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Spatial Configuration of Collective Social Housing: A Space Syntax Analysis of 1980s Housing in Biskra, Algeria

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Abstract

Since independence, social housing has been one of the cornerstones of Algeria's urban policy. This article forms part of a doctoral research project devoted to the transformations of architectural quality in collective housing in Biskra, and examines the extent to which the first post-independence projects reflect, or obscure, local socio-cultural practices. The study focuses on three F3-type dwellings located in the 726, 830 and 1000 housing estates: these are representative of the earliest state-planned programmes after 1962. The methodology combines Space Syntax tools with both quantitative analysis (depth, connectivity, and movement distribution) and qualitative observations (visual fields and circulation patterns). The findings highlight a dual dynamic; on the one hand, the persistence of traditional devices such as the entrance vestibule reminiscent of the saqîfa and the hierarchical organisation of reception spaces, which ensure the protection of family privacy; on the other hand, the emergence of transformations linked to the standardization and rationalization imposed by state planning. This analysis sheds light on how collective housing in Biskra has attempted, with both successes and limitations, to reconcile normative constraints with cultural traditions.

Keywords: *Collective Social Housing, Spatial Configuration, Space Syntax, Socio-Cultural Practices, Privacy.*

Introduction

Following Algeria's independence in 1962, the country experienced rapid population growth accompanied by significant urban expansion, which led to an acute housing shortage (Arab *et al*., 2022; Boutabba *et al*., 2019). This situation required urgent intervention by public authorities. To address the growing demand, the government implemented modern planning procedures inspired by urban development models in industrialized countries, particularly the construction of large-scale collective housing complexes under the framework of the *Zones d'Habitat Urbain Nouvelles (ZHUN)* or *new urban housing zones* (Mili *et al*., 2016; Alouane, 2015). Over time, this approach became the foundation of social rental housing and established itself as a central component of Algeria's long-term housing policy.

This extensive housing programme was implemented across all Algerian cities (Mezrag *et al*., 2018), and Biskra was no exception. In 1977, two new urban housing areas were established: *ZHUN East* and *ZHUN West*. These developments were primarily aimed at addressing the housing shortage in terms of quantity; however, concerns regarding quality, both architectural and social, soon emerged as a significant challenge.

Anyone examining the urban history of Biskra will recognize that this new type of housing is largely alien to the city's traditional customs and practices. It has had a significant impact on multiple social, cultural, ethical, urban planning, and architectural dimensions. Indeed, numerous studies have demonstrated, both experimentally and conclusively, the functional inadequacy of this model, particularly with regard to cultural and social aspects. These studies highlight, in particular, that the outdoor spaces in newly developed neighbourhoods do not adequately foster social interaction or a sense of belonging, revealing a lack of urban integration and a feeling of disconnection from the built

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environment (Naceur, 2013; Bendjedidi *et al*., 2018; Femmam and Mazouz, 2018; Djenaihi *et al*., 2021). The discontinuity between the old and modern urban fabrics has exerted a profound effect on subsequent generations of the city's population.

This study builds on previous research but focuses specifically on the internal spatial configuration of collective social housing, a crucial factor for understanding social dynamics. By employing spatial syntax tools, it becomes possible to examine how the distribution of space within dwellings influences residents' daily practices, particularly interactions between inhabitants and visitors, as well as the varied uses of domestic spaces. The objective is to evaluate the extent to which spatial organisation facilitates the expression of habits, social relationships, and cultural values within the home. This approach allows for assessing how well these new residential models align with local lifestyles. Three housing estates were selected in the western ZHUN district of Biskra: the 726-, 830 and 1000-dwelling estates, which represent the city's oldest collective housing complexes.

This article therefore focuses on changes in the architectural quality of social housing in Biskra, specifically examining how its design reflects, or fails to reflect, continuity with local socio-cultural practices. The selection of two-bedroom apartments (F3) as the focus of analysis is deliberate, reflecting the fact that this apartment type now constitutes the dominant, and in many cases, exclusive, residential configuration in contemporary social housing programmes. This contrasts with earlier projects, which offered a broader range of unit types, from studio apartments (F1) to four-bedroom apartments (F5). This clarification situates the study within a comparative and diachronic perspective, while highlighting the representativeness of the cases selected.

Presentation of the case study:

The city of Biskra is located approximately 470 kilometres south-east of the capital, Algiers. Often referred to as the *Gateway to the Desert* and the *Queen of the Zibans*, it occupies a strategic position between the foothills of the mountains and the Saharan expanses, making it a major gateway to southern Algeria.

Its urban development forms part of a centuries-long historical process. During the Roman period, the city was known as « *Vescera* ». Under the Islamic dynasties, it emerged as an important regional commercial and cultural centre. During the Ottoman period, the urban core was structured around seven historic villages: *M'cid*, *Gueddacha*, *Bab Dareb*, *Bab El Fath*, *Ras El Gueria*, *Sidi Barket*, and *Medjniche* (Farhi, 2002). These villages, dispersed across the palm grove, constituted the early settlements that gradually developed along the regulated layout of the irrigation canals, reflecting a way of life adapted to the constraints of the Saharan environment (Côte, 2005, cited in Barkat *et al*., 2019).

French colonisation imposed an exogenous urban model based on an orthogonal grid, known today as the « *colonial grid* », which profoundly reshaped the spatial organisation of the city (Belakehal *et al*., 2015).

After the country gained independence in 1962, Biskra experienced rapid urban expansion driven by sustained population growth (from approximately 128,300 inhabitants in 1987 to more than 204,600 in 2008). This demographic pressure led to an increasing demand for housing, to which the authorities responded by creating two *Zones d'Habitat Urbain Nouvelles* (ZHUN): ZHUN East and ZHUN West. Their names reflect the geographical division of the city by Wadi Biskra, which separates it into two main distincts: the eastern zone and the western zone (Fig. 1).

