The Society and the Optimal Mode of Occupation of the Urban Ground in the Individual Housing in the Arid Areas

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Abstract: We approach, in this study the analysis of the problems of the occupation of the grounds in urban tissues of the Maghrebian cities and more particularly, in its housing units, which knew a massive importation of new urban forms and models of dwellings industrialized not adapted to the socio-economic factors, cultural and climatic; And that, through a direct analysis of the mode of occupation of the urban ground report (built/not built), urban form, use and operation of various spaces of the traditional cities in the arid areas on the one hand and the comparison of and the influence percentage occupied time of grounds (the COS-FAR: Floor area ratio-and the CES-LUI: and use intensity-) of the various types and examples of traditional dwellings on the other hand, in order to know to detect the parameters which take part in the fixing of the COS and CES optimal and thereafter, an optimal occupation of the urban ground.

Key words: Society, traditional city, habitat, arid regions, individual dwelling, occupation of ground (COS/CES)

INTRODUCTION

The composition of urban tissue, the relationship between the frame and not built, total surface floor of the frame, the density of constructions and the urban form differ from an area to another according to socio-economic, cultural and climatic factors. It is noticed that the preoccupation of the city planning and a construction in the areas with cold and wet climate is carried to the solar energy, which are initially expressed by the study of the technical system of collecting and more often of the technological system (sensors, heat pumps,...) or, also the adaptation of the frame existing to end to save energy. Beyond that, also a reflexion carries out on the new shapes of habitat. The Maghrebian cities knew a massive importation of these new urban forms not adapted to the socio-economic, cultural and climatic factors, by generating the following problems:

- A scattered urban tissue.
- Imbalance enters built surfaces and not built surfaces.
- The absence of urban space, because the turns as well as the buildings on several floors of the great sets destroyed spaces of regrouping, life social, exchanges and circulation.

The objective is summarized in two points:

- To analyze the report/ratio built/not built and the mode with occupation of the ground with respect to the cultural, socio-economic and climatic factors in urban fabrics of the traditional individual habitat in the arid and semi-arid mediums.
- To establish the COS, them CES and the forms optimal of spaces full and empty for the individual dwelling of the arid and semi-arid mediums and more particularly in Bou-Saâda in Algeria.

MODE OF OCCUPATION OF THE URBAN GROUND IN THE TRADITIONAL HABITAT

The type which interests us more in our study is that of the individual habitat, where the best examples are in Algeria (Gardaïa, Ourgla, Bou-Saâda,...), in Tunisia and in Morocco. The analysis aims at the mode of occupation of the ground with respect to the cultural, socio-economic and climatic factors on the level of urban tissues on the one hand and the individual housing units on the other hand.

Analyze on the level of urban tissues: The urban tissue very compact (dense and tight) and is characterized by:

Compact habitat and introvert: The dwellings are coupled as much as possible the ones with the others so as to reduce the surfaces exposed to the sunning. The districts are generally more or less closed decreasing the possibilities of opening on outside. The introversion of the dwellings through their organizations around an open space (Patio or court) appears by a low abundance in

openings on outside the house ouargli is a type of Saharan house at interior court and terraces (CHABA, 2002). In the examples of ksar dwellings, the court occupies a small influence on the ground, on the other hand surface floor exceeds the total surface of the piece of the dwelling, with the result that the floor area ratio-FAR-(C.O.S) is generally equal to or higher than one (COS≥1). It is about a type very adapted on the one hand to a climatic integration and on the other hand with a social organization. The central patio answers completely given climatic conditions, which characterizes the Mediterranean zone: Temperatures relatively high, important sunning, rains completely distributed and often rare. (Raymond, 1985). The urban form of this type of compact habitat is very adapted to the Saharan climatic conditions and the ksar remains the form best adapted to the Saharan climate, because it is initially compact, in direct relationship to a microclimate (palm plantation) and it reacts to the hostility of the climate by strategies adopted by the originators (Bennadji, 1999). Ksour present housing units whose operation is generally based, first once, on a vast central volume lit by the ceiling (opening in the ceiling which, sometimes, is called especially Raouzna in the ksar of Bou-Saâda). This opening is covered during the day to protect the interior of the heat, the radiation solar and the sand winds and discovered during the night to make it possible freshness to penetrate. One second time, on the courses like crossroads of circulation and various activities. In the court exists a staircase, a water basin for washing, a toilet and for a few housing units there exists also a space of vegetation and a part covered on the court of which

proceeds the main part of the family and practical occupations female. The staircase gives access to the terrace which orders one or more rooms and finally the court serves the parts around it (Faycal, 1987; Poux and Petit, 1977).

Complex urban structure: For the type of compact urban tissue, the urban structure of the roadway systems is very complicated (Fig. 1). The streets which are deep, sinuous and tortuous spare zones of shade (Fig. 2). They cut the winds and reduce the time of sunning are not a long time under the effect of the sun (Poux and Petit, 1977). The corbellings make it possible to increase surface floor of the parts on the floor. Sometimes the streets are covered by the floor of the stage of the dwellings. Some vacuums being reserved for their illumination and their ventilation. They are narrow the dimension of street in width is just necessary to the crossing of two asses quite charged (Donnadieu *et al.*, 1986). The street is thus the resultant of the closed groupings of the dwellings. It is deep and often ends in a dead end, with the last served dwelling.

