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Building traditions of Mzab facing the challenges of re-shaping of its built form and society

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Abstract

The vernacular building of Mzab settlements shows the optimization, over many centuries of the performance of locally available materials within the climatic conditions of southern Algeria, designed to serve the specific needs of "Ibadits" culture. Mzab demonstrates to a marked degree some peculiarities of Islamic culture, especially in town planning and dwelling design. It provides a good example of how a site may be exploited to assist defense, to benefit from summer breezes and to promote natural drainage, while providing shelter from the sun and adapting generally to severe local climate. Two main concepts can be used to explain the ways the traditional Mzab dwellings are organized and the settlements are planned; these are centrality and barriers. The application of these two concepts by Mzab traditional society persisted until the last few decades when it has undergone profound changes in the re-shaping of its built form and society. These changes were the result of the evolution of political, economical and social factors of the country as a whole and the aspiration of Mzab society to a luxurious and modern life. New modern urban forms have, consequently, appeared and disrupted traditional building design and planning practices. In fact, Mzab is living in a period when everything is in a state of agitation—everything seems to be undergoing a change. In this paper, the knowledge and understanding of the qualities and advantages of the traditional design of Mzab settlements are analyzed. The decline of traditional building design and urban form, and its causes are discussed, and remedies are proposed.

Keywords: Mzab settlements; Ibadits culture; Building traditions; Centrality concept; Barriers; Ksurs

1. Introduction

Mzab settlements (the Ksurs and their city gardens) were developed in response to both the cultural and the climatic needs of their inhabitants. Much importance is given to the status and the privacy of the inhabitants. The Ksurs are self-contained, each fortified by a massive wall, and hierarchically arranged, starting from the dwellings, as private spaces to that of the gate as public ones. The road system is also hierarchically arranged, from public roads to culs-de-sac. The house reflects an inward looking character. Within the house, the spaces are arranged to ensure family privacy. The house has two main parts: family space and space for guests.

The site is selected with an eye to environmental protection, especially for security, promotion of natural drainage and benefit from summer breezes. Buildings are built compactly from locally available materials, such as plaster, mud, stones and palm branches. Streets are narrow and generally covered to avoid direct exposure to sun and sandstorms. Each house has a courtyard, which serves both family life and thermal control. Outside spaces such as roofs are designed to be used for sleeping at night. Palm groves modify the local microclimate and provide protection from sandstorms and dust.

In the past, expansion of traditional settlements responded well to the slow increase of population, and planning and design relied on traditional skills and knowledge. The homogeneity of the site and the harmonic development of the settlements were thus preserved. But in the last five decades, the discovery of oil and gas fields, artesian wells, the construction of a traffic infrastructure, the introduction of new industry and the implementation of new administrative units, such as Communes, sub-prefectures (*Daira*) and later prefectures (*Wilaya*), has greatly affected the regional economy. The population has increased significantly, largely due to migration from other regions. The urbanization of the

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valley has resulted in an accelerated rise of new architectural and urban forms, both planned and spontaneous, to the detriment of traditional planning and design practices. Urbanization has been exclusively on the valley bed where the best agricultural lands are concentrated. Both planned and spontaneous urban developments in the valley contributed into the decline of original style of the main settlements and have instead led to malfunctioning between urban aggregates and a disordered urbanization. This could have been avoided if the public authorities had taken these problems into account from the beginning.

Traditional settlements of Mzab contain many features and qualities that merit study and examination. A great deal has been written about their history, architecture and planning [1–3]. However, much remains to be elucidated concerning the complex interrelationships between the Mzab community, its culture, its climate and its built form. This paper is largely based upon personal field survey and site observation, intending to achieve a better understanding of the design aspects and peculiarities of traditional Mzab practices in urban planning and dwelling design, and their relation to the natural environment. Also discussed are the impact of the modern urbanization and social activity and the consequent degradation of both traditional building design and urban forms in recent decades. Strategies and solutions to meet these challenges and to reduce or repair the damages are proposed.

2. Geographical and historical overview

Mzab settlements are located in the Northern desert of Algeria about 500 km south of Algiers, 32°30′ North and 3°45′ East (Fig. 1). Over 128 000 inhabitants live in Mzab itself [4] over an area of about 4000 ha. This arid region is characterized by high summer temperatures during the day (up to 45°C) and relatively lower temperature at night. The winter is characterized by low temperature at night (down to 3°C) and relatively warmer during the day (up to 20°C). The mean relative humidity in winter is about 42% while in summer it is about 24%. Mean wind speed lies between 4.5 and 5 m/s for the period of March to June and between 3.3 and 4 m/s for other months. Prevailing winds during the winter come from northwest, whereas in summer, east winds are the most common. Northeast and north winds are more frequent in spring [5].

Rare but violent floods have created withered valleys in the desert plateau, forming a complex network, called *chebka* (or net). The valley of Mzab is one of the greatest valleys in this net and is situated roughly in the middle. It is about 20 km long, with a depth varying between 100 and 150 m, and is dry in summer. Its main tributaries are the valleys of Aridan, Labiad, Laadira, Touzouz, Akhalkhal, Zouil and the valley of Ntissa. The valley of Mzab is surrounded by a belt of bright glossy calcareous rocks in the form of an amphitheatre with a steep internal slope. The valley runs from Northwest to Southeast. This amphitheatre is about 2 km wide. Within it are five settlements (the *Ksurs*) and the gardens of the Mzab confederation.

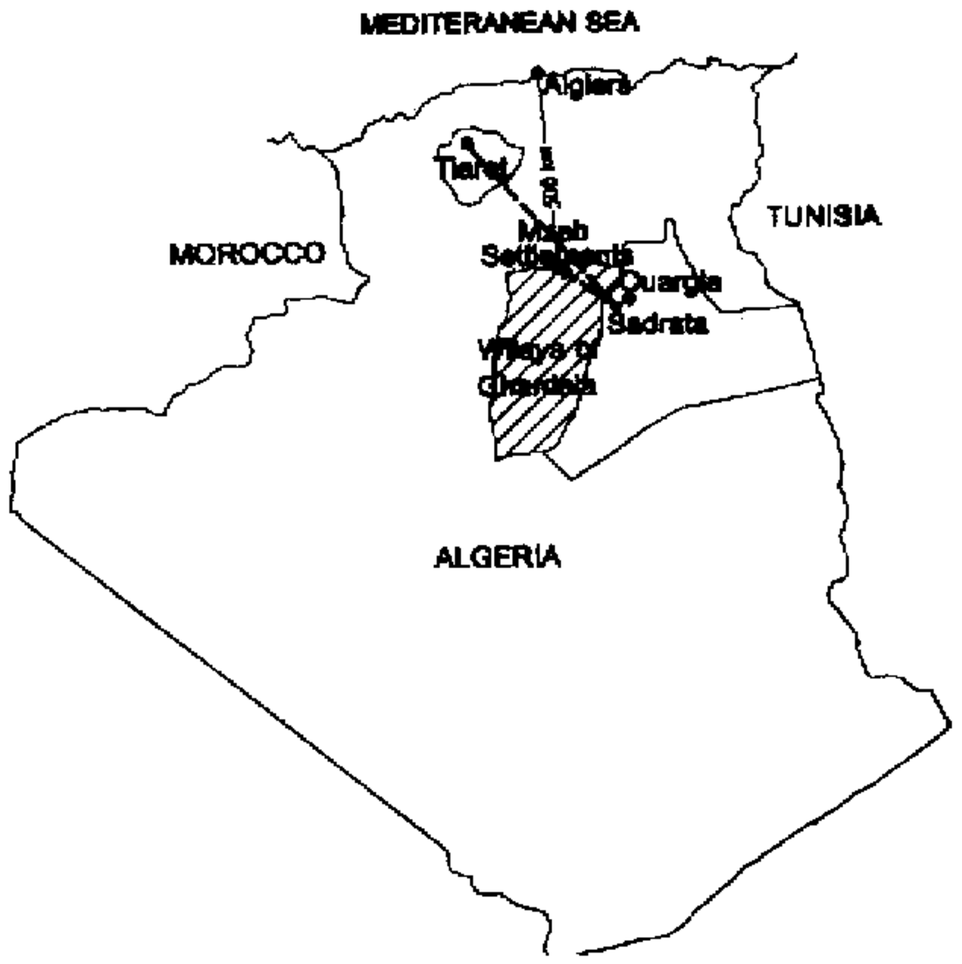

Fig. 1. Geographical location of *Mzab* settlements and the historical path of *Ibadits*.

The valley of Mzab was urbanized by the *Ibadits* around the beginning of 11th century. Ibadits were one of the sects of Islam founded by Abd-Allah Ben Ibad in the 7th century in Basra. They belong to the dissidents or (*Kharijities*): a group of supporters of Ali (the fourth caliph of Islam from 556 till 661 AD) who had withdrawn from his forces and turned against him for accepting human arbitration suggested by Moawiah for judgement on the legitimacy of caliphate in the battle of Seffin in 657 A.D. They continued to oppose the Umayyad and their successors, authorities whom they judged illegal. They insist that a believer of any origin could be caliph (or chief) if believers chose him. Some of the Ibadits went to the north of Africa to settle first in Tripoli, then Kairawan. Abd-Arrahman son of Rostum governed the latter until the fall of Tripoli to the Abassid army on 723 AD when *Ibadits* migrated to the west of Algeria. They established the city of Tahert (10 km away from actual Tiaret city) which became the capital of a powerful state in the north of Africa for a period of 130 years. The Fatimids destroyed this state in 909 AD, and the Ibadits took refuge in Sedrata (a city of old Tahert kingdom) in the region of Ouargla and established a prosperous community. However this new Ibadit power did not last long because of the internal divisions of nomadic tribes, and was in ruins at the end of 11th century. But this time, and before the city was destroyed, the *Ibadits* were already looking for a new and safer site away from caravan movement of nomadic tribes. In the end, the valley of Mzab was the site chosen for the survival of this community. This isolation

