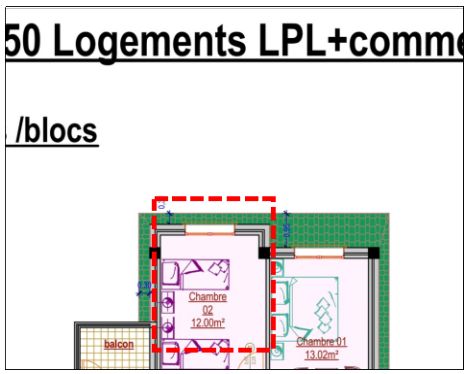


Fig. 9. Plan of one of the 800 social housing units (Source: BET Boukhalfa 2015 + Author)

Research indicates that housing size directly influences well-being and social interactions in co-housing. For example, a study from the Southampton Women's Survey shows that children living in overcrowded housing are more likely to develop behavioral disorders due to limited space for educational and recreational activities (Marsh et al., 2019). Similarly, during the COVID-19 pandemic, individuals in Italy living in larger homes demonstrated a better ability to adapt to confinement compared to those in smaller dwellings (Aguglia et al., 2022). Furthermore, research highlights that people residing in very small housing units—such as those under 40 m²—experience significantly higher levels of stress and dissatisfaction with their living conditions (Evans et al., 2000).

Spatial flexibility

The social housing units studied are designed according to standardized 2-bedroom type plans, characterized by low spatial flexibility. This architectural rigidity hinders the adaptability of the housing to family developments and the specific needs of residents, who are all tenants, as indicated in the questionnaire (see Fig. 10). The lack of modularity of the spaces limits their redevelopment, thus reducing the comfort of use and the appropriation of the housing by its occupants.

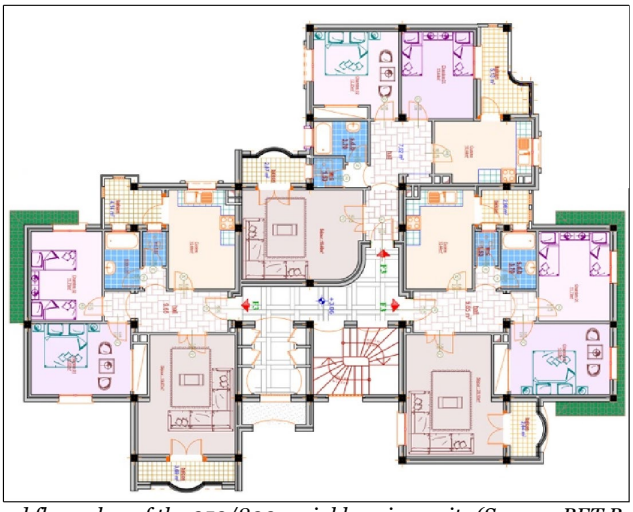


Fig. 10. Standard floor plan of the 350/800 social housing units (Source: BET Boukhalfa, 2015)

In the context of collective social housing, excessive standardization can have negative impacts on the well-being of residents by restricting the flexibility of living spaces. On the other hand, modular interiors offer better adaptation to family dynamics (births, marriages, children leaving home) and allow for optimized use of spatial resources. For example, in Zurich, the integration of movable partitions in certain social housing units facilitates the transformation of spaces according to the needs of the occupants (Salama & Alshuwaikhat, 2006) . Similarly, in Germany, a participatory social housing project allowed residents to define the interior design before construction, thus promoting increased personalization and better appropriation of the spaces (Lang et al., 2018).

Thermo-hygrometric comfort and ventilation

The survey highlights significant deficiencies in thermo-hygrometric comfort and ventilation in the social housing units studied, directly impacting residents' well-being. Thus, 58%

of residents reported humidity problems that promote mold growth, while 95% report poor indoor air quality due to insufficient ventilation. Furthermore, 63% of homes are subject to drafts, exacerbating thermal discomfort. The study also reveals that 94% of residents suffer from low temperatures in winter due to inadequate insulation and heating, while 99% report experiencing excessive heat in summer, indicating the inability of homes to mitigate the effects of heat waves. The complete lack of thermal insulation exacerbates these conditions, leading to significant temperature fluctuations, high energy consumption, and increased health risks.