The surface of the dead end is generally to the minimum reduced to keep the maximum of space to the dwellings. It represents an essential element for the screen viaire of the traditional cities. A.Lésine quoted: The dead end is the basic element of traditional Moslem town planning. Its appearance is related to a type of habitat in which the city is organized exclusively around an interior court and which is unaware of by consequence, the frontage (Raymond, 1985). Through these examples, it appears that the urban fabric of the traditional cities is very dense, the proportion of the area of construction
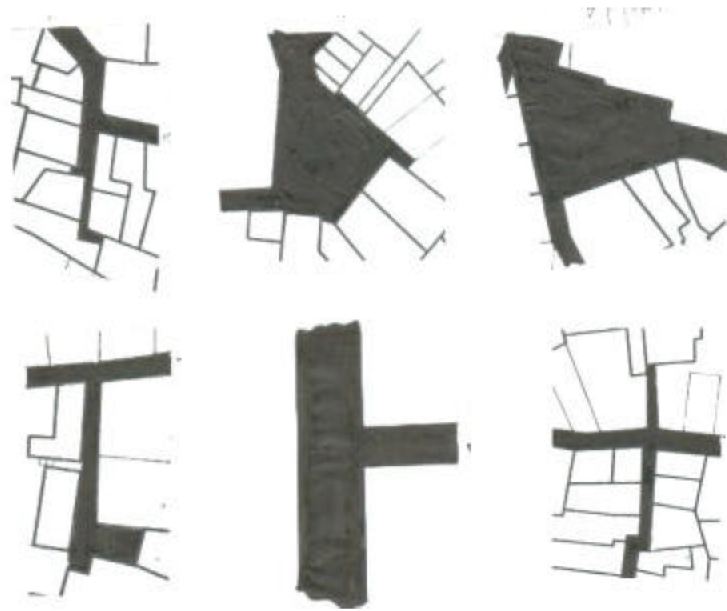

Fig. 1: Narrow streets and shades mutual

Fig. 2: The complexity of the system viaire and complementarity enters the street and place

strong (dominant) compared to not is built (CES generally ranging between 0.60 and 0.72) and thereafter it is very adapted to the climatic conditions of the arid and semi areas arid.

Analyze on the level of the individual housing units: If the approach of the occupation of the ground on the level of urban fabric rests on the decomposition of urban fabric in two fields, the frame and not built, the same principle can apply to the level of the dwelling, where the approach to analyze the mode of occupation of the ground is thus based on the decomposition of the dwelling in two parts, the built part represented by surface floor of the various parts and the not built part usually represented by the free court, patio, or all spaces not forks and spoons (analysis of floor area ratio COS). The analysis of the COS in the individual dwelling thus rests, on the study of the court like volume not built and its relation with built volume.

The mode of space relation between the court (space not built) and built volume can be direct through the interior frontages (full or open) so as to express the nature and the function of the space which they close, or meditated by the transition metals which can exist either in a homogeneous way on all the levels or in a way differentiated from a level to another like the gallery, the gantry and the loggia. These various positions of the court, compared to the volume built like their relations, correspond to the possibility of profiting from the refreshed air and the maximum of shade. Between the court and built space, there are two important roles: One is functional, the other is climatic.

Functional role: In the example of Ksour, the court occupies a small surface discovered or it is represented by a vast volume discovered. It represents a crossroads of circulation and various activities (family and practical occupations female,...). The court thus has two contradictory and at the same time complementary qualities: it is neither outside nor inside; or rather it is lived at the same time like outside and inside: like the inside of an enveloping mass-a vacuum in full built and the outside with a blind whole of buildings to any other request of the free air (Marie, 1982). From these two qualities are born the relations between the court and the frame, between the opened field and, cover and the overdraft, which expresses relations between the shade and the light, freshness and heat. The court plays the part of common space of regrouping for all the members of the family where they can meet and functions like a distributor towards the various rooms and or a space of the female practices (to make the detergent, preparation of the weaving loom and meals). It is intimate by its introversion (orientation of the openings towards the interior). It plays also the part of re-creation (especially in the courses planted, punctuated of elements like the fountains) (Kaci-Mabrour, 1994; Lesbet, 1985).

The climatic role: The court is the place which functions as regulating climatic because it defends against the dominant winds by the form and dimensions that it can take, so that, if it is restricted with a small patio, it fights against the sand winds by avoiding the creation of a trough of low pressure. The various parts of volume are

aired, ventilated through their windows of variable size which gives directly on the court or the patio. It can be today still and taking into account the technique most advanced, only true defense against the winds desiccants charged with sand which save it provided that it is rather restricted (patio) not to create significant depressions (Marie, 1982).

In Algeria, the climatic elements most dominant in the arid and semi areas arid are the sand winds, the very high temperature and the high intensities of solar radiations. The variation of the seasons and the days seeks the optimal shape of the court which is integrated with the solar race by offering the maximum of light and shade in summer and the maximum of light and solar radiation in winter with the envelope. The months of the hot season which mark the climatic period of discomfort inside the Saharan dwellings and présahariennes new require the study of the court (space not built) and its influences on built volume. It rests on the analysis of the report-dwelling/court-and the study of the variations of dimensions of the court compared to the variations the heights which limit it, according to the variation of the various orientations, to minimize built surfaces of envelope (interior facades) and not built (ground of the court) exposed to the solar radiation. Not to reduce the courses to simple wells of light, one takes into account the period of cold season and his variations day laborers (where the sun is very low, the solar contributions are insufficient the morning and the evening and excessive in the middle of the day). The court thus has, of the qualitative limits especially if it constitutes practically a means of defense against the dominant winds and the solar radiation of the desert zones which makes it possible the dwelling to turn the back (introversion) to him. It is a place which takes part in heat exchange while reducing the variations in temperatures between the envelope outside and interior of the parts by introducing the internal nomadism which can be daily or seasonal worker into the dwelling of the arid and semi mediums arid (Abdulac, 1979; Marie, 1982).