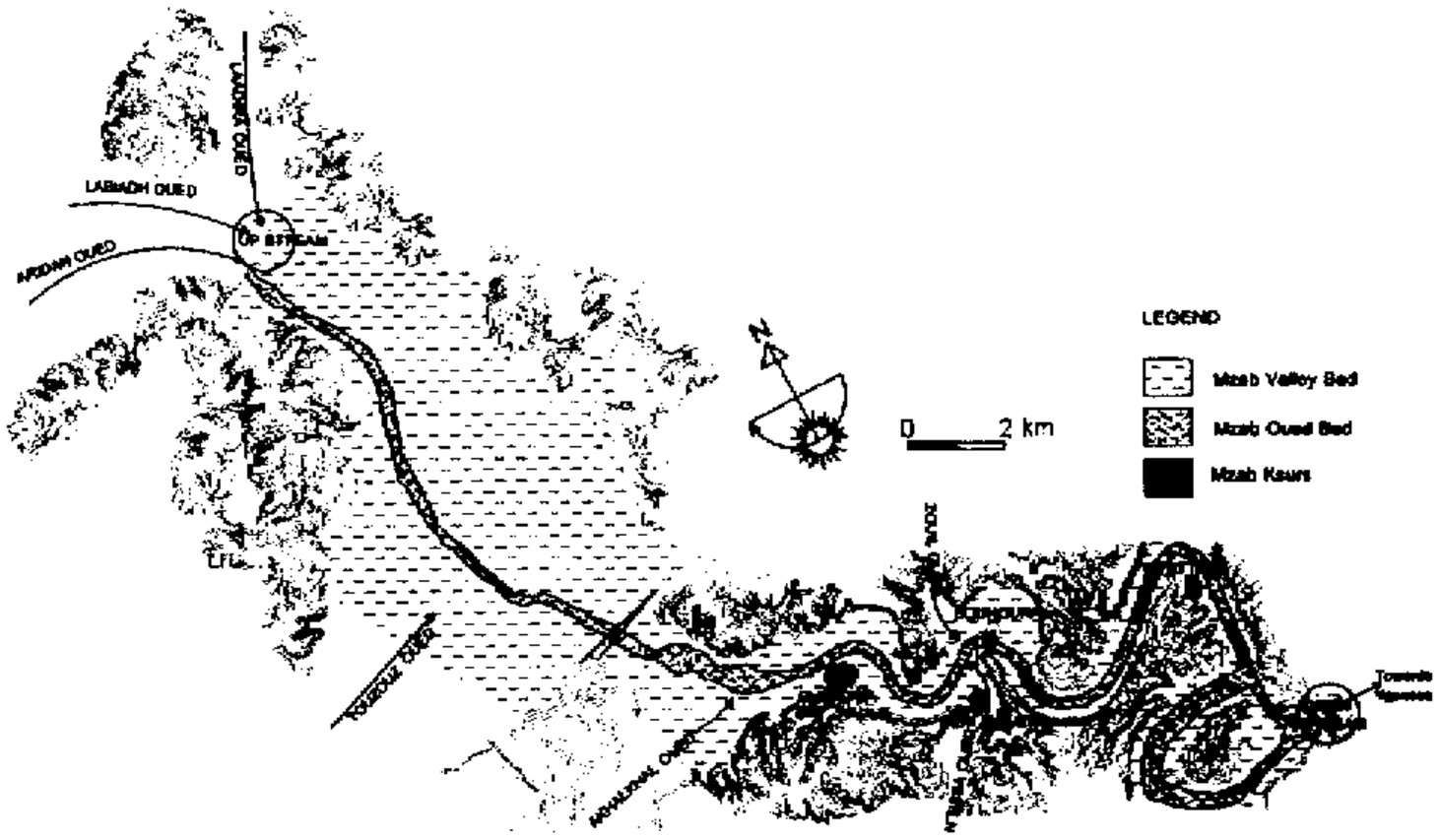

Fig. 2. General spite plan of traditional settlements along the valley of *Mzab*.

has significantly helped this community to preserve its cohesion and culture for a long period (Fig. 1). The knowledge and skills of Mzab builders led them to produce a settlement of five towns along the valley of Mzab over a distance of about eight kilometers. Including; El-Atteuf, Bounoura, Beni-Izgen, Melika and Ghardia (Fig. 2 shows a general site plan of the main traditional settlements of Mzab implanted along the valley).

Mzab settlements originated within very harsh climatic conditions and political conflicts. The establishment of communities requires food, water, and shelter. The food supply relied mainly upon animals; such as goats and camels, vegetables and fruit trees; such as fig, pomegranate, and apricot. Food may be transported more easily than water and shelter, and inadequate local production at first led to trade with the surrounding nomadic population. Eventually, this developed into a network of commercial exchanges with the North of Algeria. The water supply depended mainly upon occasional rainfalls during winter and the ground water in the valley.

Except for Melika *Ksar* (*or main settlement*), which stands on top of an outcrop and can be reached from the valley only by a spiral-stepped pathway, all Ksurs are implanted on the rocky banks of the Mzab valley (Fig. 3 shows a general view of Melika Ksar). All Ksurs dominate the valley and are occupied mainly in winter. Their lowest elevations are well above flood level. They are built above the valley floor in order to allow rainwater to seep underground.

El-Atteuf was the first settlement built in 1012 AD, enclosed within a massive wall. The increase in population led to the appearance of the four other similar Ksurs, each dominated by the quadrangular minaret of its mosque. Bounoura, the second, built in 1046 AD, was followed by Ghardaia in 1053 AD, Melika in 1124 AD and Ben-Izgen in 1347 AD. Ghardaia is built around a knoll and crowned by the mosque. Natural topography largely determines the basic layout of the Ksurs. The chosen sites permit natural defense, natural drainage, easy supply of water, freedom from floods and space for cultivation (Figs. 4, 5, 6, 7 show general views of El-Atteuf, Bounoura and Beni-Izgen and Ghardaia, Ksurs respectively).

3. Design aspects of traditional Mzab settlements and their decline

The built response of the Mzab community to their socio-cultural and surrounding environmental requirements is expressed by two concepts: centrality and barriers. Centrality, in the arrangement of the Mzab settlements reflects traditional Islamic town planning in general, in that it does not dissociate the material and spiritual aspects of life, as does much of modern town planning. The space is a response to religious and community life adopted by Ibadits. The centrality of the towns and dwellings was, to a degree, symbolic of the society's cosmology. Barriers are the boundaries between settlements and their hostile environment, which could be human or climatic. A rampart around a settlement is a barrier against a hostile surrounding population. Vegetation, heavy buildings, compact buildings with winding streets are also barriers against a harsh climate.

4. Centrality concept

The centrality concept appears in the arrangement of Ksurs. During the creation process of a Ksar under the supervision of the *Halkat Al-Azzaba* institution (the assembly of scholars), the centrality was emphasized in

Fig. 3. General view of Melika Ksar.

Fig. 4. General view of El-Atteuf Ksar.

the layout of the future Ksar. The *Halkat Al-Azzaba* institution is, in one sense, a substitute for the Imam (or religious chief), who has the supreme authority of the settlement affairs. The Imam was the guarantor of *Ibadits* doctrine and held the meetings in the mosque. The management and legislation of urban problems (buildings, water, properties, etc.) was given to the *Jamaa* (or the community). The *Jamaa* is a traditional institution composed from elected deputies of different fractions (*Achair*). Their meetings are usually held in the market place. This institution depends hierarchically on the authority of *Halkat Al-Azzaba*.

After selection of an appropriate site, the whole territory to be urbanized was marked out. A rampart and watch towers were built following the predefined boundary. To symbolize the centrality concept, the mosque was placed dominantly at the central and highest point of the Ksar. As the religious, cultural and social center, it had authority over religious and socio-cultural affairs (worship, teaching, marriages, etc.). Each settlement was to have only one mosque to avoid the divisive impression. The mosque was surrounded by buildings of religious scholars. Just beyond were the homes of those citizens nearest to the scholars in status and so on in declining order towards the periphery (Fig. 8). The market place considered as a public space, was pushed to the periphery of the settlement (Fig. 9). In subsequent stages of settlement expansion, the market place was moved outside the gate to be more accessible to visiting merchants, and to facilitate the access of goods.

Fig. 5. General view of Bounoura Ksar.

Fig. 6. General view of Beni-Izgen Ksar.

However, there are exceptions. The market place in the Melika settlement still occupies, together with the mosque, the central position and was not shifted to the boundary as the settlement expanded (Fig. 14). The site investigation revealed that this exception is due to the physical constraints of the site. Market place areas require generally a wide and level area. In Melika, however, the ground is inclined and consequently has a relatively small market. The centrality is also expressed by the general plan layout of a Mzab Ksar, which follow an irregular, radial-concentric pattern. Fig. 10 shows plan layouts of the five Ksurs where it can be seen the last original arrangements before their decline. The layouts are constructed based on [6–8] and the personal site investigations. Fig. 10 shows a general view of Ghardaia market.

The centrality makes the value of lands higher in approaching towards the mosque area while the areas of lowest land values represent the periphery (Fig. 11). The centrality concept used for the process development of has been profoundly undermined and weakened in the last few decades by the political, economical, social and technological changes as well as expansion requirements. The *Halket-El-Azzaba*, the traditional authority, was dismissed from power and substituted by a state-based system of administration, endangering the social, economical and financial values of the Ksar. Consequently, centralization (process), which was influenced by spiritual values, has been severely weakened by materialism (Fig. 12). One aspect of the weakening of the role of the mosque as a symbol of unity is the construction of a second or more

Fig. 7. General view of Ghardaia Ksar.