Thermal comfort and ventilation quality are essential parameters for the health, quality of life, and energy efficiency of social housing. The World Health Organization highlights that indoor humidity promotes the development of respiratory diseases such as asthma and bronchial infections (Heseltine & Rosen, 2009). Similarly, a survey of social housing in Madrid revealed that 70% of residents experienced excessive heat in summer, a direct result of poor thermal insulation (Escandón et al., 2019).

Acoustic comfort

Analysis of the noise environment in the studied neighborhood highlights significant exposure to noise pollution, mainly due to the proximity of business parks, industrial zones, busy national roads, and primary schools. The lack of noise mitigation measures, such as green buffer zones or effective acoustic insulation in buildings, exacerbates this noise and compromises residents' comfort (see Fig. 11). The survey results reveal that the majority of residents perceive this noise pollution as a source of daily stress, negatively impacting their well-being and quality of life. In particular, noise from road traffic and industrial activities is reported as a factor disrupting sleep and concentration. The lack of adequate soundproofing in homes leads to increased propagation of exterior noise into interior spaces, which accentuates the feeling of discomfort, particularly in living areas and bedrooms. The impact of noise pollution on the health of residents is not negligible.

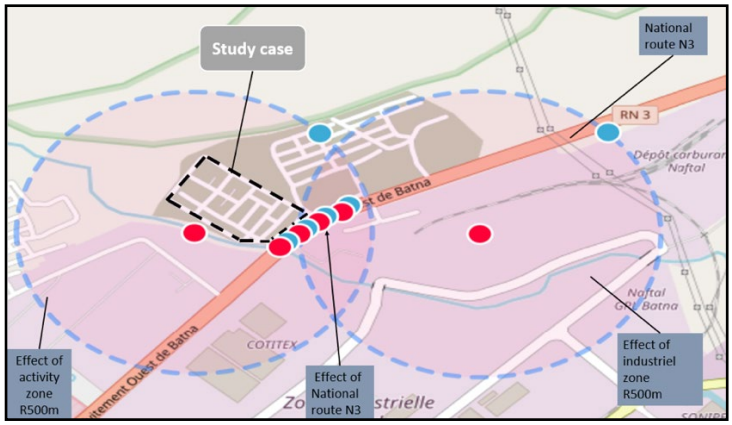


Fig. 11. Sources des nuisances sonores

According to recent findings, chronic exposure to transportation noise is associated with increased cardiovascular risk, including heart attacks and stroke, reinforcing WHO's classification of environmental noise as a major health hazard (Münzel et al., 2024). Fur-

thermore, studies conducted in similar neighborhoods have shown that chronic noise exposure, particularly at night, contributes to sleep disturbances, fatigue, and irritability (Halperin, 2014).

Exposure to sunlight

Analysis of the buildings in the neighborhood reveals an architectural design that favors natural lighting, notably through adherence to the H=L ratio, which ensures proportional spacing between buildings based on their height. This configuration optimizes the penetration of natural light into homes, thus reducing dependence on artificial lighting and improving the visual and psychological comfort of residents (see Fig. 12).

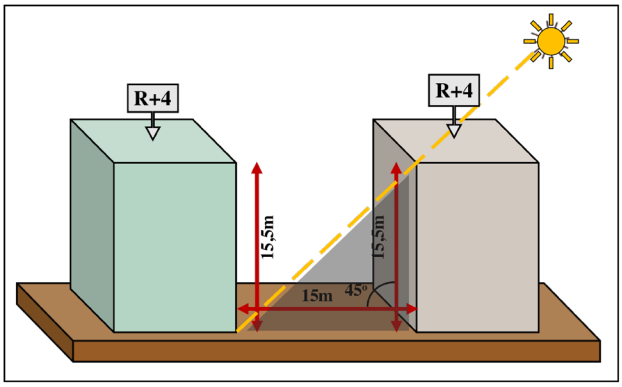


Fig. 12. Housing sunshine diagram

Adequate exposure to natural light is an essential factor for the well-being of residents, the reduction of energy consumption, and the quality of life in urban environments. Indeed, scientific literature highlights the benefits of natural lighting on the mental and physical health of residents.