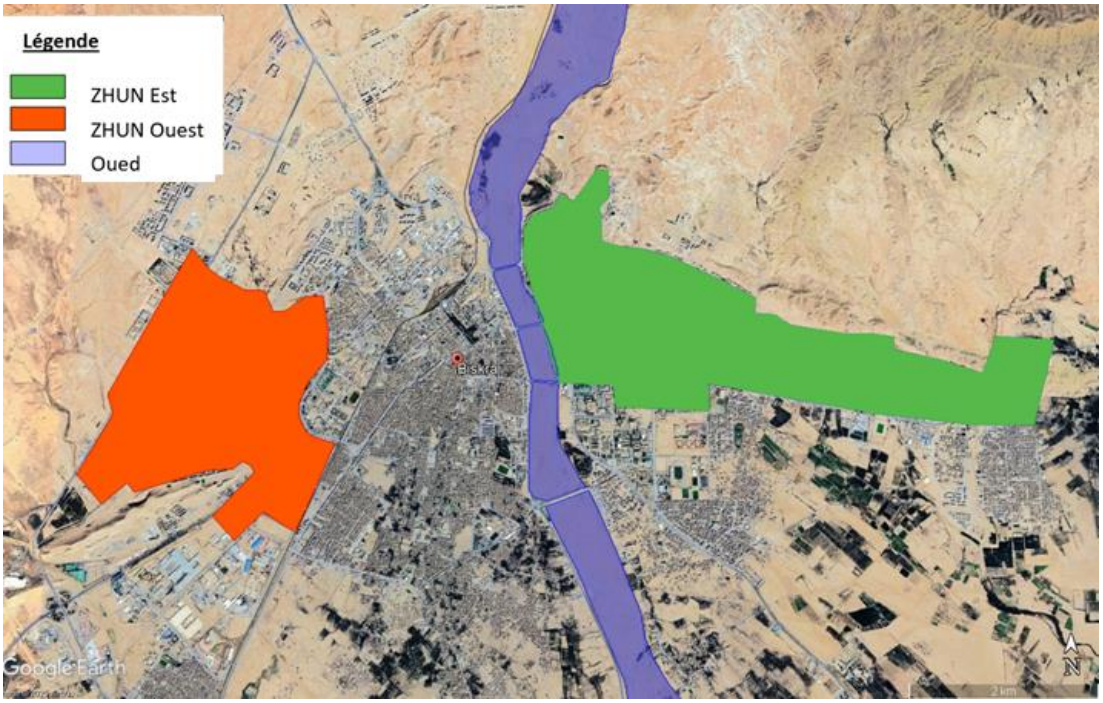


Fig. 1: Location of the two ZHUN East and West

Source: Urban Planning Design and Implementation Office (URBA), 2004

The three housing units studied in this research are located in the western ZHUN, namely the 726-, 830-, and 1000-dwelling estates (see Fig. 2).

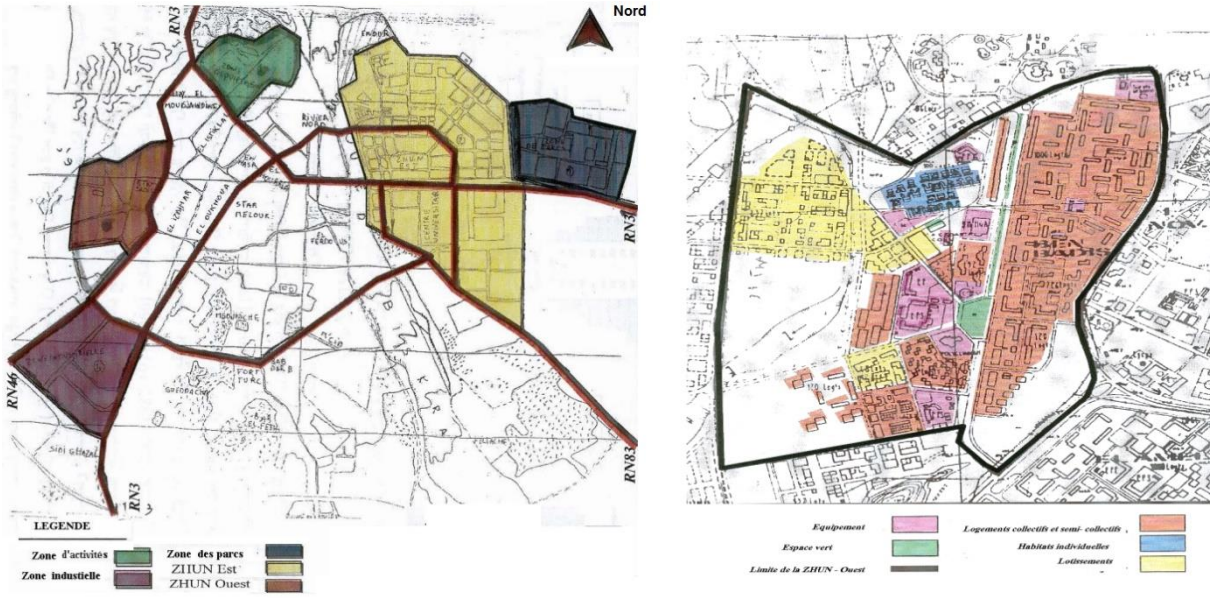
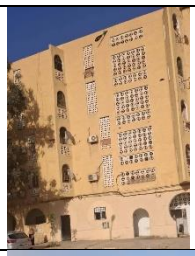
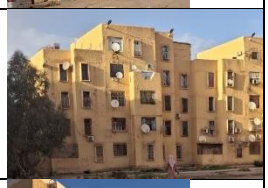


Fig. 2: Location of case studies in relation to ZHUN West and the city of Biskra

Source: Information and Guidance Office, PDAU of Biskra 1997

These neighbourhoods were all built during the second decade after the country's independence. They were brought into effective use in the mid-1980s. Regarding the surface area of their housing units, they were relatively spacious, with an average surface area of approximately 80m² (Table 1).

Table 1: Spatial and Architectural Characteristics of the Case Studies

Location	Date de début de la construction	Date of occupancy	Site area	Building height	Unit floor area (F3)	External appearance of the buildings
726-dwelling estate	1979	1985	15 acres	3–4 storeys	88 m^2	
830-dwelling estate	1979	1986	14 acres	3–4 storeys	79 m^2	
1000-dwelling estate	1979	1984	24 acres	2–4 storeys	84 m^2	

Source : Office de Promotion et de Gestion Immobilière (OPGI) Biskra

Cultural references and spatial logic of traditional housing in Biskra

The primary urban core of the city of Biskra was formed around seven historic villages. This structure gave rise to traditional housing that embodies the social and cultural values of conservative Biskrite society, while reflecting its lifestyles and principles of privacy and family relations. Consequently, before commencing our study, it was deemed appropriate to briefly examine the design rationale underlying these dwellings. A set of traditional houses was selected in the *Bab Edarb* neighbourhood, as well as in the *Guddacha* and *M'cid* districts.

The design of these dwellings exhibits a spatial layout that reflects the social and religious values inherited from conservative Biskrite society (Barakat *et al*., 2021). Constructed from raw earth, the traditional Biskrite house was characterised by a layout centred around an interior courtyard, known as the *wast eddar*. This courtyard is largely covered, except for a rectangular skylight, the *raouzna*, situated at the centre of a flat roof (Alkma *et al*., 2018).

In order to preserve the privacy of the domestic space and following the model of individual dwellings in other southern Algerian cities (Brown and Bellal, 2001), access to the house was provided through a *chicane* known as a *s'qifa*. This entrance vestibule, serving as both a visual and social filter, led directly to the *bīt eddiyāf*, a space reserved for receiving visitors, typically located near the house entrance (Barakat *et al*., 2021). Similarly, ablution areas, namely the toilet and bathroom, were often positioned close to this reception area, in order to preserve the privacy of the inhabitants, particularly women, when these facilities were used by male guests (Figs. 3 and 4).

Overall, these spatial arrangements reveal an organisation consistent with cultural principles of privacy, hospitality, and the separation of public and private spheres, and more specifically, between male and female domains.

Fig. 4: Traditional houses in the M'cid neighbourhood (units 1, 2, and 3) and in the Guddacha neighbourhood (units 4, 5, and 6).

Source: Barkat *et al*., 2021

Beyond the general spatial organisation and cultural principles governing the traditional Biskrite house, certain functions specific to the oasis region of Biskra further demonstrate how inhabitants adapted to their socio-cultural environment and economic needs. This is particularly evident in the storage facility, provided by a space known as the *makhzen*, typically located on the upper floor. It was primarily used to store food provisions, reflecting families' concern for maintaining a degree of food self-sufficiency and economic stability. The presence of the *makhzen* also illustrates adaptation to local environmental and climatic conditions, enabling long-term storage of food. Such spaces were entirely absent in the design of all planned collective housing (Adad, M. C., & Zerouala, M. S., 2002).