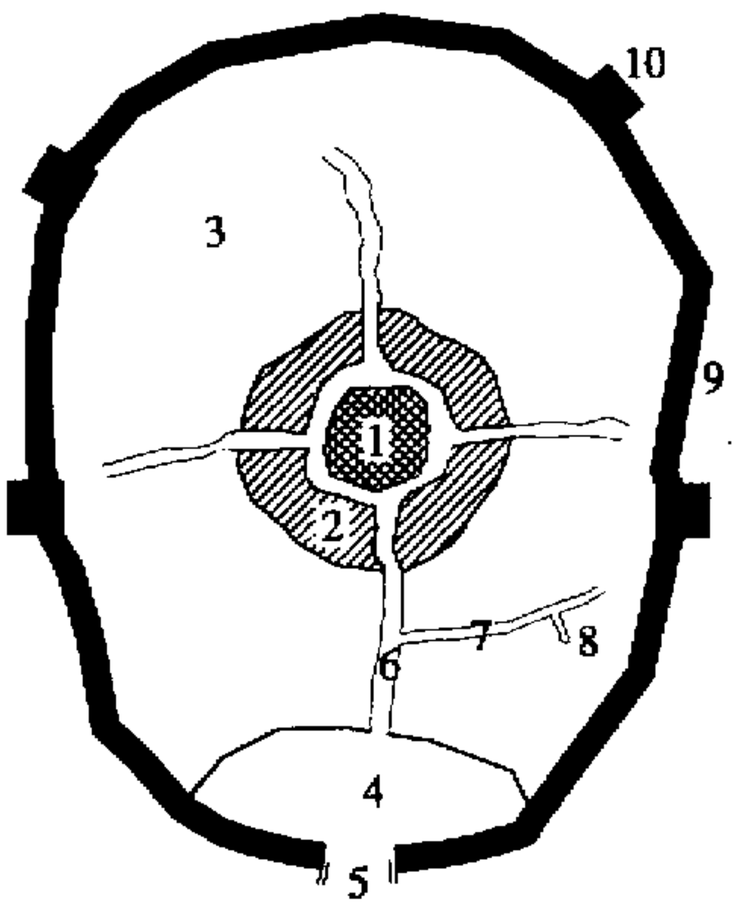

Fig. 8. Schematic diagram of the arrangement principle for a typical Mzab settlement. *Legend*: 1. Mosque, 2. Scholars area, 3. Citizens area, 4. Market Place, 5. Gate, 6. Public road, 7. Secondary street, 8. Cul-de-sac, 9. Rampart, 10. Watch towers.

mosques, such as in Ghardaia (see Fig. 7). The weakness of the role of the mosque has provided a ready justification for decentralization. The improvement in transportation and other forms of communication outside the Ksurs, have undoubtedly been another major factor in the recent decentralization and have lessened the advantages of concentration in Ksurs. Accordingly, other poles of attraction have appeared in the periphery of the Ksurs near traffic roads, such as manufacturing, commercial, administration and service areas. Residential districts developed in close proximity to these new poles of attraction reinforce the decline of the traditional centrality of Ksurs (Fig. 13).

During French occupation, the French district was developed linearly South and East of Ghardaia. This has become an administrative district or center, which formed the starting point for the development of a modern residential area, known as Tniet El Makhzen, linearly along the Oued Mzab towards Beni-izgen. After independence, there has been the appearance of a number of urban aggregates, far larger and more numerous than before. These have usually been formed by the simultaneous expansion of a number of neighboring districts, which have grown out toward each other until they have coalesced into one continuous conurbation (Ghardaia, Melika, Beni-izgen and Bounoura) without the control and integration of the old settlements. The alterations and extensions are generally made with cheap bricks, concrete blocks and reinforced concrete with no respect for the existing environment.

These expansions gave a non-homogeneous urban texture characterized by its alignment along traffic roads, West to East and towards the North. They are developed around different infrastructures: orthogonal, linear, mixed or undefined plot which do not fit with traditional Ksurs tissues (Fig. 14).

The centrality principle is also applied in dwelling design. The courtyard is the symbol of this centrality, and all the rooms are arranged around this space (Fig. 15). It is through the courtyard that the inhabitants of the dwellings can have a direct contact with the external environment. The courtyard is a source of life and offers safety and privacy of the family. All openings for light, ventilation and access to rooms are orientated towards this central space.

Fig. 9. Market place for Ghardaia Ksar.

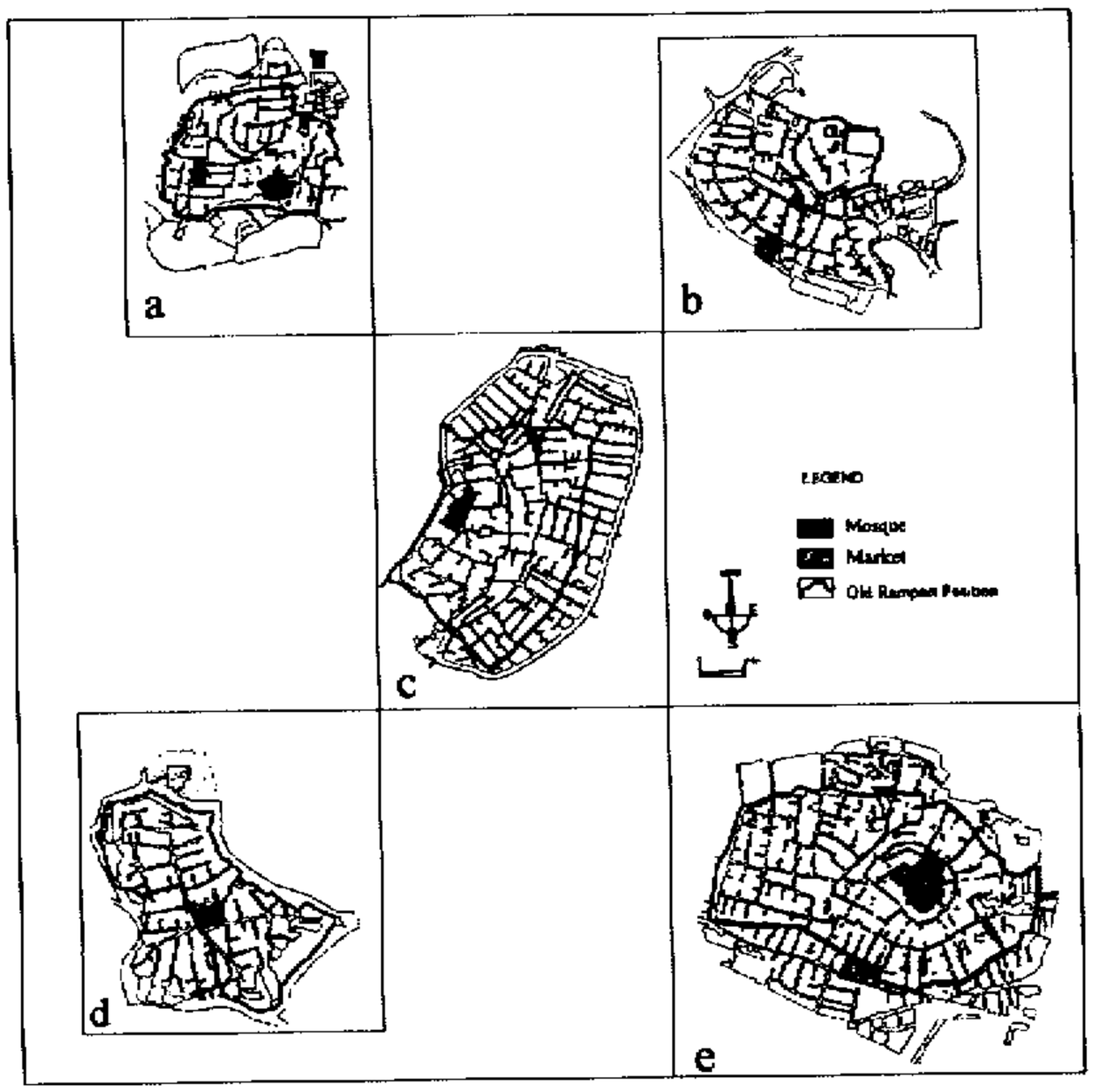

Fig. 10. Layout of typical Ksurs: (a) El-Atteuf Ksar, (b) Bounoura Ksar, (c) Beni-Izgen Ksar, (d) Melika Ksar, (e) Ghardaia Ksar.

In recent years, this principle has been gradually abandoned, and its original role restricted. More openings are pierced on the facades to get light and vision and ventilation (Figs. 16 and 17). It was then unnecessary to leave the courtyard open, and internal upper levels are thus used to enlarge rooms. Figs. 18 and 19 show some typical plans produced by local professionals where the courtyard is transformed into a hall.

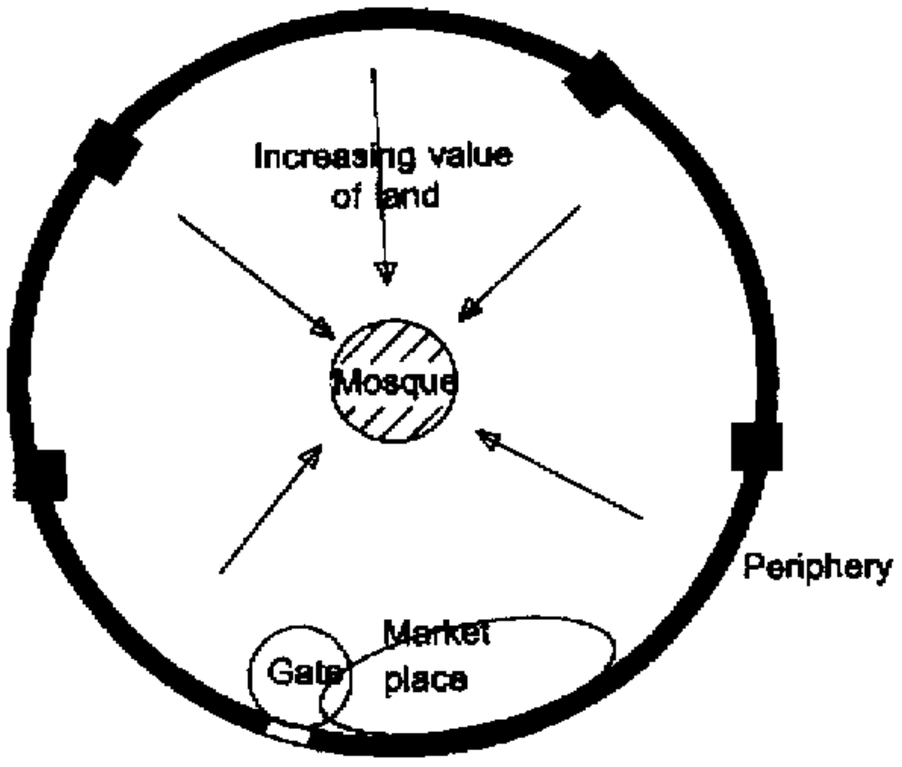

Fig. 11. Centrality principle in the arrangement of Ksurs.