IMPACT OF THE COS ON CLIMATIC COMFORT, THE BLOCK OF HOUSES TO THE PARCEL

This practical part comprises two axes, of which first rests on the application of the tables of MAHONEY on the case of study of the traditional city of Bou Saâda, followed by a data-processing analysis of simulation through program COS.BAS that one worked out especially to seek the COS and CES optimal, as well as the optimal shapes of the frame and of not built individual dwelling. The second axis aims at the tests of validity of the results obtained by data-processing simulation through the comparative analysis of the COS and the mode of occupation of the ground of the various types of traditional individual dwellings, which are very adapted to the climatic conditions (according to the preceding theoretical support of the analysis of the traditional cities in arid areas).

Impact of the urban density on climatic comfort on a block of houses scale (urban tissue): The climatic study through the injection of the principal climatic data (rain, temperature, winds and relative humidity) of our case of study Bou Saâda in the tables of MAHONEY gave urban and architectural orientations which aim on the one hand, the mode of occupation and organization of the urban ground on the level of the plan of mass, small islands and spaces external. In addition, mode of treatment of the facades, openings, walls and floors; and which is as follows:

- Orientation along the longitudinal axis (E.O).
- Plans compact and dense with interior courses (the urban density thus plays, a positive role to ensure climatic comfort has the scale of the urban environment of the arid and semi-arid areas).
- Buildings with double orientation allowing an intermittent circulation of air ensuring compactness enters the block of houses.
- Small openings occupying of 10 a 20% of the total surface of the facades.
- Massive Construction (dephasing > 8 H) to ensure thermal comfort at the level of the walls and floors.
- Sites to sleep in the open air (to ensure of spaces external on a block of houses scale-small squares-and has the scale of the dwelling-court and terrace-).

These orientations showed that the occupation urban ground on the level of urban tissue of the traditional city Bou Saâda is very adapted to the desert climatic conditions.

Portions out and measurements of the optimal COS: Several graphic methods and others of physical and data-processing simulation were worked out for the evaluation not only of the devices of shades, but of the processes of simulations thermal. These programs data processing like City-Shadows, SEMT 01 (for the layout of the solar diagrams of the trajectory of the sun), Chams and its appendices made it possible to calculate the powers and energies of the various types of radiation, the angles of optimizations, the standard day of the month, the solar spectrum and the transmission of the radiation by the atmosphere, glass and the obstacles.

One combined between the graphic method and the mathematical method of the equations to work out program COS.BAS like data-processing tool, whose objective is to seek the percentage occupied time of the optimal ground of a parcel with use of individual dwelling, with respect to the control of the solar radiation to open spaces (not built or vacuum, sometimes court or patio), like their suitable forms and dimensions according to the variation heights, orientations and time (according to the hour, day and season); While using for the method graphics, the abacus of the masks and the abacus of the stereographic projection of the Northern latitude 36° (the latitude of Bou Saâda is 35°13' and the latitude 36° is considered for the places whose latitude lies between 35° and 37°) and for the mathematical equations, the determination of sunny surfaces (by a sunny average ratio: RME) or shaded (by a shaded average ratio: RMO) of the open space of the parcel. The choice of the parcels was based on the ministerial circular No. 177/92 and the interdepartmental circular No. 889/89, which fixes dimensions and the surfaces of the parcels has use of individual dwelling on the one hand and the typology of

the traditional habitat of Ksar of Bou Saâda on the other hand. Thereafter, one applied program COS.BAS to the three following types of parcels:

Type A: Portions out of surface 300 m² (X = 15 and Y = 20).

Type B: Portions out of surface 216 m² (X = 12 and Y = 18).

Type C: Of surface 96 m² portion out (X = 8 and Y = 12).

Indeed, the parcel studied in program COS.BAS is defined by the following parameters (Fig. 3):

*   X and Y, respectively represent the width and the depth of the parcel.
*   H, height of construction.
*   x and y, respectively represent the width and the depth of open space (court or patio). This open space not built (x. y) is placed theoretically in the center of the parcel to facilitate the task of

Parameters of the studied parcel

Forms of constructions of dwelling
Report-built and not built

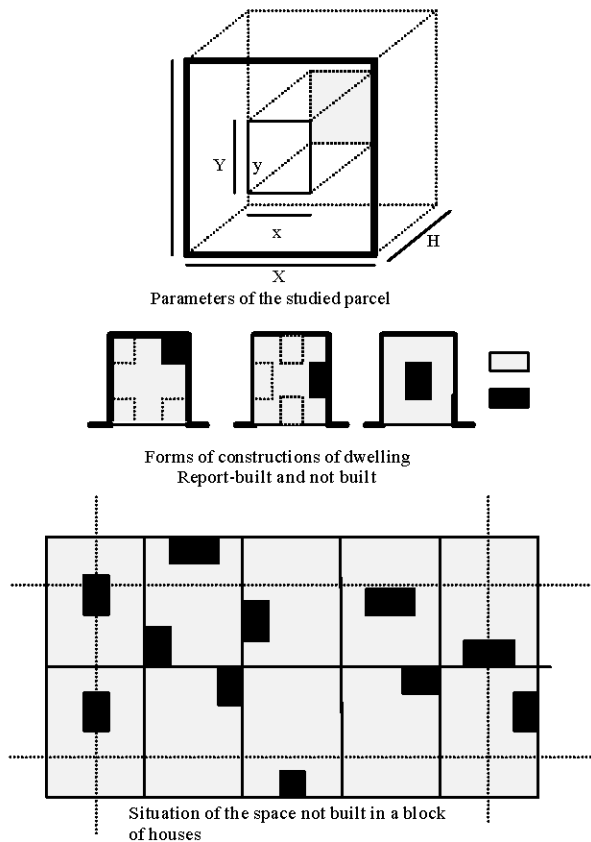Situation of the space not built in a block
of houses

Fig. 3: Parcel studied with the block of houses

calculation. And actually, the masonry can take several forms (O, L and U).