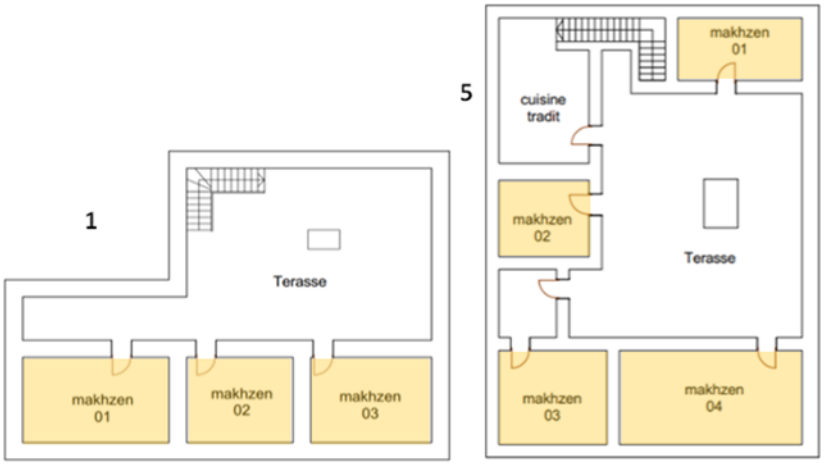


Fig. 5: Location of the « *Makhzen* » storage space on the upper floor of traditional Biskrite houses. House 1 in the M'cid neighbourhood and house 5 in the Gueddacha neighbourhood.

Source: Barkat *et al*., 2021

Theoretical and Methodological Framework

Spatial Syntax as a Tool for the Socio-Spatial Analysis of Housing

The relationship between human behaviour and space could not be quantitatively modelled or analysed until the emergence of Space Syntax Theory in the early 1980s. Developed by Bill Hillier and Julienne Hanson (1984), the theory underwent gradual expansion of its conceptual framework over the following decade (Hillier *et al*., 1987; Hillier, 1996; Hanson, 1998) before entering a phase of practical application across various fields, including architecture, urban planning, sociology, archaeology, and other disciplines concerned with interactions between humans and space (Boutabba *et al*., 2019). This approach aims to anticipate patterns of movements and social interactions by analysing the interaction between physical boundaries, human behaviour, and spatial experience (Çetin *et al*., 2025; Boutabba *et al*., 2022).

In this study, Space Syntax theory is employed to investigate the effects of the design of the housing units on user behaviour, taking into account their integration within a society with specific cultural and social characteristics, particularly concerning the regulation of privacy, the hierarchy of spaces, and the distinction between public and private spheres. Accordingly, this study utilises the tools provided by Space Syntax to assess the extent to which the collective social housing constructed in Biskra from the late 1970s onwards reflects, or conversely, undermines the traditional spatial logic rooted in cultural norms.

Justified graphs: a tool for reading spatial configurations:

According to Ostwald (2011), justified plan graphs represent the first concrete analytical method developed within the framework of Space Syntax theory. This method aims to provide a coherent graphical, mathematical, and theoretical model for analysing the spatial configuration of buildings. These graphs are considered a representation of spatial connections, enabling the identification of room typologies and internal structures (Driessen *et al*., 2008; Boutabba and Farhi, 2011).

To summarise the concept of justified graphs, they can be described as a visual representation of the hierarchical depth of spactial distribution within a plan. (Malhis, 2003). Spaces are represented as nodes, the first of which is usually the external space (the root), which is essential for analysing intimacy, accessibility, and control (Zolfagharkhani *et al*., 2021). The remaining nodes are then organised into successive levels according to the number of spaces that must be traversed to reach them from the root. The further a node is from the root and the greater the number of levels, the deeper the system; conversely, fewer levels indicate a shallower system (Ayyildiz, 2023). Nodes, depicted as circles, are connected by links (lines) that illustrate the spatial connections between the various spatial units of the building (e.g., doors or other access points) (Hamouda, 2018; Boutabba *et al*., 2020; see Fig. 6).

According to Hillier (2007), human behaviour in space can be understood in general terms through two primary forms: occupation and movement. Occupation refers to the static or localised use of space,

whereas movement involves transit between spaces. These two dynamics engage different spatial properties: local properties for occupation and global properties for movement. Occupation thus relies on convex spaces, defined by Klarqvist (1993) as spaces in which no line connecting two points crosses the perimeter, thereby promoting mutual visibility. Movement, in contrast, requires linear and permeable configurations, represented by axial lines, that is, the longest possible straight lines of visibility and movement. Finally, perception and visual control can be analysed through isovist space, defined by Benedikt (1979) as the set of points visible from a given location within an environment. This distinction enables the identification of four topological types of spaces within a building, made visible through the justified plan graph (see Table 2).

Table 2: Typology of Topological Spaces According To Spatial Syntax Theory

Space Type	Number of connections	Topoloy	Mouvement Characteristics
Type-a	Single connection (1)	Cul-de-sac	No through movement; occupation only
Type-b	Multiple connections	Linear	Single controlled through movement; return along the same path
Type-c	Multiple connections on a single loop	Cyclic	Through movement with possible return via an alternative path
Type-d	Two or more loops, with intersections	Network	Free movement with less control; variety of route choices

Source: Hamouda, 2018

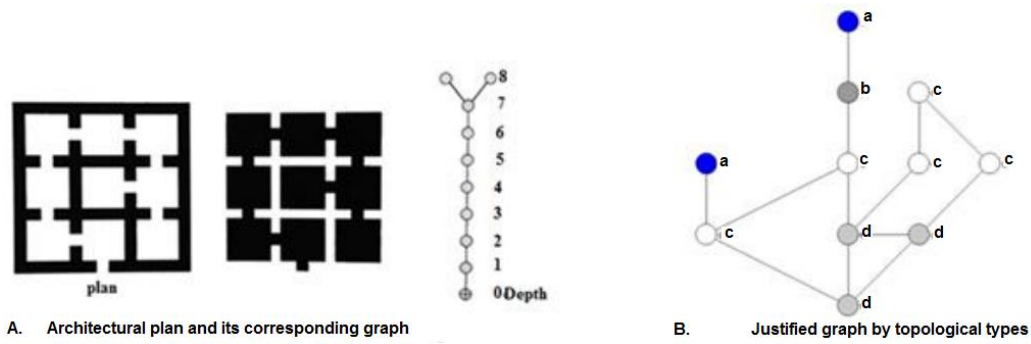


Fig.6: Example of a justified graph of building and a justified graph by topological type according to Hillier, 1996

Source : Boutabba *et al*., 2022

In order to deepen our understanding of spatial configuration beyond the topological types of spaces, the relationships between these spaces can be analysed along two fundamental dimensions: symmetry/asymmetry, and distributivity/non-distributivity, which in turn reflect potential social implications (see Table 3 and Fig. 7).