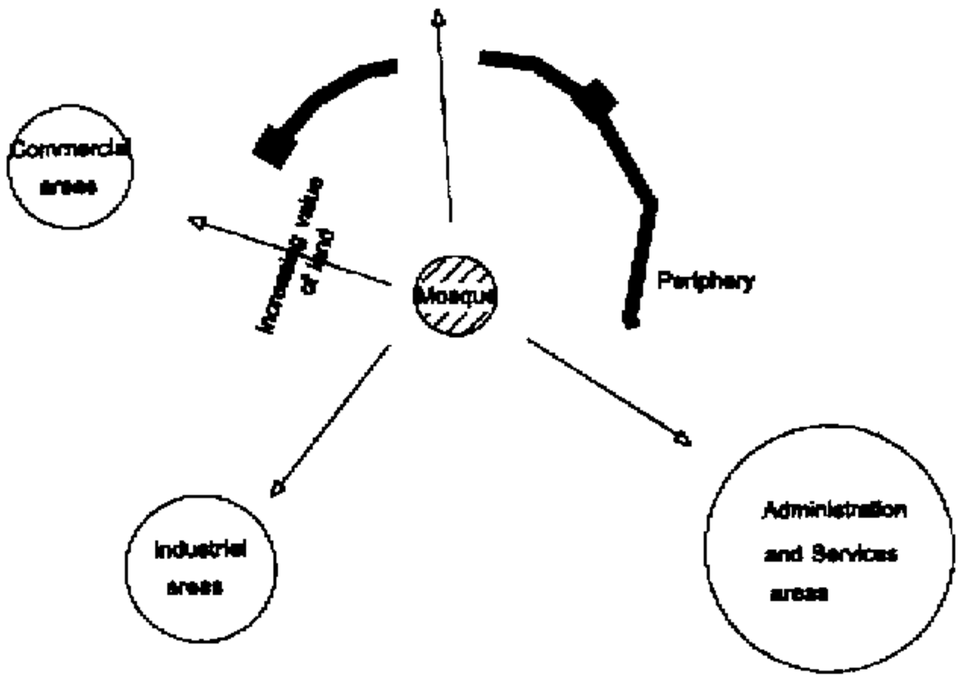

Fig. 12. Decline of centrality for Ksurs: it is oriented towards other centres.

5. Barriers

5.1. Security barriers

Ramparts are massive walls, built around the Ksurs, primarily for defense against enemies, also gave much-needed protection from winds and sand-storms (Fig. 20). They are built high enough (about 5 m) to protect against attack, and are pierced by doors, one of which is public or the main gate. The others were used by inhabitants for access to cemeteries or to the gardens. Ghardaia used to be fortified by a massive wall which was later pierced with three doors [1]. A wall inevitably imposes planning upon a community. This will especially be so when growth and overcrowding demand expansion and the establishment of new defenses to enclose a larger area. With expansion, the perimeter walls are generally shifted or replaced.

Watch towers or Borjs are placed at dominating points. Some are also placed on high-level positions along the valley for the protection of Ksurs and surrounding city gardens, and to control the valley water levels during rainy seasons. The towers are quadrangular and are constructed from stone and lime mortar, around 25 m high and 12 m wide at base. Great emphasis was placed upon the exclusion of strangers, and even today no uninvited visitor is allowed to stay in a Mzab settlement after sunset.

The security barriers have been in decline and ramparts and watch towers have deteriorated in response to settlement expansion and state take over of security. The only settlement which still retains its rampart and watch-towers is Beni-Izgen. The other settlements have partly lost these elements, although some vestiges can be seen scattered throughout in Ghardaia, Melika, Bounoura and El Atteuf.

5.2. Safety barriers

The courtyard gives the family privacy, safety and calm. Children can play within it under the control of their mothers. It is protected from sun and rain by a central narrow opening at the top called the Shebek (Fig. 21). A metal or wooden grid may cover this in order to protect people from any danger, especially children from falling, and for deterring thieves. The Shebek can easily be closed when the sun approaches the zenith, when it rains or when there are sand-storms. Around the Shebek on the first floor is an open space (or *Tagherghirt*). The courtyard is used to allow maximum freedom of movement inside the house, as well as for social and religious occasions. This may be the reason why, unlike other areas, it is not provided with plants or fountains.

Sanitary installations for the evacuation of sewage, rainwater and rubbish have also been given attention. A closet is fitted into a small corner on the ground floor, and has an outlet to evacuate waste into a pit, which has an opening allowing periodic collection of residues to be used as fertilizers. Near the closet is a shower room with a drain through its floor, discharging into the pit. Wastewater may however be discharged through a hole into the courtyard floor towards a sump in the rocky soil beneath. Water jars are usually placed in the toilet room. Modern arrangements in most Ksurs replace traditional sanitary installations. Pits are replaced by public drainage.

5.3. The privacy barriers

The arrangements of traditional settlements define differences between male and female, private and public, sacred and profane. Each settlement is arranged into three important areas, used at different times: the Ksurs (the main settlements), the gardens and the cemeteries.

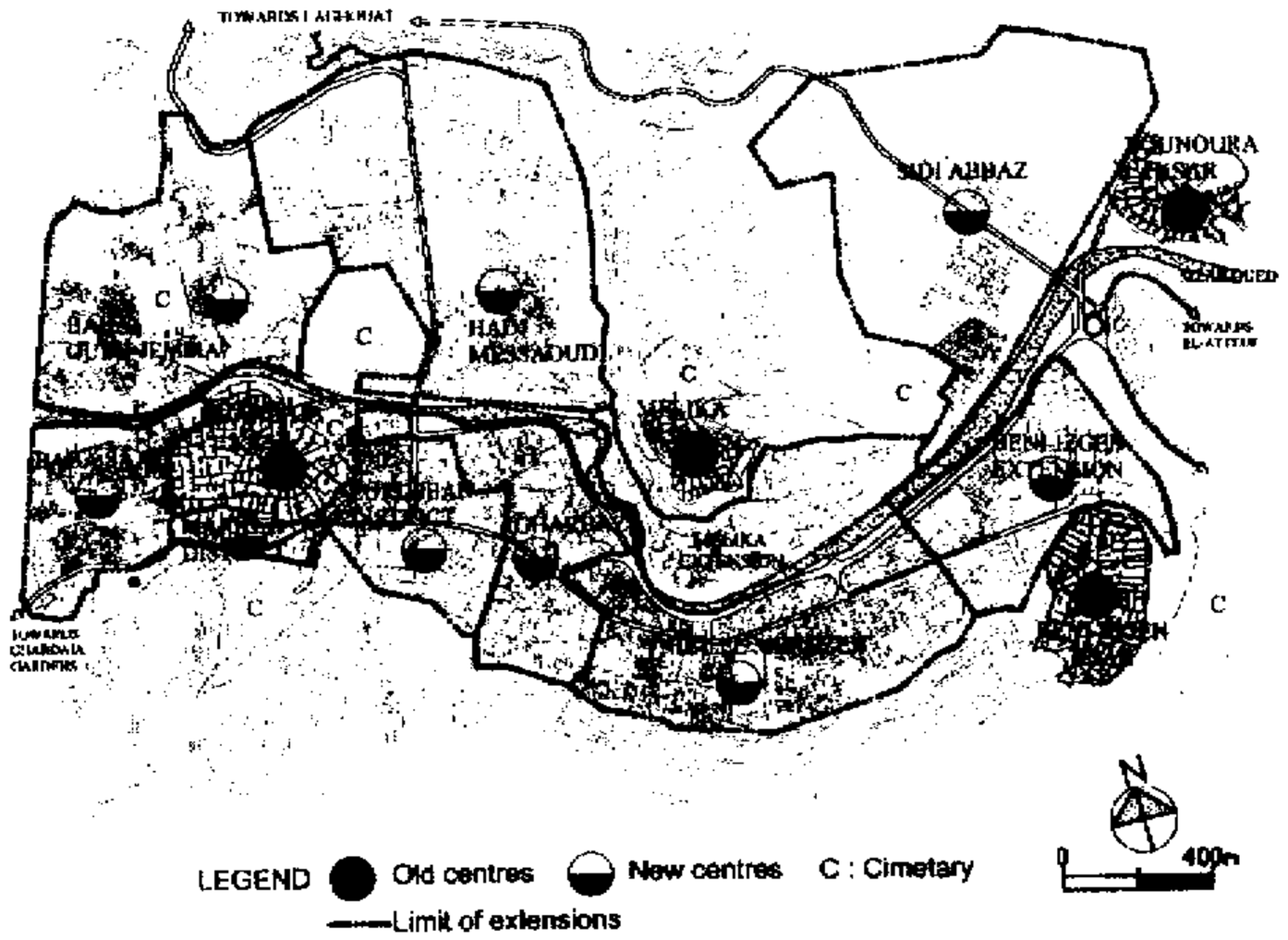

Fig. 13. New types of centralities outside Ksurs.