- S and N, SO and NE, O and E, SO and NE: variation of the orientation of the parcel.
- A: Azimuth (the variation of azimuth A, A' and A" are respectively related to the variation of time 09, 12 and 15 h).
- h: solar angle. (The variation of the solar angle h, h' and h" are respectively related to the variation of time 09, 12 and 15 h).
- COS: Percentage occupied time of the ground (surface floor surfaces total piece).
- CEL: Coefficient of space free (free face-court-/surfaces total parcel)

This program COS.BAS gives charts of the shaded average ratios and sunny average ratios according to the percentage occupied time of grounds [RMO (COS) and RME (COS)] (RMO: sunny average ratio, RMO: shaded average ratio). The application of program COS.BAS on the three types of parcels of the case of study Bou Saâda was interpreted as follows:

Type A: Three levels of interpretations were established for type A, where each level present of interpretations according to the variation of the orientations:

Level (R.d.C+0):

- For the orientation SN, the optimal COS vary between 0.77 and 0.93 with a maximum optimal COS equal to 0.95 related to a minimal rectangular optimal form of the open space of dimensions (xm = 5 m and ym = 3 m).
- For orientation EO, the COS optimal vary between 0.84 and 0.93 with a maximum optimal COS equal to 0.95 related to a rectangular optimal form of dimensions (xm = 3 m and ym = 5 m) whose geometrical forms (X, y) of open space differ with those from the orientation SN (Fig. 4).
- For the optimal orientations SENO and SONE, COS vary between 0.80 and 0.87 with a maximum optimal COS equal to 0.92, related to a square minimal optimal form of open space, dimensions (xm = 5 m and ym = 5 m); the forms of open space differ from orientation SENO to orientation SONE. The combination between the various optimal forms of open space is authorized because giving a total freedom to the architects and urbanites, to conceive individual housing units protected from the solar radiation; and thereafter, a compact and dense urban tissue as regards construction.
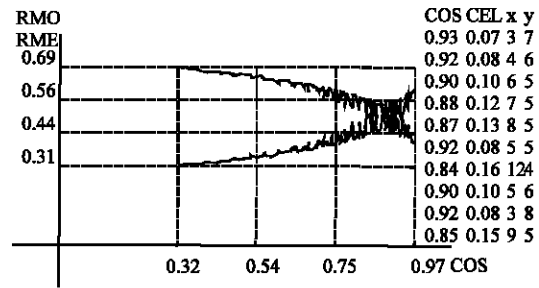

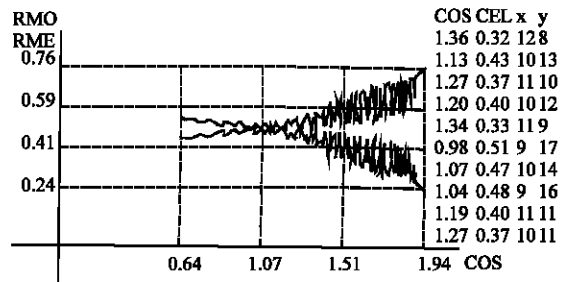Fig. 4: Type A (RDC+0), Ort : EO

Fig. 5: Type A (RDC+1), Ort : SN

Level (R.d.C+1):

- For the orientation SN, the optimal COS vary between 0.98 and 1.36 with a combination of optimal forms of R.d.C and first floor, which indicates a maximum optimal COS equal to 1.71 (Fig. 5).
- For orientation EO, the COS optimal vary between 1.19 and 1.44 with a combination of optimal forms of R.d.C and first floor, which indicates a maximum optimal COS equal to 1.78.
- For two the optimal orientations SENO and SONE, COS vary between 0.83 and 1.05 with a combination of optimal forms of R.d.C and first floor, which indicates a maximum optimal COS equal to 1.51.

Level (R.d.C+2):

- For the orientation SN, the optimal COS vary between 0.96 and 1.68 with a combination of minimal optimal forms of R.d.C, first and second floor which indicates a maximum optimal COS equal to 2.31 (Fig. 6).
- For orientation EO, the COS optimal vary between 1.08 and 1.64 with a combination of minimal optimal forms of R.d.C, first and second floor which indicates a maximum optimal COS equal to 2.38.
- For two the optimal orientations SENO and SONE, COS vary between 1,08 and 1,64 with a combination of optimal forms of R.d.C, first and second floor which indicates a maximum optimal COS equal to 2,08 (Fig. 7).
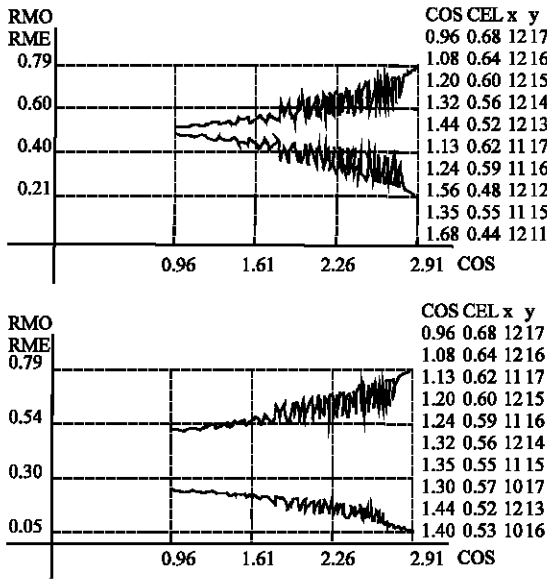
Fig. 6: Type A (RDC+2), Ort : SN