Table 3: Typology of topological relationships in a justified graph, according to Hillier and Hanson (1984)

Relation	Definition	Spatial Tendency	Social Implication
Symmetry	Two spaces (a and b) have an equivalent reciprocal relationship with respect to an origin point (c).	Tendency towards spatial integration	Social integration of categories

Asymmetry	Space (a) is not to (b) what (b) is to a from (c). Unequal accessibility relationship.	Tendency towards spatial hierarchy or segregation	Social segregation
Distributivity	Multiple independent paths exist between two spaces (a and b) from the origin point (c).	Diffusion of spatial control	Sharing of spatial power / Flexibility
Non-distributivity	A single mandatory path connects two spaces, passing through a central point (e.g., c).	Centralisation of spatial control	Unitary and hierarchical control

Source : Hamouda, 2018

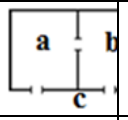
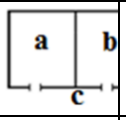
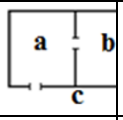
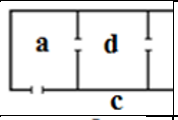
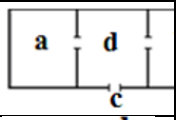
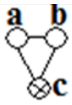
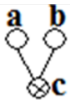
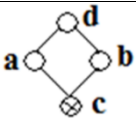
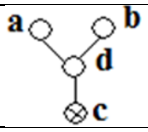
Case	01	02	03	04	05
Plan					
Justified Graph					
Relation and Model	Symmetric Distributive	Symmetric Non-distributive	Asymmetric Non-distributive	"a" and "b" symmetric / "c" "d" asymmetric with "a" and "b"/"c" Distributive set	"d" non-distributive and asymmetric with "a" and "b" "a" and "b" symmetric /"c"

Fig. 7: Typology of spatial configurations according to Hiller et al, 1984

Source: Boutabba, 2013

Quantitative measures of Space Syntax

In addition to the qualitative analysis of spatial configurations, Space Syntax provides a set of quantitative measures designed to objectify the relationships between spaces, thereby revealing underlying spatial logics that are not easily perceptible through descriptive observation alone. These indicators establish a rigorous comparative basis across different buildings, expressed through several analytical formulations:

- **Mean Depth (MD):**

$MD(n) = TD(n) / K - 1$

- **Relative Asymmetry (RA):**

$RA = 2 (MD - 1) / K - 2$

- **Real Relative Asymmetry (RRA):**

$RRA = RA / X \qquad X = \{6.644K.\log 10 (K + 2) - 5.17K + 2\} / (K^2 - 3K + 2)$

- **Base Difference Factor (BDF):**

$H = - \Sigma [a/t \ln(a/t)] + [b/t \ln(b/t)] + [c/t \ln(c/t)] \qquad H^* = H - (\ln 2 / \ln 3 - \ln 2)$

Syntactic Analysis of the Selected Case Studies

The F3 social housing units examined in this study, namely L1 located in the 726-dwelling estate, L2 in the 830-dwelling estate, and L3 in the 1000-dwelling estate, exhibit a similar spatial configuration in terms of the number of bedrooms (two) and the systematic inclusion of a living room. This space serves a dual function: it operates both as a living area for the occupants' daily activities and, in the presence of guests, as a reception space (lounge). In many households, it is also used as a sleeping area at night, particularly in large families. The dwellings also include a kitchen and sanitary facilities. However, the presence of ancillary spaces such as balconies, loggias, drying rooms, and terraces is not uniform, varying from one dwelling to another.

The first step consists of constructing the justified graphs of the three dwellings in order to understand the spatial organisation and the topological types of each space. Subsequently, using the AGraph 1.14 software, the main syntactic measures are calculated, namely: total depth (TD), mean depth (MD), relative asymmetry (RA), integration (i), and control value (CV).

In this study, the RRA value is not considered, as the three dwellings analysed exhibit a similar spatial configuration in terms of the number of spaces, all corresponding to F3 units. Furthermore, the aim of this study is not to compare these dwellings with one another, but rather to assess whether they can be considered representative of the design logic underlying social housing in the 1980s.

Phase 1: Qualitative Findings from Space Syntax Analysis

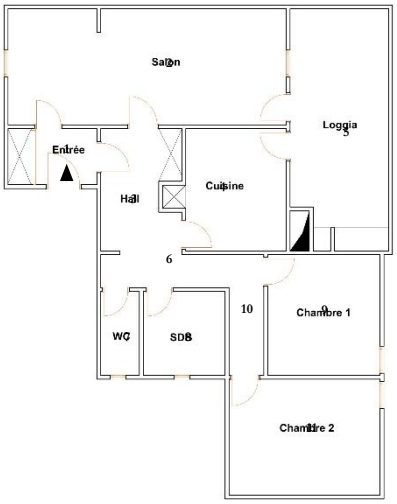
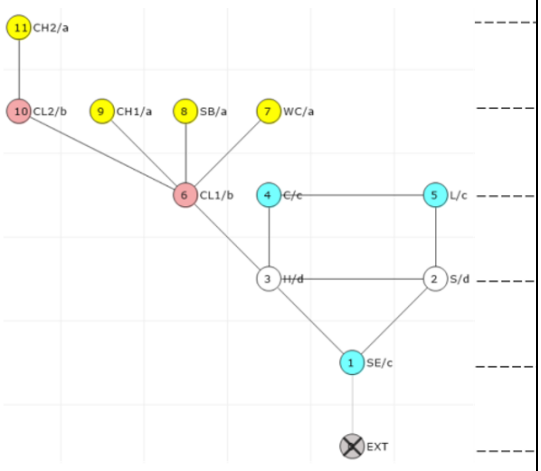
To facilitate analysis, it is essential to assign a code to each space; the following table shows the symbol representing each space:

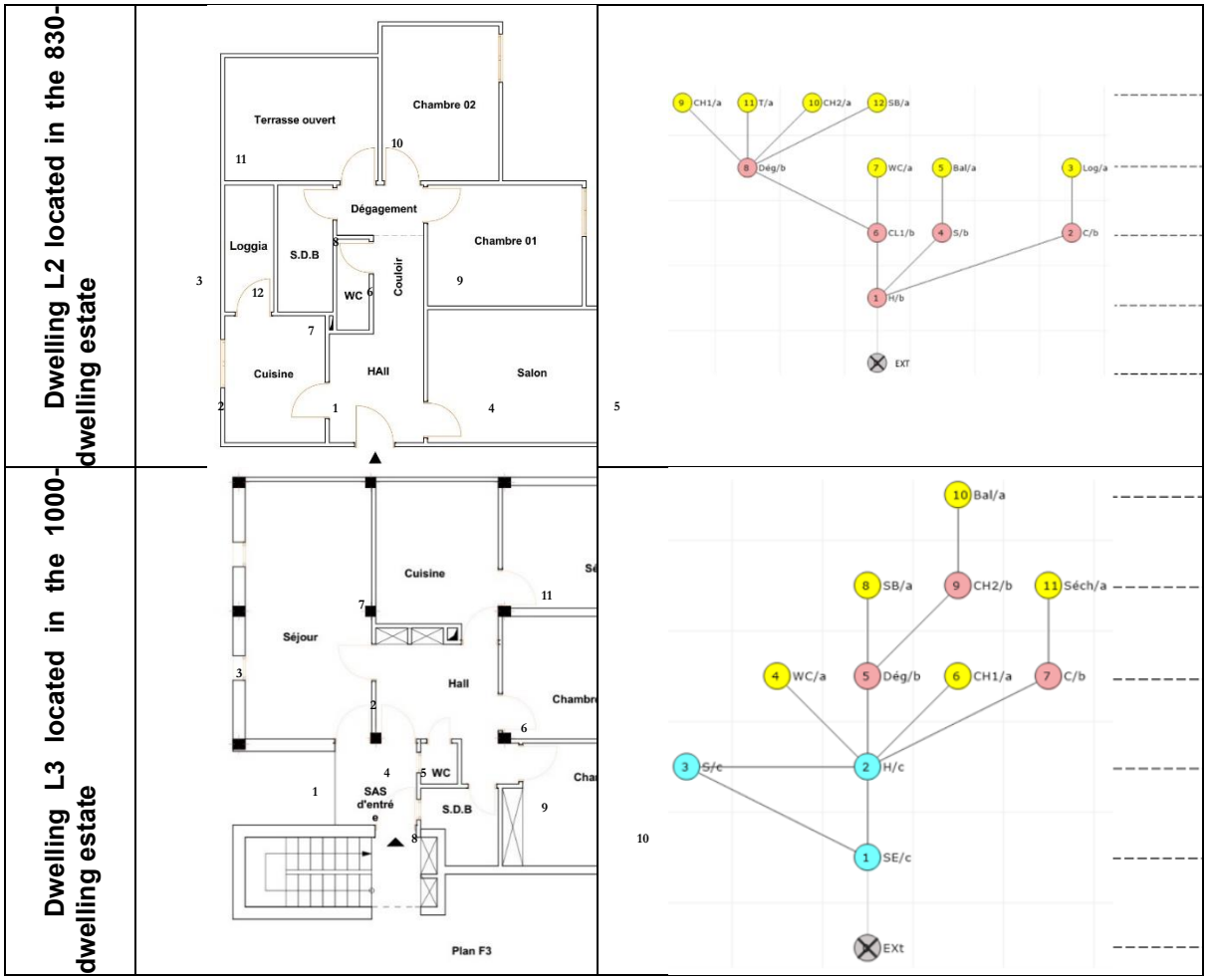
Table 4 : Coding of Spaces

Space	Code	Space	Code
Entrance vestibule	SE	Hall	H
Living room	S	Bedroom	CH
Kitchen	C	Bathroom/Toilet	SB/WC
Corridor	CL	Secondary corridor	D
Drying room	Séch	Loggia	Log
Balcony	Bal	Terrace	T

Source: Authors, 2025

Table 5: Justified graphs of each dwelling

	Distribution plans	Justified graphs and topological types of spaces
Dwelling L1 located in the 726-dwelling estate		



Source: Authors, 2025

Dwelling L1 is organised across five levels of depth, with 13 connections linking 12 nodes. Each level contains a circulation space, reflecting a clear hierarchical arrangement based on degrees of privacy. This configuration indicates a relatively complex spatial structure, allowing for an effective organisation of movement and a clear distinction between private, semi-private, and collective spaces.

Dwelling L2 is structured across four levels of depth, with 12 connections linking 11 nodes. Circulation spaces are present at each level, demonstrating a hierarchical organisation of the spatial layout. This arrangement supports controlled interactions between residents and visitors, while remaining less spatially complex than L1.

Dwelling L3 is organised across five levels of depth, with 12 connections linking 11 nodes. Three circulation spaces are located within the first three levels, which contributes to a comparatively lower spatial complexity than that observed in L1. Despite this, the dwelling maintains a satisfactory level of privacy. This is particularly evident in the positioning of Bedroom 2, which is directly connected to the bathroom, thereby giving it the role of the principal bedroom.

Based on the previously constructed justified graphs, it is possible to identify the relationships and patterns that characterise the different spaces within each system. When boundaries are considered as physical separations, they reveal symmetrical or asymmetrical relationships between spaces, while when viewed as points of passage, they help to identify patterns of distributivity and non-distributivity.

Dwelling L1 located in the 726-dwelling estate

- The living room (S) and the hall (H) are in a **symmetrical** and **distributive** relationship with respect to the entrance vestibule (SE).

- The entrance vestibule (SE) is **non-distributive** and **asymmetrical** in relation to the hall (H) and the living room (S), while the latter are **symmetrical** to one another with respect to the entrance vestibule (SE) or the exterior.
- Corridor 2 (CL2), the bathroom (SB), the toilet (WC), and Bedroom 1 (CH1) are in a **symmetrical** and **non-distributive** relationship with respect to Corridor 1 (CL1) : **tree structure**.
- The kitchen (C) and the living room (S) are **symmetrical** to one another with respect to the hall (H), while the loggia (Log) is **asymmetrical** in relation to them with respect to the hall (H). These four spaces are in a **distributive** relationship with one another.
- The circulation spaces, entrance vestibule (SE), hall (H), Corridor 1 (CL1), and Corridor 2 (CL2), as well as Bedroom 2 (CH2), are in an **asymmetrical** and **non-distributive** relationship with respect to the exterior : **chain structure**.
- Corridor 1 (CL1) is in a **non-distributive** and **asymmetrical** relationship with Corridor 2 (CL2), Bedroom 1 (CH1), the bathroom (SB), and the toilet (WC); the latter are **symmetrical** to one another with respect to Corridor 1 (CL1) or the hall (H).

Dwelling L2 located in the 830-dwelling estate

1. The hall (H) shows a **non-distributive** and **asymmetrical** relationship with Corridor 1 (CL1). In contrast, the living room (S) and the kitchen (C) are **symmetrical** to one another with respect to the hall (H) or the exterior.
2. The secondary corridor (D) and the toilet (WC) are in a **symmetrical** and **non-distributive** relationship with both Corridor 1 (CL1) and the hall (H).
3. The two bedrooms (CH1 and CH2), the terrace (T), and the bathroom (SB) are in a **symmetrical** and **non-distributive** relationship with respect to the secondary corridor (D).
4. The pairs, loggia (Log) and kitchen (C), balcony (Bal) and living room (S), and toilet (WC) and Corridor 1 (CL1) are in an **asymmetrical** and **non-distributive** relationship with respect to the hall (H). Meanwhile, all these spaces are also **asymmetrical** and **non-distributive** in relation to the exterior.

Dwelling L3 located in the 1000-dwelling estate

- The hall (H) and the living room (S) are in a **symmetrical** and **distributive** relationship with respect to the entrance vestibule (SE). In contrast, the entrance vestibule (SE) is **asymmetrical** and **non-distributive** in relation to the hall (H) and the living room (S). The latter remain **symmetrical** to one another with respect to the entrance vestibule (SE) or the exterior.
- The living room (S), the toilet (WC), the secondary corridor (D), Bedroom 1 (CH1), and the kitchen (C) are in a **symmetrical** and **non-distributive** relationship with respect to the hall (H).
- The bathroom (SB) and Bedroom 2 (CH2) are also **symmetrical** and **non-distributive** in relation to the secondary corridor (D). Conversely, Bedroom 2 (CH2) and the balcony (Bal) are **asymmetrical** and **non-distributive** with respect to the secondary corridor (D). The same relationships apply to Bedroom 1 (CH1), the kitchen (C), and the drying room (Sech) in relation to the hall (H).