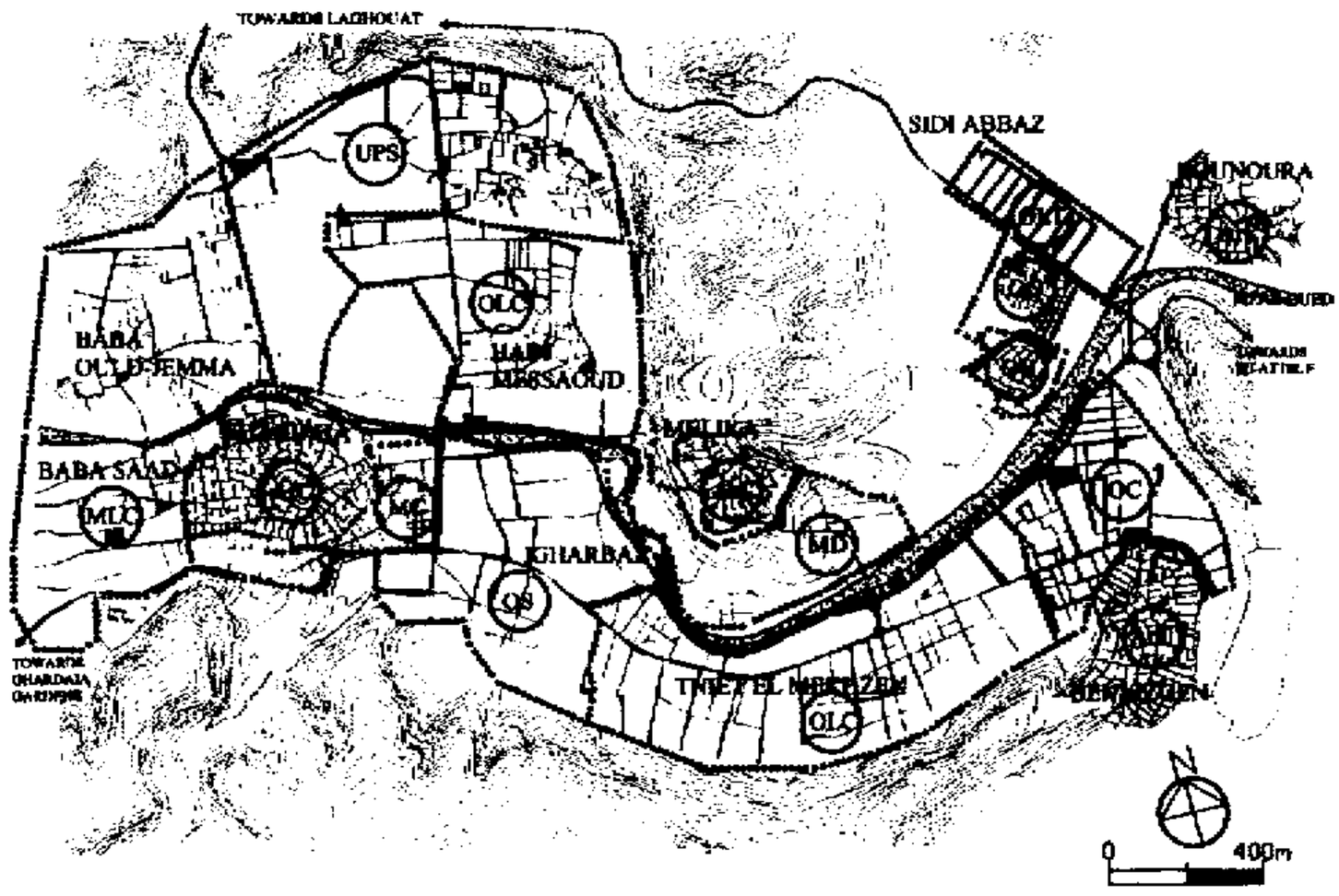

Fig. 14. New districts were developed around diverse infrastructures: orthogonal, linear or even undefined plot, which do not fit with that of traditional Ksurs. *Legend*: ArC, Arborescent and compact tissue; OLC, Orthogonal and linear tissue with clustered buildings; OS, Orthogonal tissue with scattered buildings; MC, Mixed and compact issue; MD, Mixed tissue with detached buildings; OG, Orthogonal grid pattern; OC, Orthogonal compact tissue; OLT, Orthogonal tissue with terrace of buildings.

Privacy outside the buildings. Privacy of dwellings as a whole is assured by separating residential from commercial and public areas. Public activities take place only in the lower part of the settlement near the market place.

Hierarchic arrangement of external spaces. Dwellings open generally into semi-private spaces or cul-de-sacs (Fig. 22), which lead into streets as semi-public space (Fig. 23) and then public roads. The dwellings situated on

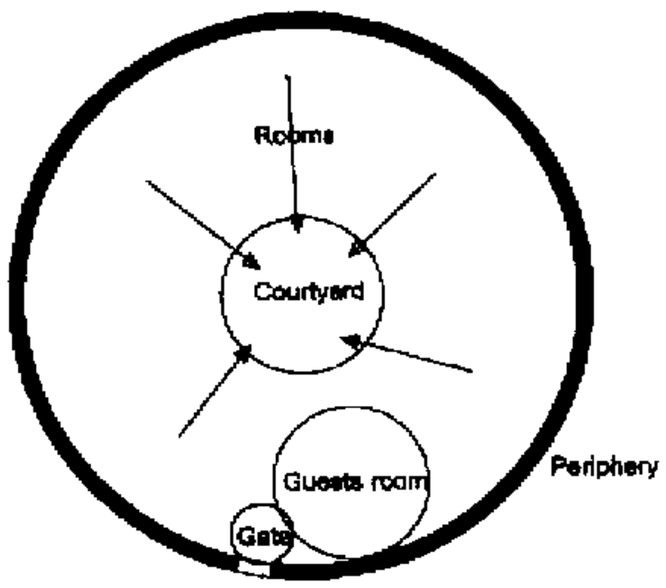

Fig. 15. Centrality concept in the arrangement of traditional dwellings.

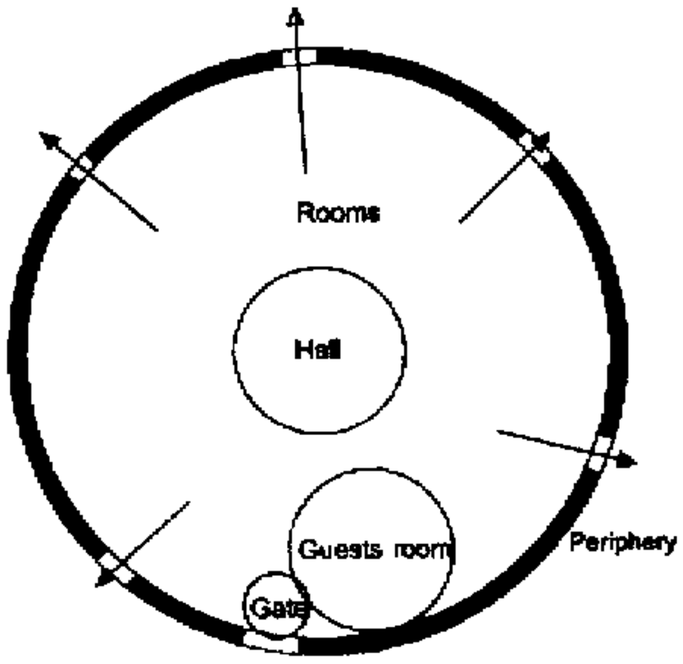

Fig. 16. Decline of centrality in traditional dwellings.


(a)


(b)

Fig. 17. Dwellings become more and more outward looking (a: blind façades are pierced by windows but are screened to avoid overlooking, b: unscreened windows and balconies are in many ceases introduced to the façades).

the periphery are designed so that they protect the cul-de-sac, and are called rampart dwellings. Joint ownership of boundary walls ensures that there will be no communication apart from the main entrance. The parapet walls of roofs are high enough to avoid eye contact between neighbors. The roads are intended for pedestrian and animal transport only. They are narrow and irregular and are covered by arches, palm branches or other means, to offer shade (Fig. 23). However, in recent years, some roads in the peripheral areas of the Ksurs have been widened to allow access of vehicles, especially in Ghardaia, near the market place (Fig. 24).

Privacy within the building. In Islamic traditions the house is regarded almost as a sacred place that should not be violated. It is the place of the women, who traditionally are required to be isolated from public and communal life. All women are covered by veils when they go outside the house and avoid eye contact with male strangers. Residences are segregated from public spaces and access to them is through narrow and winding pathways. The house as a whole is orientated towards its internal courtyard, from where it derives its air and light and, except for access, is closed to the street. In the design of Mzab dwelling, emphasis is placed on achieving privacy, safety, thermal comfort and durability.

Privacy within the family is based upon the separation of male and female. Women in Mzab are not supposed to meet any male except close relatives. The dwelling is separated into two distinct parts. Men's space, (or *Douiraya*), is where male guests are usually welcomed. It often has access from the *Taskift*, and may be regarded as the semi-public space of the building. Women's space is the remainder. Frequently, there are two separate entrances, one for women and one for men. The most important spaces within the women's quarters are the *Tizfri*: a living space used also for weaving, on the ground floor; the *Ekomar*: a similar space on the first

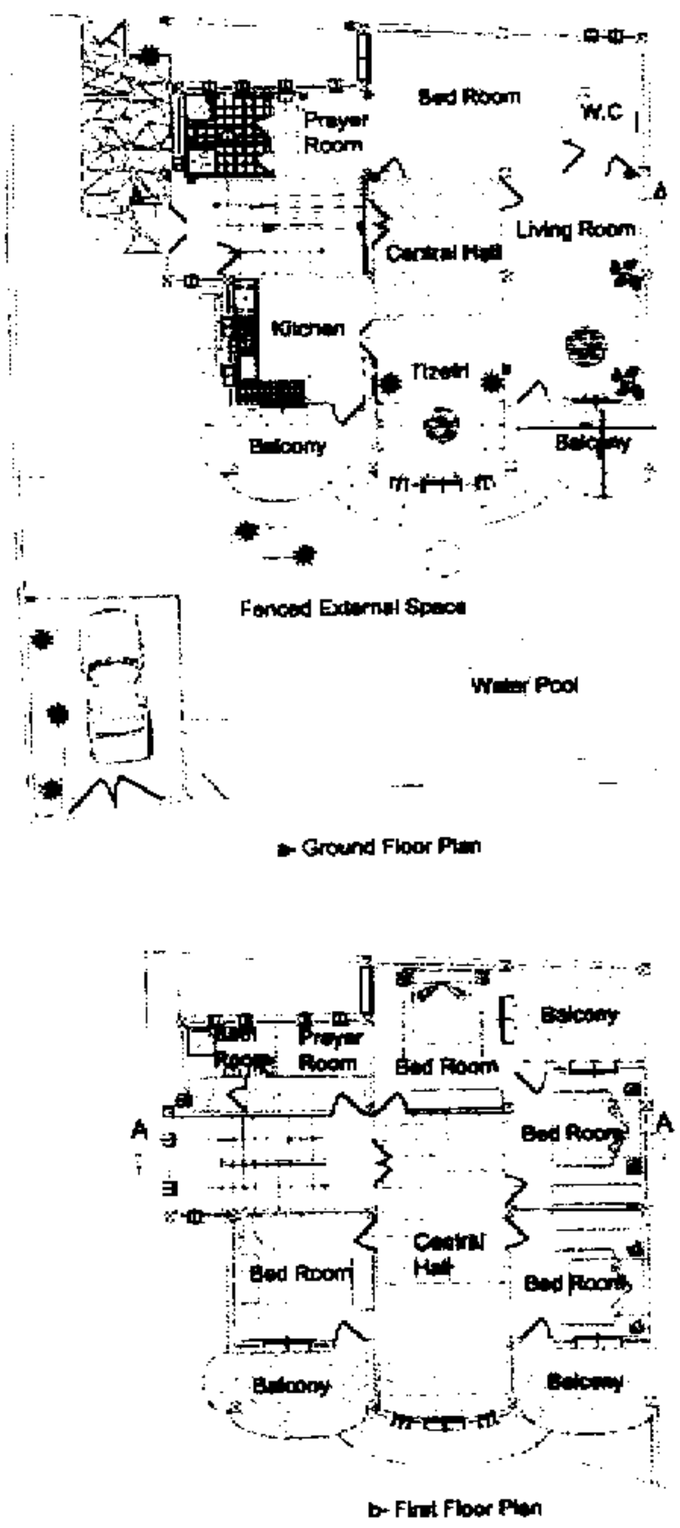

Fig. 18. Typical plans produced by professionals (a: ground floor plan, b: first floor plan).

floor and on the roof (or *Stah*); the courtyard and the kitchen. The *Tizfri* is mainly used during the summer, because it is cooler, whereas the Ekomar is used during wintertime, because it is warmer. The access to both men's and women's spaces is usually through two separated doors, each with its own *Taskift*. Sometimes there is only one *Taskift*, in the form of a chicane, designed to assure the privacy of the women's space. Fig. 25 shows a typical ground floor and Fig. 26 shows typical first floor for a Mzab dwelling. The courtyard (or *Emessent Eddar*) is a semi-open space in the center of the house, with almost all the rooms clustered around. In it, most of the women's daily life is conducted unseen by strangers. The kitchen is fitted into a corner of the courtyard. It has a chimney and some niches to accommodate appropriate shelves.