For example, a study by Smith et al (2009) found that exposure to natural light improves sleep quality and reduces depressive symptoms in shift workers, with those exposed to daylight showing better sleep and lower depression levels. For instance, a 2022 international study examined residential lighting conditions in several countries, including Sweden, and found a correlation between satisfaction with natural lighting and its adequacy. The results suggested that improving natural light in homes could significantly increase resident satisfaction (Morales-Bravo & Navarrete-Hernandez, 2022). Furthermore, the Kampung Admiralty social housing project in Singapore follows urban design principles that adhere to the H=L ratio, optimizing natural light and air circulation. The design has been shown to improve the living quality of residents by incorporating sustainable and human-centered features (Loh et al., 2025).

Privacy

Residents adapt their homes to maintain their privacy by covering windows and balconies with tarpaulins or mirrored glass, or by modifying ground-floor screens by closing them or adding bars (see Fig. 13 A and B).

These adjustments compensate for initial architectural shortcomings and reflect a need for privacy.

(A) (B)

Fig. 13. (A) and (B): Balcony, window, and screen enclosures

The importance of privacy in collective social housing is confirmed by Rouag-djenidi (2005), who observed the installation of blackout blinds in Constantine, Algeria, and by Gamero., et al (2022), who showed that semi-enclosed balconies in Singapore improve both privacy and social interaction. These results highlight the importance of integrating privacy considerations from the architectural design phase of collective housing.

Analysis and Results of the Environmental Conditions Criteria

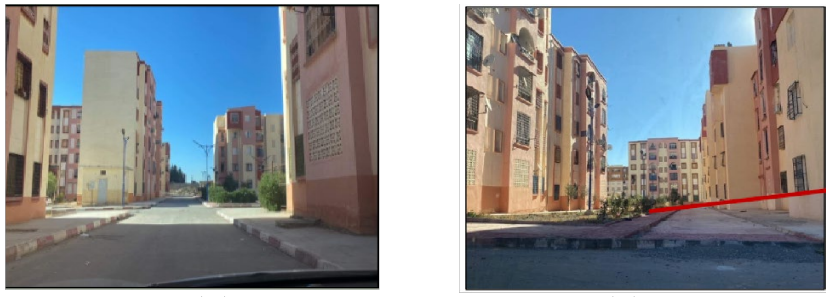
The analysis identifies the improvements needed to enhance life quality and promote a healthier, more pleasant, and harmonious living environment in the city.

Green Space

The study of the site plan reveals a notable lack of green spaces, representing less than 10% of the built-up area. Due to budgetary and time constraints. Neglected from the design stage, these spaces are nevertheless essential to the well-being of residents (See Fig. 14). Their absence reduces environmental, social, and aesthetic benefits. This proportion is significantly lower than international and Algerian standards. Indeed, the international standard recommends 10 m² of green space per inhabitant, divided into 1.5 m² for kindergartens, 4.5 m² for parks and pleasure gardens, and 4 m² for other green spaces. In Algeria, although Law No. 07-06 of May 13, 2007 on the management, protection, and development of green spaces does not specify a percentage or minimum area to be devoted to green spaces in collective social housing estates, it emphasizes the importance of integrating these spaces into urban planning projects (Chaoui, 2023). Despite the limited presence of green spaces, the majority of them are abandoned or poorly maintained, as shown in Fig. 15 (A and B). These spaces are nevertheless essential to the well-being of residents. Their absence or degradation reduces environmental, social and aesthetic benefits, negatively impacting the quality of life within the city.