The L1 and L3 dwellings are characterised by the presence of an entrance vestibule (SE), equivalent to the *s'qifa* in traditional housing. This space acts as a transitional element that organises movement within the dwelling: visitors are directed towards the living room, while residents access the interior through the central hall, from which circulation extends to the other spaces. This design strategy helps to ensure the privacy and intimacy of the occupants. Moreover, the presence of this space allows for the integration of typological types “c” and “ d “, in addition to types “a” and “b” , thereby enhancing the distributive capacity of the spatial system.

In the case of dwelling L2, privacy and intimacy are ensured by the position of the living room, located in close proximity to the entrance, which allows direct access without intruding into the private areas. Furthermore, the private spaces are situated deeper within the dwelling. This spatial configuration therefore explains the predominance of typological types “a” and “b” only.

Table 6: Typology of Topological Space Types in the Three Dwellings

	dwelling L1	dwelling L2	dwellingL3
SE	c	/	c
S	d	B	c
H	d	B	c
C	c	B	b
CH1	a	A	a
CH2	a	A	b
SB	a	A	a
WC	a	A	a
Bal	/	A	a
Log	c	a	/
Sech	/	/	a
T	/	a	/
CL	b	b	/
D	/	b	b

Source : Authors, 2025

Analysis of visibility and privacy: isovist fields from the entrance and the living room

Visibility refers to the capacity to visually perceive the interior of a dwelling from the outside, as well as the ability to observe one interior space from another, thereby reflecting the visual relationships between the different parts of the dwelling.

In this study, the aim is to assess the extent to which the interior of the dwelling is visible from the outside, from the entrance vestibule or hall, and from the living room. To this end, two scenarios are considered:

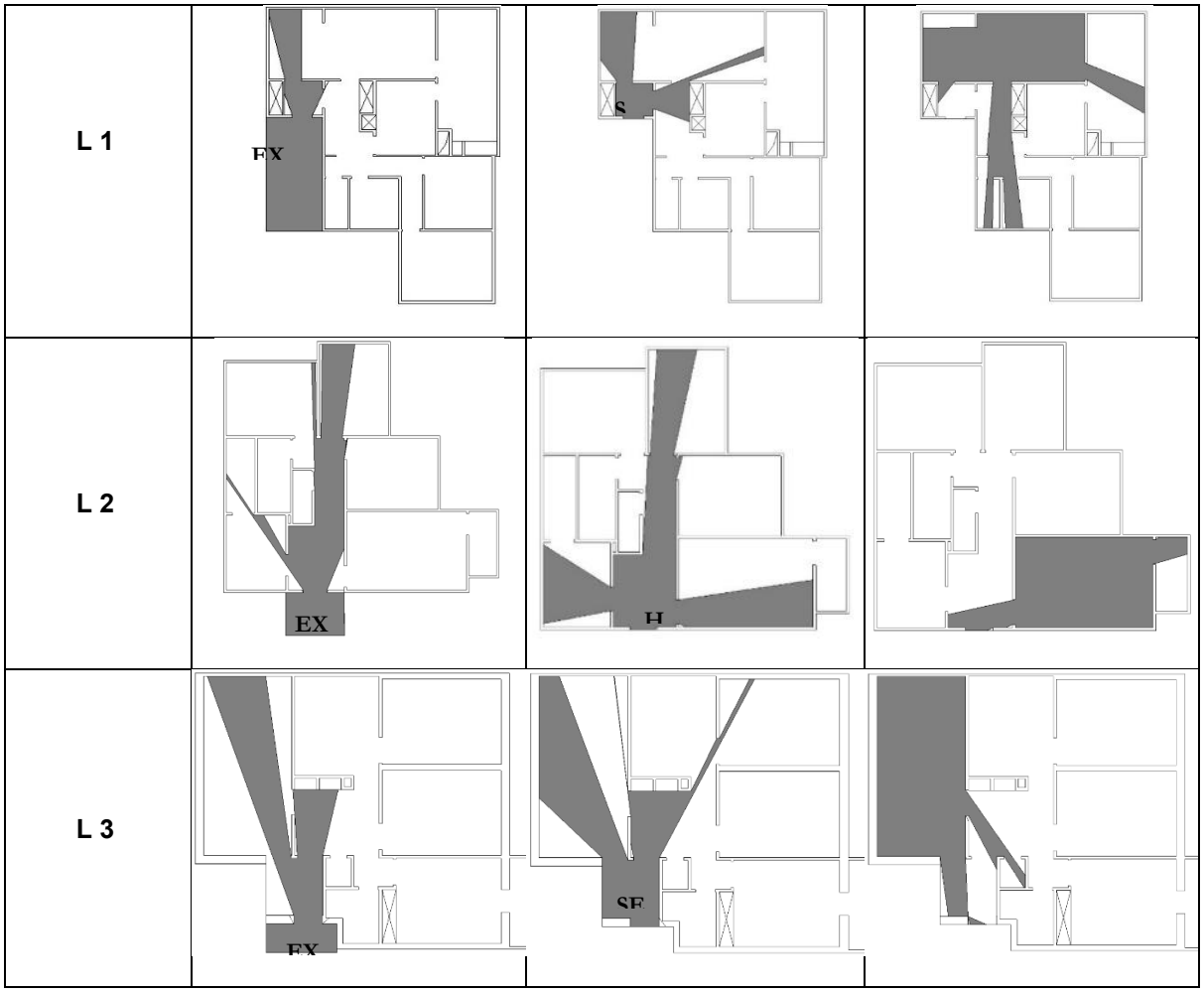
1. When a non-resident engages in conversation with a resident at the entrance to the dwelling, or when a neighbour passes by while the door is open;
2. When a guest is in the living room (with the door connecting the living room to the hall open), and the extent to which the interior of the dwelling is visible to them.

These scenarios make it possible to assess the extent to which the interior layout reveals aspects of daily life, and what it indicates about architectural choices in terms of privacy and security. This analytical section employs Depthmap software, which determines the visual fields to be determined from any point within the dwelling and in any direction. The analysis of these visual fields highlights the degree of visual permeability from the outside and examines the thresholds of transition between the public and private spheres in collective housing.

Table 7 presents visualisations illustrating the fields of view at the entrance of each dwelling in the study sample (visual field angle: 120°) under two scenarios: when the visitor is outside and when they are positioned at the centre of the entrance vestibule (or hall). It also presents the fields of view in the living room, assuming that the visitor is positioned at the centre of this space.

Table 7: Isovist Fields From The Entrance (External And Internal Positions) And The Living Room

Dwellings	Isovist fields from the entrance		Isovist fields from the living room
	Depuis l'extérieur	Depuis le sas (ou le hall) d'entrée	



Source : Authors, 2025

- **Isovist fields from the entrance**

For dwelling L1, when a visitor or stranger is positioned outside, the field of view covers the entrance vestibule directly in front of them, as well as a very limited portion of the living room; all other spaces within the dwelling remain out of sight from this position. From the entrance vestibule, however, the field of view extends only to part of the living room and the hall, while the remaining spaces are not visible.

In dwelling L2, observation from the outside reveals a field of view centred on the middle zone of the dwelling. This area primarily includes the entrance hall, the first corridor, and the right-hand portion of the secondary corridor. This configuration allows partial visibility of certain interior spaces, notably a section of Bedroom 1, located directly opposite the entrance, as well as a very limited part of the kitchen.