The roof is usually used for sleeping in summer (Fig. 27). Customarily, is not used during the day by men, primarily for the privacy of the neighbors. The parapet walls of the roof are built high with small windows designed to see down the roads without direct vision into neighbors' space (Fig. 28).

5.4. Climatic barriers

Mzab inhabitants, as most people of hot climates, have learned from long experience various ways of maintaining comfort inside dwellings. Much has been done to reduce the discomfort by the use of courtyards, the use of suitable materials, by shading from direct sunlight, and by adaptation to climatic patterns.

The courtyard is also used for thermal regulation. It allows air movement within the dwelling, due to the temperature difference between cool air within the shady streets, and hot air within the courtyard. Hot air within the courtyard moves upwards, from first floor ground through the top opening, *Shebek*, to other upper floors into the external atmosphere, and is replaced by cooler outside air. The position of the courtyard within the dwelling makes it much quieter than the alleyways. It is less open in the lower than in the upper levels, and is divided into two. One part is open upwards for light and ventilation, and the other is a covered walk or porch. The porch, which is used for various family activities, is a balcony which partially or totally surrounds it in order to minimize direct solar gain.

Heavy buildings with high thermal capacity material. Dwellings are built with thick walls of high thermal capacity, with locally available materials, such as stones, mud and lime. This reduces fluctuation of internal temperature. Thick walls and roofs work as insulators and reservoirs of heat during the day. At night, stored heat is released partly to the house and partly to the outside. Heavy buildings provide comfortable internal spaces during the day. Unfortunately, at night much of the stored heat is transferred to the inside causing discomfort. This is why the inhabitants move outdoors at night to sleep on roofs. Thinner walls, using modern building material to gain space and to be able to furnish the house with larger modern equipment having regular geometrical shapes, however, have replaced thick irregular walls (Fig. 29 shows the replacement of traditional thick walls with thinner ones using blocks of concrete during the renovation of a traditional dwelling). New dwellings are constructed with modern material with thinner walls with concrete blocks and hollow bricks (Fig. 30). None of new buildings fits with the surroundings with respect to proportions, use of materials, textures, microclimate, etc.

Minimization of surface exposure to direct sun. Surface exposure to direct sun and heat gain through building surfaces is reduced by

- Compact cellular layout with minimum external surface area.
- Blind external walls to reduce radiation through windows: most windows face onto courtyards.
- Whitewash to reduce absorptivity.

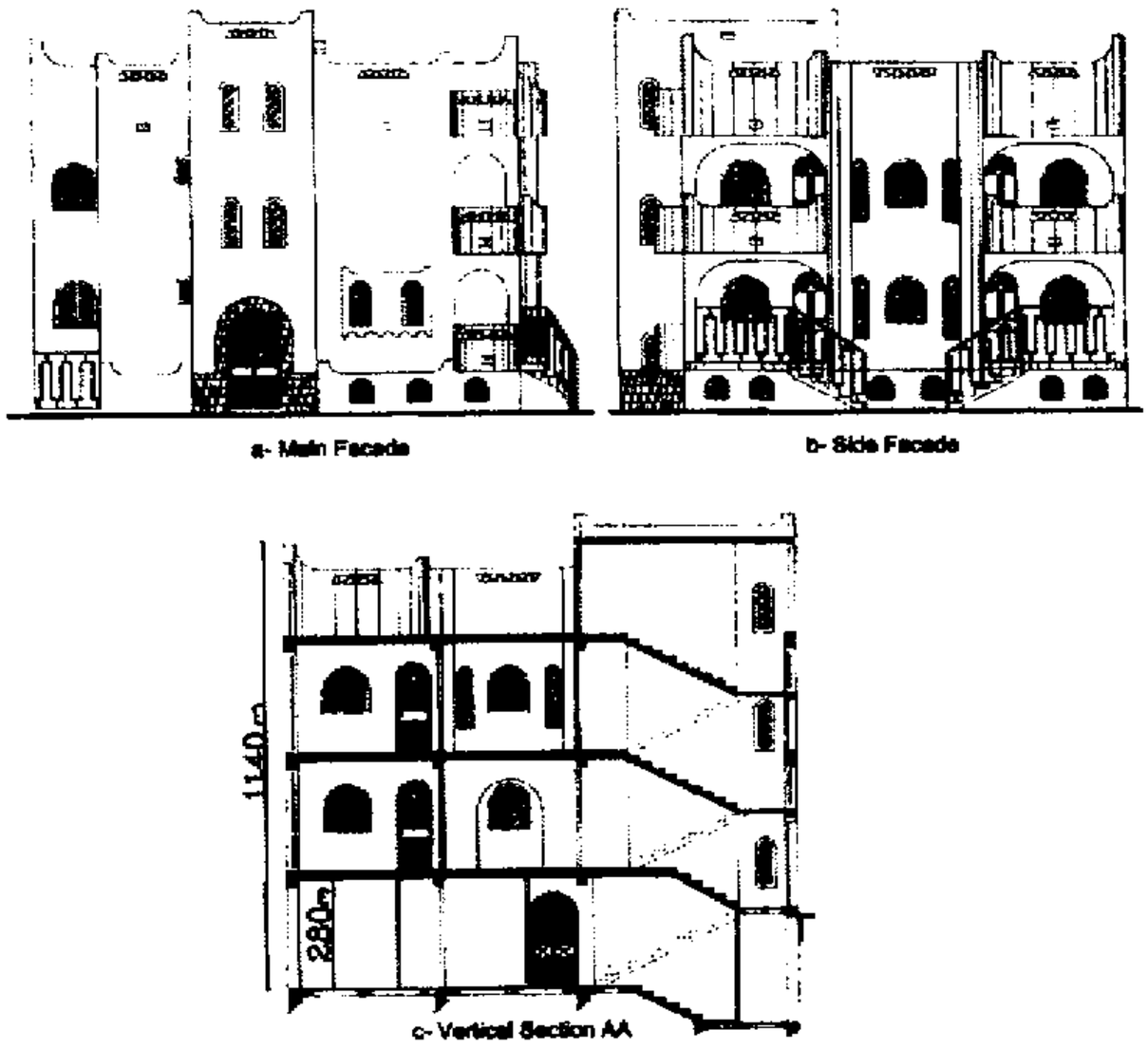

Fig. 19. Typical elevations produced by professionals (a: main façade, b: side façade, c: vertical section).

Fig. 20. General view for the rampart and watch tower of Beni-Izgen Ksar.

- Use of basement as a relatively cool space during summer days.
- Plants to give shade to buildings and ground, especially in city gardens.

Adaptation to climatic patterns. In addition to the role of the courtyard in providing comfort, daily activities are adapted in response to climatic patterns.

- Within the dwelling; the family use the roof of the house for sleeping in the open air during summer nights. The roof is usually subdivided with partitions to provide separate spaces for children, parents and guests. Parapet walls, which also enclose the roof area, are built high above the roof for visual protection of the family and to provide shade.

Fig. 21. General view for a Shebek.

Fig. 23. Typical street in El-Atteuf Ksar.

- Outside the dwelling, inhabitants move from Ksurs to city gardens during summer, and vice versa during winter.
- Commercial, cultural and other social activities take place in the morning and late evening, during which time the outside conditions are comfortable.

Use of vegetation. The gardens are urbanized shady palm groves adjacent to the main settlements. They accommodate both dwellings and cultivated spaces. They occupy the valley plains to benefit from the availability of water. Besides satisfying the need for agriculture, palm trees also play an important role in the thermal regulation of the immediate physical environment. Palm trees shade dwellings within them and provide some cooling through evaporation and the absorption of radiation. Palm groves can also secure privacy, reduce annoying glare effects, alter wind speed and direction, catch dust and filter the air. The inhabitants of Ksurs use dwellings in these gardens in summer. Nowadays tourists use some of them during the winter. The dwellings of the palm groves are built similarly to those in the Ksurs but less compactly. Each dwelling is surrounded by palm trees, which protect it from sandstorms and are generally significant as modifiers of the microclimate. Fig. 31 shows the city garden of Bounoura. City gardens also have mosques, but, until recently, without minarets, and with low ceilings. This makes them less attractive to thieves and strangers, and also avoids the divisive impression, which would be given if there were two minarets for the same settlement. Unlike Ksurs, the streets in city gardens are for pedestrians and water drainage is for irrigation in winter. The dimensions of the roads, which effectively become canals, are precisely calculated to suit the number of trees and the area to be irrigated. The level of ground floor must be indicated by the *Oumana* commission (a subsection of *Jamaa*).