Fig. 7: Combination of the optimal forms

Type B: Three levels of interpretations were established for the type B, where each level present of interpretations according to the variation of the orientations SN and SENO:

Level (R.d.C+0):

- For the orientation SN, the optimal COS vary between 0.72 and 0.90 with a maximum optimal COS equal to 0.93 related to the same rectangular optimal form of the open space of type A (R.d.C+0) (Fig. 8).
- For orientation SENO, the COS optimal vary between 0.74 and 0.81 with a maximum optimal COS equal to 0.93 related to the same square minimal optimal form of the open space of type A (R.d.C+0).
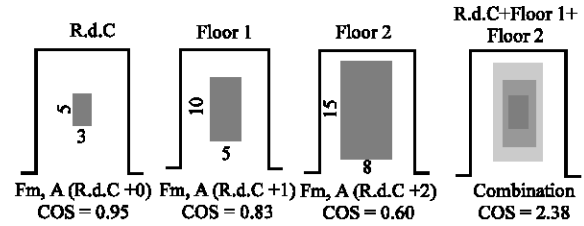
Level (R.d.C+1):

- For the orientation SN, the optimal COS vary between 0.75 and 1.25 with a combination of optimal forms of the open space of R.d.C and first floor, which indicates a maximum optimal COS equal to 1.57.
- For orientation SENO, the COS optimal vary between 0.75 and 1.11 with a combination of optimal forms of the open space of R.d.C and first floor, which indicates a maximum optimal COS equal to 1.52.
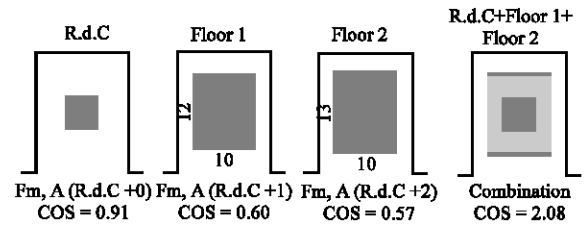
Level (R.d.C+2):

- For the orientation SN, the optimal COS vary between 1.13 and 1.88 with a combination of minimal optimal forms of the open space of R.d.C, first and 2nd floor which indicates a maximum optimal COS equal to 2.26 (Fig. 9).
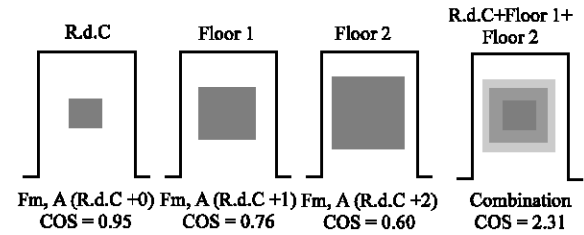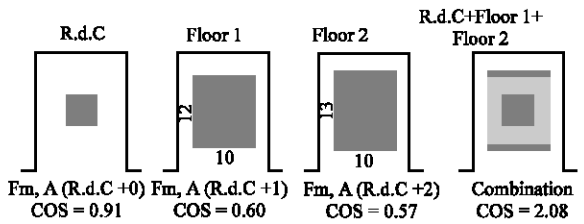
- For orientation SENO, the COS optimal vary between 1.13 and 1.67 with a combination of optimal forms of R.d.C, first and second floor which indicates a maximum optimal COS equal to 2.17.

Type C: According to interpretation, one should not build on the second floor, because of the very reduced surface of the piece C of dimensions (X = 8 m, y = 12 m and S = 96 m2), where each level presents following interpretations:

Level (R.d.C+0):

- For the orientation SN, the optimal COS vary between 0.53 and 0.75 with a maximum optimal COS equal to 0.83 related to a square minimal optimal form of the open space of dimensions (xm = 4 m, ym = 4 m) (Fig. 10).

RMO RME: 0.62, 0.54, 0.46, 0.38

COS	CEL	x	y
0.90	0.10	7	3
0.89	0.11	6	4
0.86	0.14	5	6
0.84	0.16	5	7
0.72	0.28	4	15
0.74	0.26	4	14
0.81	0.19	5	8
0.76	0.24	4	13
0.88	0.12	5	5
0.78	0.22	4	12

0.38 0.57 0.76 0.96 COS

RMO RME: 0.63, 0.54, 0.46, 0.37

COS	CEL	x	y
0.81	0.19	5	8
0.76	0.24	4	13
0.78	0.22	4	12
0.81	0.19	8	5
0.74	0.26	4	14
0.79	0.21	9	5
0.81	0.19	7	6
0.81	0.19	6	7
0.80	0.20	4	11
0.79	0.21	5	9

0.38 0.57 0.76 0.96 COS

Fig. 8: Type B (RDC+0), Ort : SN et SENO

RMO RME: 0.61, 0.54, 0.46, 0.39

COS	CEL	x	y
0.69	0.31	5	6
0.64	0.36	5	7
0.58	0.42	5	8
0.74	0.26	5	5
0.53	0.47	5	9
0.63	0.38	4	9
0.79	0.21	5	4
0.67	0.33	4	8
0.71	0.29	4	7
0.75	0.25	4	6

0.53 0.66 0.78 0.91 COS

RMO RME: 0.63, 0.54, 0.46, 0.37

COS	CEL	x	y
0.58	0.42	5	8
0.53	0.47	5	9
0.64	0.36	5	7
0.63	0.38	4	9
0.69	0.31	5	6
0.67	0.33	4	8
0.71	0.29	4	7
0.71	0.26	5	5
0.75	0.25	4	6
0.72	0.28	3	9

0.53 0.66 0.78 0.91 COS

Fig. 10: Type c (RDC+0), Ort : SN et SENO

- For orientation SENO, the COS optimal vary between 1.06 and 1.75 with a combination of minimal optimal forms of the open space of R.d.C and floor, which indicates a maximum optimal COS equal to 1.32 (Fig. 11).