When positioned in the hall, the field of view expands significantly, offering a broader visual perception. From this point, in addition to the previously identified spaces, it becomes possible to observe part of the living room and a larger portion of the kitchen area.

In the case of dwelling L3, analysis of the field of view from the outside reveals limited visibility, mainly confined to the entrance vestibule, along with a portion of the hall and the living room. However, when observation is conducted from the entrance vestibule, the field of view extends to the same spaces but with a broader spatial reach, including a very small part of the drying room.

- **Isovist fields from the living room**

In the three dwellings studied, when visitors are present in the living room, the field of view (120°) covers the entire space. This is a natural and expected outcome, as individuals typically perceive the full extent of the surrounding space when occupying a given space.

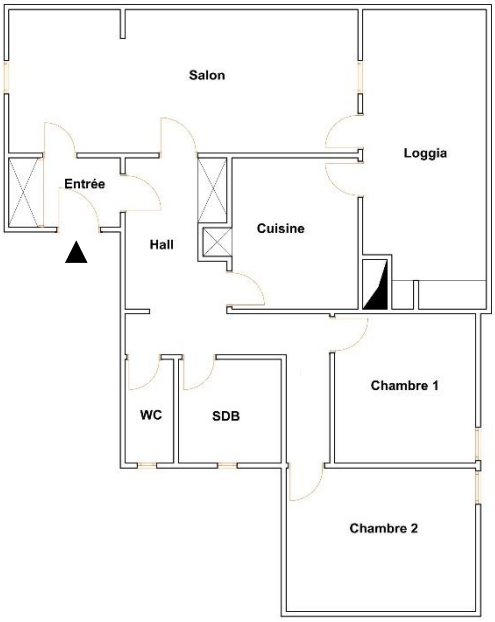
In dwelling L1, the hall and the sanitary spaces are visible from the living room when the connecting door is open (although, in the local context of Biskra, this door is generally kept closed in the presence of visitors). In dwelling L3, the visitor can see the entrance vestibule, a limited portion of the hall, and the toilet. This configuration is consistent in both dwellings, as these areas belong to the circulation spaces that are accessible to visitors, thereby preventing intrusion into private areas.

Thus, this housing model ensures a functional separation between the family space and the space intended for visitors.

In dwelling L2, the position of the living room near the entrance restricts the field of view to a very limited portion of the hall, as well as part of the balcony. All other spaces, however, remain completely out of sight for a visitor located in the living room.

phase 2 : Quantitative Findings from Space Syntax Analysis

- *Dwelling L1*



The first corridor (CL1) exhibits the highest control value (3.75). It is located at the third level of depth, at the centre of the system, reflecting its central role in organising circulation within the dwelling. It functions as a transitional space separating the day zone (communal) from the night zone (private).

This space serves five other spaces, three of which display a lower control value (0.20): Bedroom 1 (Ch1), the bathroom (SDB), and the toilet (WC). Bedroom 2 (Ch2) follows, with a control value of 0.5 (see Table 8).

Table 8: Fundamental syntactic parameters for dwelling L1

	TDn	MDn	RA	i	CV
Ext	35	3,18	0,43	2,29	0,33
SE	25	2,27	0,25	3,92	1,58
S	25	2,27	0,25	3,92	1,08
Hall	**19**	**1,72**	**0,14**	**6,87**	1,36
C	27	2,45	0,29	3,43	0,75
Log	33	3,00	0,40	2,50	0,83
CL1	**19**	**1,72**	**0,14**	**6,87**	**3,75**
WC	29	2,63	0,32	3,05	**0,20**
SB	29	2,63	0,32	3,05	**0,20**
Ch1	29	2,63	0,32	3,05	**0,20**
CL2	27	2,45	0,29	3,43	1,20
Ch2	**37**	**3,36**	**0,47**	**2,11**	0,50

Source : Authors, 2025

The three spaces, namely the entrance vestibule (SE), the hall (H), and the corridor (CL2), exhibit control values of 1.58, 1.36, and 1.20 respectively, indicating a relatively high level of control within the system. This reinforces their role as key circulation and distribution spaces.

The living room exhibits a relatively high control value (1.08). This can be explained by its position within a ring structure characterised by distributivity and symmetry, as discussed earlier in the section on permeability. Moreover, its topological type (d) further reinforces this value.

By contrast, although the kitchen is located within the same ring, its topological type (c) reduces its control value (0.75); a similar observation applies to the loggia (Log).

The hall and Corridor 1 (CL1) exhibit the lowest relative asymmetry (RA) value (0.14) and the highest integration (i) value (6.87). Therefore, these two spaces are the most integrated within the system.

Bedroom 2 (CH2) exhibits the highest mean depth (MD) value (3.36), indicating a high degree of privacy. This suggests that it functions as the principal bedroom.

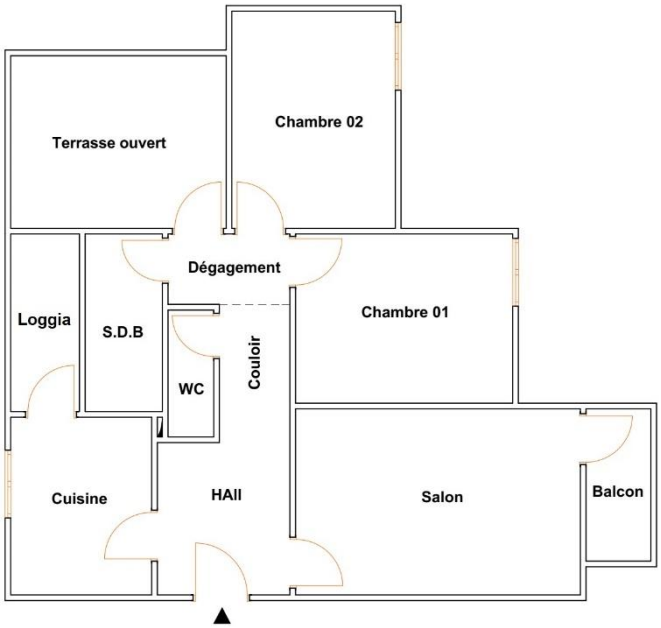
It is followed by the loggia (MD = 3.00), which residents associate with the traditional role of a courtyard. The loggia fulfils multiple functions : social, environmental, and domestic. It serves as a space for rest and relaxation, provides a secure area for children's play, and accommodates various household activities, such as cooking on special occasions and drying laundry. In summer, it may even be used as a sleeping space.

In this particular case study, the loggia constitutes a semi-private space reserved exclusively for members of the resident family.

The bathroom, the toilet, and Bedroom 1 follow, occupying the third position in terms of depth (MD = 2.63).

The hall and Corridor 1 exhibit the lowest mean depth (MD = 1.72), which is consistent with their role as central circulation and distribution spaces.

- *Dwelling L2*



The secondary corridor (D) exhibits the highest control value in the system (4.33) and is located at the third level of depth. It is connected to five spaces: three primary occupancy spaces (Bedroom 1 (CH1), Bedroom 2 (CH2), and the bathroom (SB)), one circulation space (Corridor (CL)), and one ancillary or peripheral space (the terrace (T)).