Traditional building practices have long been attached to traditional regulations (or *Orf*) which stipulate the following

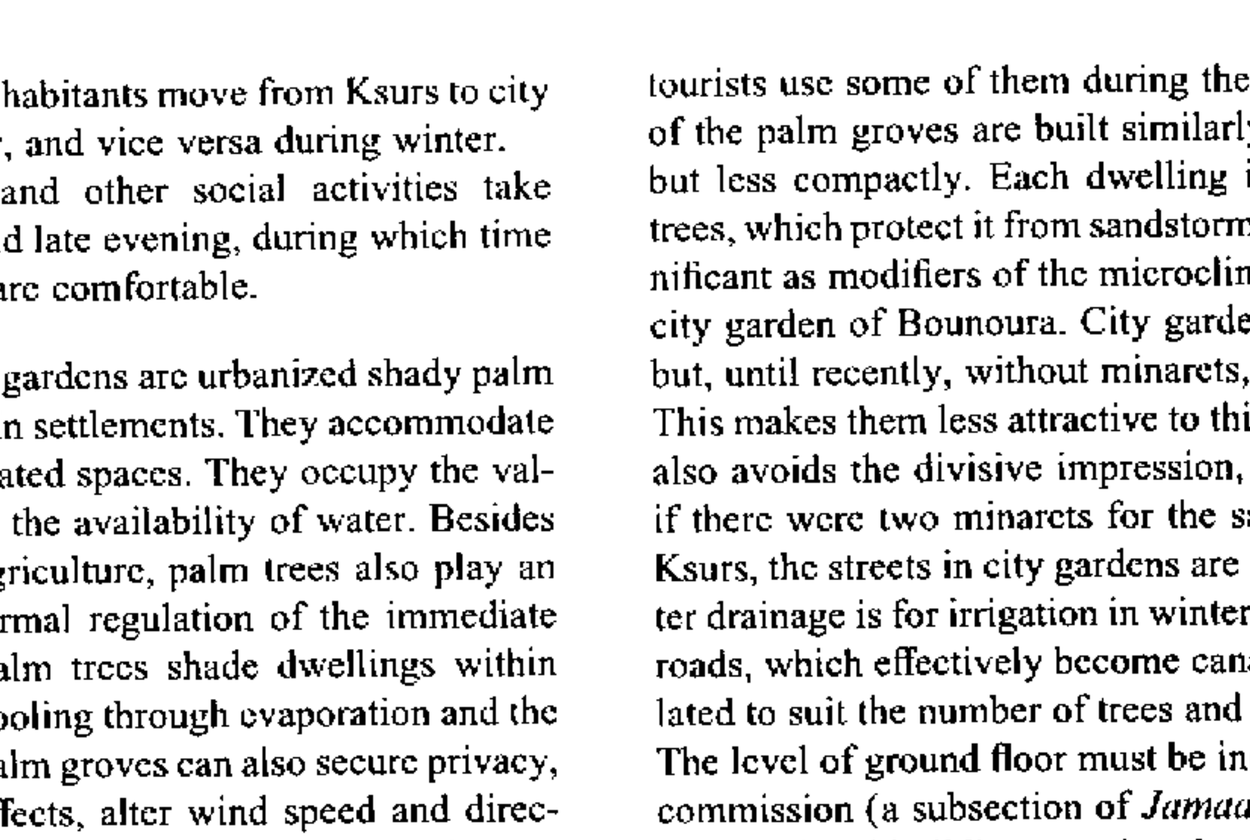

Fig. 22. Typical cul-de-sac in Ghardaia Ksar.

Fig. 24. Typical public road accessible by vehicles in Ghardaia Ksar.

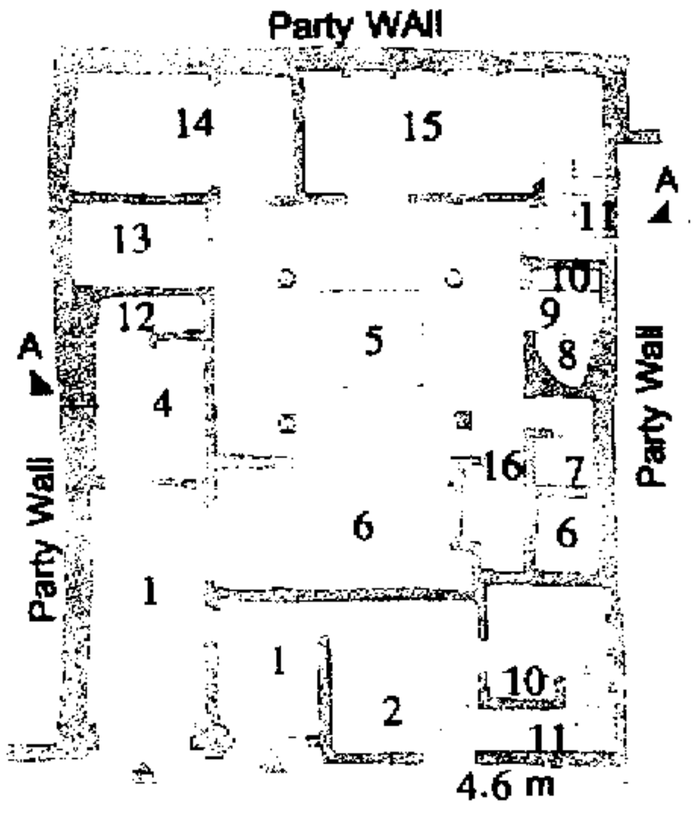

Fig. 25. Ground floor plan of a typical Mzab's dwelling. *Legend*: 1. Entrance (*taskift*); 2. Men guest room (*douiria*), 3. Women guest room (*bit-dief*), 4. Donkey room, 5. Courtyard (*Emesent eddar*), 6. Pit, 7. W.C (*ajimar*), 8. Chimney, 9. Kitchen corner, 10. Niche, 11. Stairs, 12. Water container, 13. Riddance, 14. Bed room (*tazka*), 15. Women space for weaving, 16. Shower room.

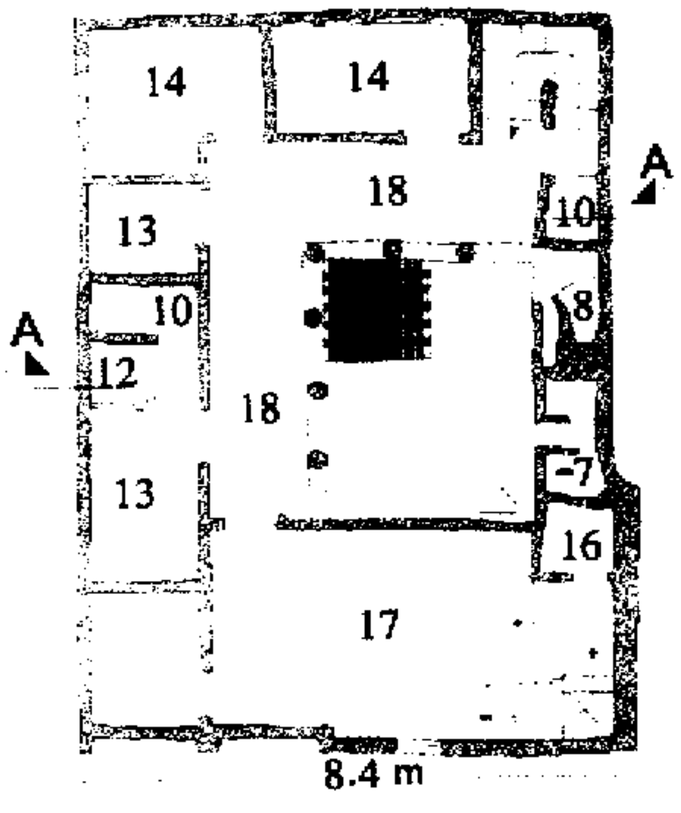

Fig. 26. First floor plan of a typical Mzab dwelling. *Legend*: 17. Living room for men (*lali*), 18. Porch, 19. Courtyard top opening (*shebek*).

measures to be respected, in order to benefit from the sun and the ventilation and to ensure privacy for inhabitants [8–10]:

- the building is not allowed to extend the height of a construction on the Southeast (*Kebla*) and Northwest (or *Dahra*) walls,
- If it is necessary to increase the height of a building on these azimuths. The height of the elevated walls should be equal to a set-back without being more than 7.5 m.
- A window of 0.6 m wide and 1 m high could be opened on the elevated wall only if it is absolutely necessary.
- Domestic animal feeding on this space is extremely prohibited.
- Access to this space is only allowed with prior permission.
- No opening is allowed in party walls.
- Windows directly opposite to each other are not allowed except for those existing before but, for privacy reasons, opened windows should be screened.

These regulations have not always been respected in meeting modern requirements. From site investigations, the

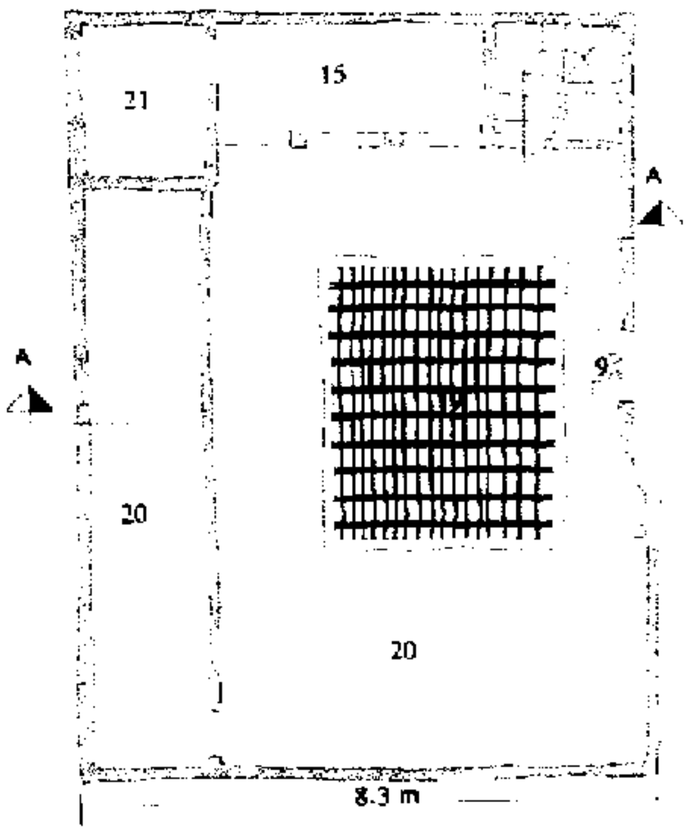

Fig. 27. Roof plan of a typical Mzab's dwelling. *Legend*: 20. Roof (*Stah*), 21. Room for wood stock.