The integration of green spaces into social housing promotes biodiversity and quality of life (Andersson et al., 2014), confirming their role in reducing stress and improving mental health.

Fig. 14. Aerial view showing the location and number of green spaces in the city



(A) (B)

Fig. 15. (A) Green spaces on the site plan (B) Green space created

Common space

The distribution of common spaces within the neighborhood presents notable shortcomings, both in terms of quantity and spatial arrangement. The only space equipped with benches adopts a triangular configuration and is located in the immediate vicinity of the national road. This location generates significant noise pollution and risks to the safety of residents, which limits its effective use. Furthermore, four other common spaces are integrated within the neighborhood, but their limited surface area does not allow for true social diversity. Furthermore, these spaces lack suitable facilities and equipment to encourage interaction between residents (see Fig. 6). Faced with this lack of dedicated infrastructure, residents are developing alternative practices for appropriating space. Social interactions are thus organized informally on the sidewalks, in front of the accesses to the blocks and even in the parking lots, where residents, depending on their age categories, improvise meeting places by bringing their own furniture (chairs, tables, benches, rugs, etc.), as illustrated by the observations in Fig. 16 (A and B).

Female social interactions in the city's outdoor common spaces are particularly limited, largely due to the lack of adequately designed and secure spaces to accommodate this type of use. As a result, these interactions retreat to intermediate spaces, particularly staircases, which become privileged places for exchange and socialization for women. In contrast, children uses all available outdoor spaces, which they spontaneously transform into

play areas. The lack of dedicated equipment leads them to improvise with makeshift objects, as shown in the scenes illustrated in Fig. 17 (A) and (B).

(A) (B)

Fig. 16. (A) Lack of common spaces in the city, (B) Social interactions between neighbors in the city

(A) (B)

Fig. 17. (A) and (B): Children's entertainment methods in the city

The degradation of common spaces in social housing can impact residents' quality of life and social cohesion. Simon (2015) emphasizes that poor maintenance exacerbates tensions and worsens living conditions, highlighting the importance of public policies that address these issues effectively.

Odor

The 800-unit housing estate is subject to multifactorial pollution, altering the environment and quality of life. The embankments, which have become illegal dumps, create visual and environmental pollution (see Fig. 18 A and B), aggravated by inefficient waste management.

The only state body responsible for waste management is the town hall's technical service, which is limited to collecting household waste and emptying bins. With only one shift per day, the service provides the bare minimum due to a lack of human and material resources, allowing non-household waste to accumulate. Furthermore, the insufficient number of bins and their poor distribution complicate local waste management (see Fig. 19).

Residents' attitudes also contribute to the deterioration of hygiene and common spaces. The lack of awareness and collective accountability creates a vicious cycle, in which common spaces are gradually neglected. The presence of a dried-up valley (see Fig. 20 A

and B), which has become an open-air dump, exacerbates the situation by promoting the proliferation of unpleasant odors and altering the urban landscape, leading to environmental and social nuisances. Furthermore, the absence of green spaces and the accumulation of waste demonstrate poor urban management and a lack of social cohesion to preserve the local environment.

(A) (B)

Fig. 18. (A) and (B): Landfill full of waste at the boundaries of the property

Fig. 19. Waste Management in the City

Recent research has shown the impact of odor and social nuisances as sources of degradation in low-income neighborhoods, especially in areas located near landfills in South Africa and similar contexts, where odor nuisances have generated feelings of unease, marginalization, and social stigma (Heaney et al., 2011).

(A) (B)

Fig. 20. (A) and (B): Dried-up wadi full of garbage

Colors

The color palette of the facades of the 800-unit housing complex combines natural tones such as beige and white with warm colors such as pink and orange, creating a welcoming and warm atmosphere, as confirmed by the questionnaire results. According to color psychology, beige is often associated with calm and serenity, providing a soft and soothing ambiance. White symbolizes purity and delicacy, evoking freshness and calm. Warm hues such as pink and orange are known to stimulate energy and foster a friendly atmosphere. Thus, this color combination promotes a feeling of well-being and openness among residents (see Fig. 21).