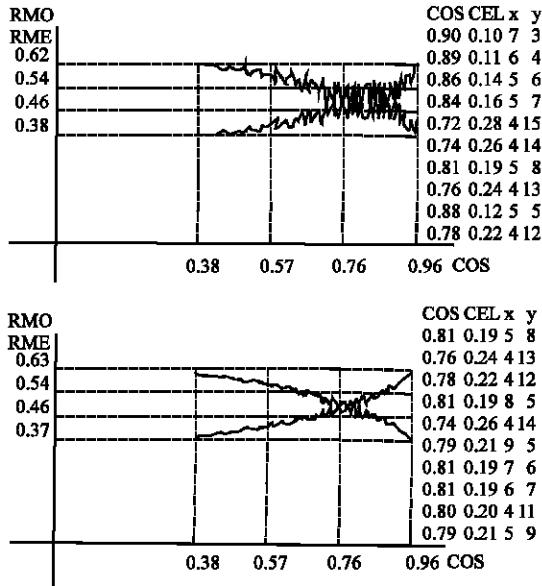**Comparative analysis of the C.O.S through the examples of the traditional dwelling compacts with court:** The comparative analysis of the C.O.S through the examples of the traditional dwelling is done numerically by studying their influences on climatic comfort inside the housing units compact with court to test the validity of the results obtained by data-processing simulation through the application of program COS.BAS on the case of study.

The C.O.S plays an important part in the thermal regulation and the climatic comfort of the housing unit bored of a court. Space not built (court or patio) is the basic element of the percentage occupied time of ground C.O.S. It is about a space of ventilation, ventilation, lighting, shade and defense against the dominant winds and the solar radiation and at the same time, it acts of a space of family, practical occupations female, regroupings, circulations and distribution towards the various parts. It thus influences positively or negatively with dimensions functional or climatic one of the housing unit according to the variation of its dimensions, surfaces, height, length, width, form, volume and orientation (the variation of dimensions of the court directly implies the variation of the floor area ratio C.O.S).

The analysis of the C.O.S in these Saharan ksar housing units in Algeria (the example of Ksar de

R.d.C	Floor 1	Floor 2	R.d.C+Floor 1+ Floor 2
Fm, B (R.d.C +0)	Fm, B (R.d.C +1)	Fm, B (R.d.C +2)	Combination
COS = 0.93	COS = 0.66	COS = 0.66	COS = 2.26

Maximum optimal COS of Type B (R.d.C + 2), Ort. : SN

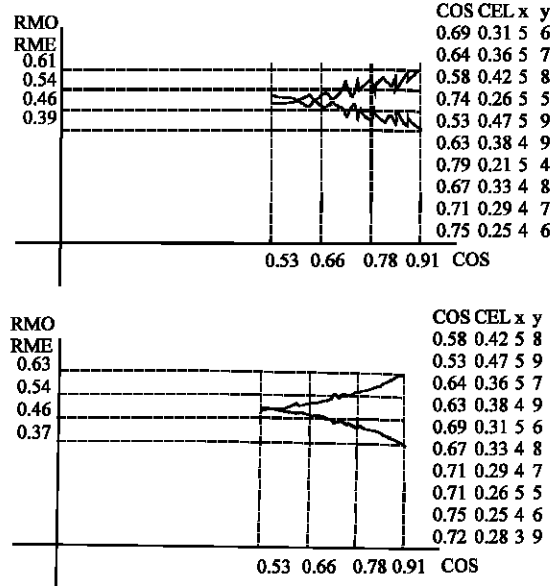| R.d.C	Floor 1	Floor 2	R.d.C+Floor 1+ Floor 2
Fm, B (R.d.C +0)	Fm, B (R.d.C +1)	Fm, B (R.d.C +2)	Combination
COS = 0.88	COS = 0.64	COS = 0.64	COS = 2.47

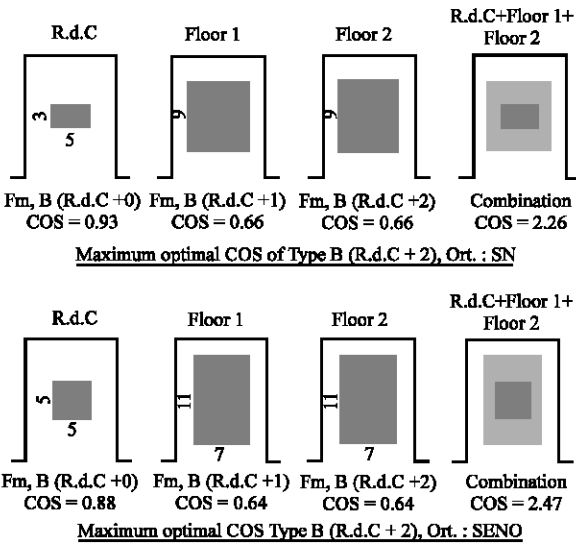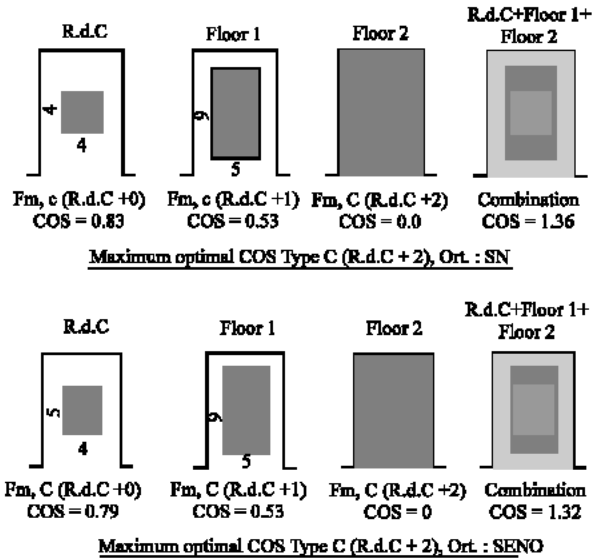Maximum optimal COS Type B (R.d.C + 2), Ort. : SENO