Four of these occupancy spaces display the lowest control value (0.20), identifying them as the most segregated spaces within the system. At the same depth level, the loggia and the balcony exhibit

identical control values (0.50), while the toilet shows a control value of 0.33. These spaces are also considered segregated within the system (see Table 9).

Table 9 : Fundamental syntactic parameters for dwelling L2

	TDn	MDn	RA	i	CV
Ext	35	2,91	0,34	2,86	0,25
H	24	2,00	0,18	5,50	2,33
C	33	2,75	0,31	3,14	1,25
Log	**44**	**3,66**	**0,48**	**2,06**	0,50
S	33	2,75	0,31	3,14	1,25
Bal	**44**	**3,66**	**0,48**	**2,06**	0,50
CL	**23**	**1,91**	**0,16**	**6,00**	1,45
WC	34	2,83	0,33	3,00	0,33
Dég	26	2,16	0,21	4,71	**4,33**
CH1	37	3,08	0,37	2,64	**0,20**
CH2	37	3,08	0,37	2,64	**0,20**
T	37	3,08	0,37	2,64	**0,20**
SB	37	3,08	0,37	2,64	**0,20**

Source : Authors, 2025

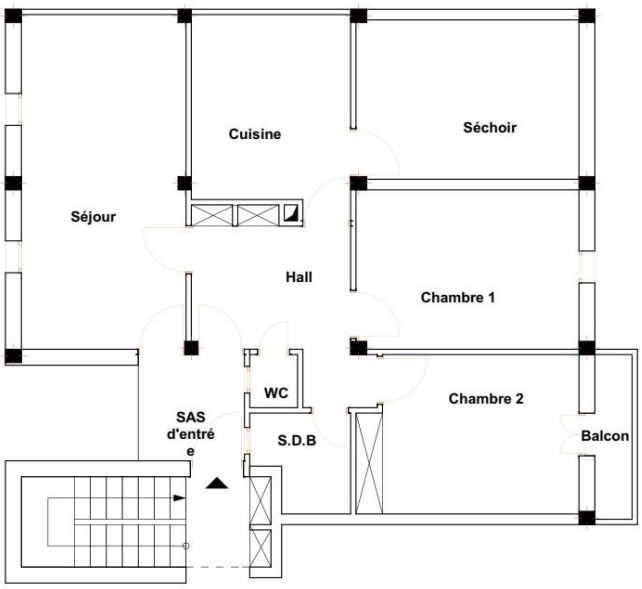
Despite being located at the second level of depth and functioning as a space linking the private (night) zone and the communal (day) zone, Corridor (CL) is identified as the second most controlling space within the system. However, its relatively moderate control value (1.45) can be explained by the limited number of spaces connected to it (three).

Its central position within the spatial configuration makes it easily accessible from all other spaces in the system, reflecting a low topological distance. This results in it being the most integrated space in the system, with an integration value (i) of 6.00. It also exhibits the lowest mean depth (MD = 1.91).

The loggia (Log) and the balcony (Bal), due to their peripheral location, are among the least integrated spaces within the system, with an integration value of 2.06. They also exhibit the highest mean depth (MD), reaching 3.66.

Bedroom 1 (CH1), Bedroom 2 (CH2), the terrace (T), and the bathroom (SB) display identical syntactic values, owing to their similar topological characteristics.

- *Dwelling L3*



In this third case study, the hall exhibits the highest control value (3.66). It constitutes the central space of the system, located at the second level of depth. Characterised by a low topological distance

from the other spaces, it emerges as the most integrated space, with an integration value (i) of 9.16. Accordingly, it also presents the lowest relative asymmetry (RA) value (0.10).

Bedroom 1 (CH1) and the toilet (WC) are located at the third level of depth and are directly connected to the hall. This configuration contributes to their spatial integration, with an integration value (i) of 3.43 and a relative asymmetry (RA) value of 0.29 (see Table 10).

However, these two spaces exhibit the lowest control value (0.16), indicating a limited capacity to regulate access to other spaces. This low control potential can be associated with their topological type (a), which defines their structural role within the overall spatial configuration.

Table 10: Fundamental syntactic parameters for dwelling L3

	TDn	MDn	RA	i	CV
EXT	34,00	3,09	0,41	2,39	0,33
SE	24,00	2,18	0,23	4,23	1,66
H	**17,00**	**1,54**	**0,10**	**9,16**	**3,66**
S	25,00	2,27	0,25	3,92	0,50
WC	27,00	2,45	0,29	3,43	**0,16**
D	21,00	1,90	0,18	5,50	1,66
CH1	27,00	2,45	0,29	3,43	**0,16**
C	25,00	2,27	0,25	3,92	1,16
SB	31,00	2,81	0,36	2,75	0,33
CH2	29,00	2,63	0,32	3,05	1,33
Bal	**39,00**	**3,54**	**0,50**	**1,96**	0,50
Séch	35,00	3,18	0,43	2,29	0,50

Source : Authors, 2025

The remaining spaces can be classified according to their control values as follows:

- The bathroom (SB), located at the fourth level of depth, with a control value of 0.33;
- The living room (S), at the second level of depth, the balcony (Bal), at the fifth level of depth, and the drying room (Sech), at the fourth level of depth, all exhibit the same control value of 0.50;
- The kitchen (C), at the third level of depth, with a control value of 1.16;
- Bedroom 2 (CH2), at the fourth level of depth, with a control value of 1.33;
- The entrance vestibule (SE), located at the first level of depth, and the secondary corridor (D), at the third level of depth, both exhibit a control value of 1.66. These two spaces appear to be the most integrated within the system after the hall. This can be attributed to their role as key circulation and distribution spaces within the dwelling.

Conclusion:

Through direct observation of the three dwellings studied, located in the New West urban housing area, one of the earliest planned developments following independence, it becomes evident that a deliberate effort was made to preserve certain spatial traditions of Biskra society. This is despite the rationalisation of the number of rooms and the elimination of spaces that were once essential, such as the *makhzen* (storage space), the *dâr el-dhiyâf* (reception room), and the *hawch* courtyard.

This initial qualitative analysis highlights clear differences between the dwellings. While L1 (the 726-unit housing estate) and L3 (the 1000-unit housing estate) maintain a high degree of privacy through the presence of an entrance vestibule (SE), reminiscent of the traditional *sqîfa*, which clearly separates the circulation paths of visitors and residents, L2 (the 830-unit housing estate), lacking this feature, partially compensates through the strategic positioning of the living room in close proximity to the entrance.

Cross-analysis with Space Syntax data confirms and further substantiates these findings. It demonstrates that, beyond specific differences, the three dwellings retain spatial configurations that, to varying degrees, support the preservation of privacy and the control of both visual and functional intrusion.

Moreover, the analysis of room depth reveals an internal spatial hierarchy that distances the bedrooms from reception areas, thereby reinforcing family privacy. In addition, the presence of ancillary spaces, such as the loggia, terrace, and drying room, reflects a modern reinterpretation of the traditional roof (*as-sath*), which historically accommodated a range of domestic and social functions.

These findings demonstrate that, rather than merely replicating standardised modernist models imposed by post-independence state planning, the early collective housing programmes in Biskra reflect a subtle balance between architectural rationality and socio-cultural continuity. They reveal a deliberate attempt to preserve the codes of privacy and sociability inherent to Biskra society.

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