Fig. 21. The colors of the neighborhood's 800 housing units

However, the presence of graffiti, often created by young people (see Fig. 22 A and B), alters this aesthetic and reflects a malaise, a need for expression, or a lack of awareness of the enhancement of the built environment.

Although the initially chosen colors aim to improve visual and psychological quality, their impact is mitigated by these inscriptions, reflecting complex social dynamics.

Fig. 22. (A) and (B): Graffiti on facades

However, in other contexts, notably in Copenhagen, the use of pastel colors in a multi-family housing neighborhood has increased the appeal and use of common spaces, while the lack of aesthetic appropriation has favored the appearance of graffiti, reflecting discontent with the environment (Jorgensen, 2008).

Discussion

Although Algeria's social housing programs have improved access to shelter, their impact on residents' well-being remains limited. The analysis of 800 collective housing units in El Menchar, Batna, reveals that only a few of the 14 well-being criteria—such as sunlight exposure and the use of color—are adequately met. In contrast, major deficiencies persist in the outdoor environment (lack of green spaces, poor security, and exposure to nuisances), housing quality (small surface areas, lack of comfort), and socioeconomic conditions (unemployment, limited services, and peripheral location).

Findings from surveys, interviews, and field observations confirm that environmental conditions are the primary determinant of residents' perceived well-being. This highlights the urgent need to integrate well-being criteria from the design stage. Key areas for improvement include:

- Interior space flexibility: Rethinking unit layouts for better adaptability, ventilation, and acoustic comfort.
- Outdoor environment enhancement: Introducing green spaces, play areas, and inclusive infrastructure to foster community life.
- Security and nuisance management: Addressing safety and minimizing noise and odors through urban design and maintenance.

Conclusion

This research examined well-being in collective social housing in Algeria, using the 800 housing units of El Menchar in Batna as a case study. It assessed how environmental, spatial, and social factors influence residents' quality of life, using a multidimensional approach that incorporated 14 well-being criteria. The findings show that while aspects such as sunlight exposure and color use are adequate, most criteria, including green space availability, safety, comfort, and community infrastructure, remain unmet, contributing to a limited overall impact on well-being. Crucially, the study reveals that the physical environment, social dynamics, and perception of safety play interrelated roles in shaping both objective and subjective well-being. Issues such as odor nuisances, lack of thermal comfort, and insecurity not only reduce quality of life but also highlight the consequences of neglecting well-being in design and management. These findings resonate with international studies. Globally, research has shown that social housing often correlates with poorer health outcomes, housing insecurity, and limited social mobility, especially when policies focus narrowly on quantity over quality. Yet, as studies from Australia, Canada, New Zealand, South Africa, and Tunisia indicate, the negative effects can be mitigated through housing stability, neighborhood quality, participatory planning, and regional equity. Therefore, aligning Algerian social housing policies with these international lessons is essential. Improving well-being requires a shift toward integrated, inclusive, and sustainable approaches that address both material and psychosocial housing dimensions. Well-being must be considered from the earliest stages, planning, design, and construction, through to long-term management and maintenance. A structural reform is urgently needed to promote resilient, health-promoting living environments that reflect the expectations, dignity, and needs of residents, not just in Algeria, but as part of a broader, globally informed housing agenda.

Recommendations and suggestions: This study identifies key actions to enhance the quality of social housing in Algeria. A policy shift is needed, focusing on: Inclusive urban planning that

integrates essential social and economic infrastructure; Participatory housing design involving residents to align housing solutions with actual needs; Promotion of social diversity to reduce inequality and strengthen community cohesion. These measures are essential to create sustainable, livable, and resilient housing environments.

Conflicts of Interest: The authors declare no conflict of interest.

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