Fig. 9: Combination of the optimal forms

- For orientation SENO, the COS optimal vary between 0.53 and 0.75 with a maximum optimal COS equal to 0.79 related to a rectangular minimal optimal form of the open space of dimensions (xm = 4 m, ym = 5 m).

Level (R.d.C+1):

- For the orientation SN, the optimal COS vary between 1.06 and 1.50 with a combination of minimal optimal forms of the open space of R.d.C and floor, which indicates a maximum optimal COS equal to 1.36.

R.d.C	Floor 1	Floor 2	R.d.C+Floor 1+ Floor 2
Fm, c (R.d.C +0) COS = 0.83	Fm, c (R.d.C +1) COS = 0.53	Fm, C (R.d.C +2) COS = 0.0	Combination COS = 1.36

Maximum optimal COS Type C (R.d.C + 2), Ort. : SN

R.d.C	Floor 1	Floor 2	R.d.C+Floor 1+ Floor 2
Fm, C (R.d.C +0) COS = 0.79	Fm, C (R.d.C +1) COS = 0.53	Fm, C (R.d.C +2) COS = 0	Combination COS = 1.32

Maximum optimal COS Type C (R.d.C + 2), Ort. : SENO

Fig. 11: Combination of the optimal forms

Case of study	Traditional Dwelling				limits of comfort (optimal COS) Results of simulation of program COS.BAS			
	Type	Niv	S.m2	COS	Type	Niv.	Optimal COS	Validat.
Bou-Saada								
	Small	R+1	40	≥1.00	C	R+1	1.06-1.32	Valid.
	Average	R+1	40-100	0.80-1.20	C	R+1	1.06-1.32	Valid.
	Large	R+1	100-300	1.00-1.50	A	R+1	0.83-1.51	Valid.

Fig. 12: Table of the limits of comfort (optimal COS)

Bou-Saâda) gave optimal COS in the Forks of comfort (Fig. 12), which validates the results of data-processing simulation of program COS.BAS.

Ksar of Bou-Saâda represents out of typological matter three types of dwellings (Fig. 13):

- Type of small dwelling.
- Type of average dwelling.
- Type of large dwelling.
- Type of small dwelling

The surface of this type of dwelling varies between 15 and 40 m². It represents either an original unit in the form of tent, of a small poor family, or the result of the division heir. It is much more in the dead ends and the corners of the small islands that in the places and the broad streets of Ksar. It is generally deprived of space not built (court), thereafter the C.O.S is equal to or higher than one, but the possibilities of climatic comfort miss completely (Fig. 14).

Type of average dwelling: The surface of this type varies between 40 and 100 m² and it are only the result of the

Fig. 13: Report built-not built of Bou-Saâda Ksar, CES = 0.62, COS = 0.76 (Nouibat and Sahli, 1993)
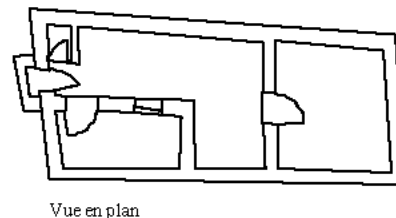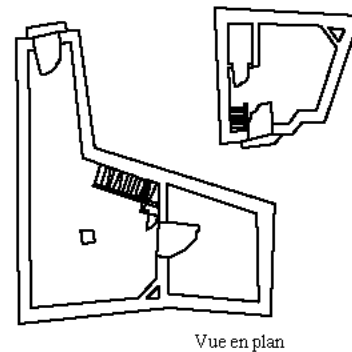

Vue en plan

Vue en plan

Fig. 14: Types of small dwellings, (COS≥1)

evolution of the original type because of the needs for overpopulation for the inhabitants. It is composed of three to four parts of various functions and a court which marks the appearance of a staircase (the staircase gives rise to the introduction of the floor) (Fig. 15). The court is sometimes characterized by the presence of the intermediate elements (gallery in arcade, gantry,...), with another time it is covered in the form of a tent aired by the Raouzna or the opening of staircase. The C.O.S thus generally lies between 0.80 and 1.20, in the limit of comfort by validating the results of data-processing simulation of program COS.BAS.
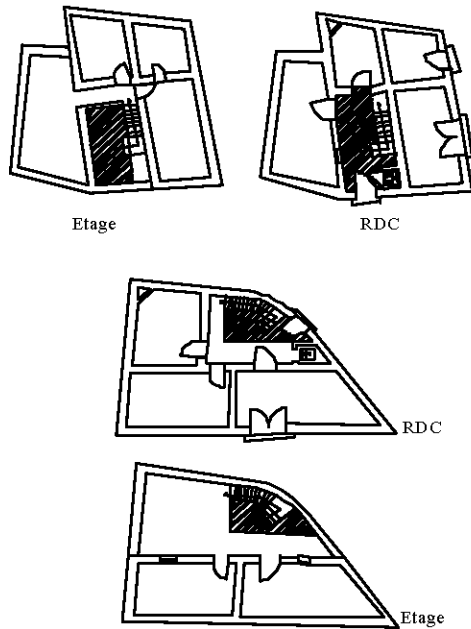
Fig. 15: Types of average dwellings, (COS varies between 0.80 and 1.20) (Nouibat, 1997)
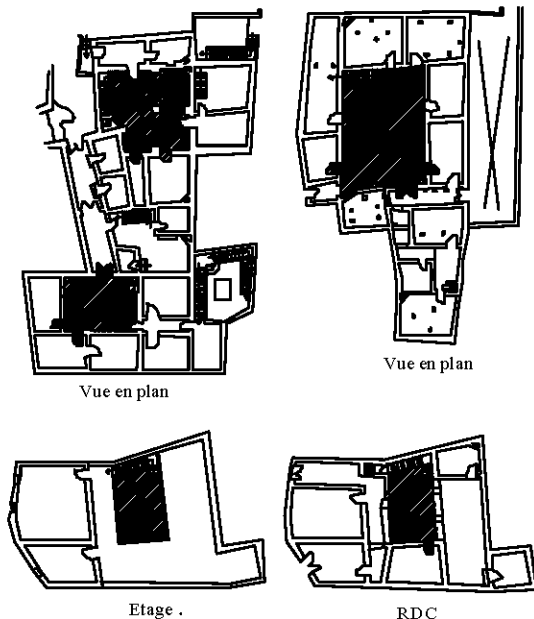

Fig. 16: Types of large dwellings, (COS varies between 1 and 1.5) (Nouibat, 1997)

Type of large dwelling: The surface of this type varies between 100 and 300 m². It represents the type more developed, most advanced in Ksar. Its relationship to

outside is very strong (it is in extreme cases of the broad streets and small squares Rahbas. Its space composition comprises between 5 and eight parts of various functions and a great central space which plays two parts (Fig. 16).

Role of a court: The court binds the built space of the dwelling to the climatic variations (sun, rain, wind, night, day...). Towards him the various parts are directed. It represents a source of ventilation, sunning and daylight.

Role of bit layal court covered: The bit Layal takes the position of a court covered in the form of tent aired by Raouzna or the opening of staircases. It marks sometimes the problems of moisture and the lack of lighting and sunning.

In this type, the floor exists. The C.O.S is important. It in the case of varies between one (01) open Haouch and 1.50 in the case of Haouch covered by ensuring comfort and validating the results of data-processing simulation of program COS.BAS.

CONCLUSION

Can recapitulate the results of this study have two levels:

The first level: Recapitulate the general results obtained starting from the analysis of the report built/not built and of the mode with occupation of the ground with respect to the cultural, socio-economic and climatic factors in urban fabrics of the traditional individual habitat of the Maghrebian cities. These results are as follows:

The traditional habitat expresses very high COS, with an urban fabric compact and dense whose streets are deep, sinuous and narrow, which spare zones of shade, the winds cross and reduce the time of sunning. The dwellings are coupled the ones with the others in order to reduce the surfaces exposed to the solar radiation.

The urban tissues of ksar are very adapted to the climatic conditions of the arid and semi-arid mediums by the predominance of full surfaces (built) compared to empty surfaces (not built), expressing flexible and dynamic COS-FAR-which vary from a type of dwelling to another according to the variation height, the orientation and dimensions of the piece.

The COS of the individual habitat rests on the decomposition of the dwelling in a built space and a space not built, which is generally the court or the patio. The dwellings of the traditional cities present courses interior whose form and orientation are very adapted to the control of the solar radiation. They are shaded for a long part of the day during the summer while acting like thermal regulators with the dwellings.

The court is the climatic place of defense which takes part in heat exchange, while reducing the variations in temperature between the interior of built volume and outside by introducing the phenomenon of the nomadism interns daily or seasonal worker with the dwelling.

Intermediate elements (porch, gallery, gantry, loggia, iwan, ikomar…) that constitute part of the overall surface rough of the dwelling influential on fixing of the COS, because they play an extremely important climatic part, according to the participation in the reduction of sunning in summer.

The second level: Recapitulate the orientations to establish COS, CES optimal and optimal forms of full and empty spaces for the individual dwelling in the arid and semi-arid mediums, starting from the recommendations obtained by the application of program COS.BAS on the three types of pieces of the case of Bou-Saâda study, in Algeria. These orientations are as follows:

- To prepare typology studies with the individual habitat for each commune or together communes of the arid and semi mediums arid where one classifies the various types of dwellings necessary as regards surface, heights and dimensions.
- To establish, for each type and each case, a direct application of program COS.BAS and to quote the general recommendations after interpretations in the form of a regulation for the building density.
- To indicate, for each type, a whole of optimal COS and their forms of open space.
- To fix the minimal optimal COS of the smallest parcel at (R.d.C+0) like (COS limits) at the residential zone or the commune.
- To authorize the combination enters the optimal forms of open space.
- To authorize the possibility of going beyond of (COS limits), with the proviso of not exceeding the maximum optimal COS of each type, against a payment of a financial participation.
- To introduce a formula or a scale, for the calculation of the amount of the payment of the financial participation necessary to each going beyond of the limiting COS; who can be assigned to urban management in general and more particularly with the management of the park and vegetation, in order to attenuate the hot climate.

- To take part in the introduction of a tissue urban compact and dense as regards construction (high COS), economic and rational use consumption of the grounds.

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