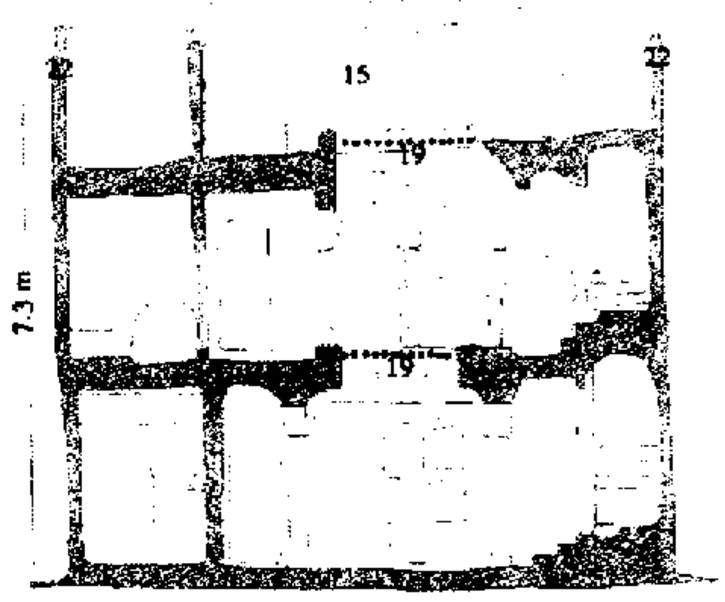

Fig. 28. Vertical cross section. *Legend*: 22. Wall parapets.

Fig. 29. Photograph showing renovation of traditional thicker walls by thinner ones from modern material (concrete blocks).

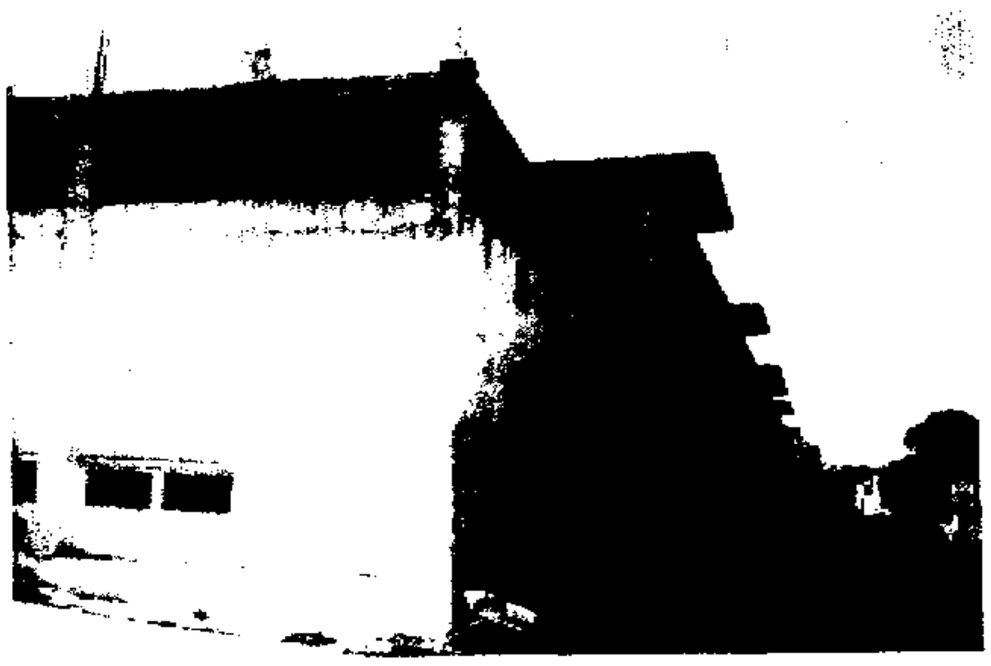

Fig. 30. New buildings are constructed with modern materials and thinner walls are used.

reasons behind these changes, appear to be:

- economy of space (old buildings have thick walls and roofs);
- response to modern technological products—fridges, television, etc.—which are mainly rectilinear and cannot fit into old spaces which are generally non-rectilinear;
- economy of time—especially in building by modern techniques and materials;
- the desire to emulate western cultures for luxury through modernization.

5.5. *Main causes of the decline of traditional built forms*

A variety of factors have all combined to threaten Mzab traditional urban form and building design. These factors can be grouped into categories: exogenous and endogenous factors.

5.5.1. *Exogenous factors*

5.5.1.1. Economic change The natural growth of the Mzab population was very slow for centuries, because the Ibadits have chosen from the beginning to follow a policy of withdrawal isolation and discouraging exclusively non-Ibadits from migration into the Mzab valley. It was not until 1950 that population increase became important in number [2]. Since then, the valley has known a period of uninterrupted expansion. The economic prosperity of the Mzab region, especially due to the discovery of oil fields, artesian wells and the construction of appropriate traffic routes, had a great impact upon the social system and the life style and has been an important factor in attracting new immigrants. This has consequently introduced a modern life style to this area, which has increased the level of consumption, and therefore introduced changes in the old life

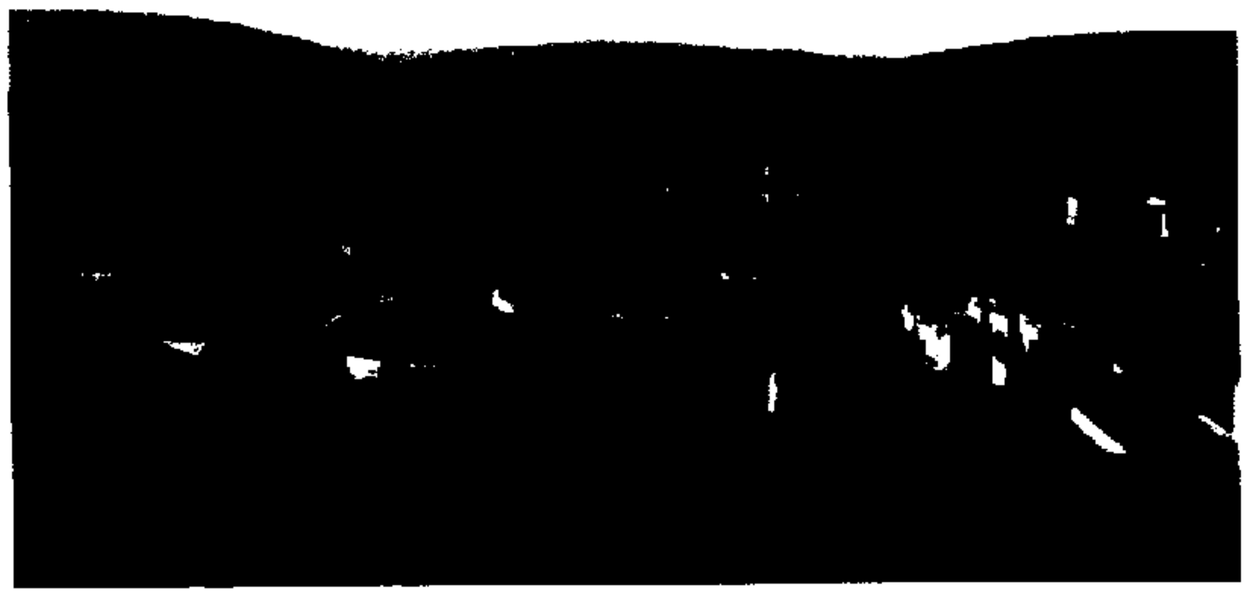

Fig. 31. General view of city garden of Bounoura: building are shaded by palm trees.

style. Immigrants arrived into Mzab valley before independence were: Jews, Europeans and nomads. The Jews and nomads integrated easily and had little influence on the existing urban form styles. But Europeans introduced change in the traditional urban forms of this region. In the east of Ghardaia, the European district consists of residences, administration, health and education buildings, based upon an orthogonal plan to facilitate traffic movement and control the population. The roads are large to accommodate mechanical transport. The buildings are in modern European style.

5.5.1.2. Political changes Expansion and development of settlements before independence was achieved by building new settlements, similar in principle to older ones, on newly selected sites. After independence, Algeria became socialist and aspired to construct a modern society with equal opportunities. New ideological values were thus introduced to replace traditional ones without thorough study of the nature of cultural and historical values of Mzab society. The fusion of all social groups and their integration and organization into "Communes" was encouraged. New socio-political and spatial forms developed, reflecting the administrative organization and hierarchy of the new society. This encouraged nomads in this region to invade the valley, forcefully appropriate land and construct new homes. This led to a continuous, compact urbanization around Ksurs. In 1966, laws were introduced which facilitated expropriation and nationalization of vacant land, which was consequently occupied and rapidly developed by the indigenous Mzab population.

5.5.1.3. Substitution of traditional institutions by state-based systems of management for planning and design practices Traditional processes of formation and transformation of ksurs have been replaced, and town-planning legislation has now caused increased land consumption within the valley, instead of outside it. Traditional institutions persisted even when colonists were settling outside the city wall, but after independence, urban development changed from community-based into state-based systems of management. Traditional institutions of planning and building practices, Halkat Al-Azzaba and the Jamaa, were replaced by local governmental bodies (at the Communes, the sub-prefecture and the prefecture) and professionals (architects and town planners). With the different reforms of administrative system and the setting of authority structure, the traditional institutions have gradually become restricted to social and cultural, rather than urban, matters.

In 1967 Mzab settlements were divided into three administrative units or "Communes"; El-Eutf, Ghardaia with Melika, and Bounoura with Beni-izgen. Then, in 1974, Ghardaia became a sub-prefecture or *Daira* and, in 1985, a prefecture or *Wilaya*. The independent traditional social and spatial entities found themselves attached to a state with new values of socialism and modernity and consequently facing profound challenges. The peculiar and outstanding building traditions of Mzab settlements, which combine site, climate, vegetation, local culture and values, has been overrun by the adoption of modernization. The implementation of new planning standards, building regulations and codes by municipalities and related governmental agencies, and professional practice based upon modernist values without consideration for local specificity, have caused the decline of traditional practices.

The state system of management of urban development in Mzab has been mainly based upon the planning instruments and parceling out operations.

The planning instruments used so far are:

- The orienting town planning plan "*Plan d'Urbanisme Directeur*" or *P.U.D* used until 1990. This was

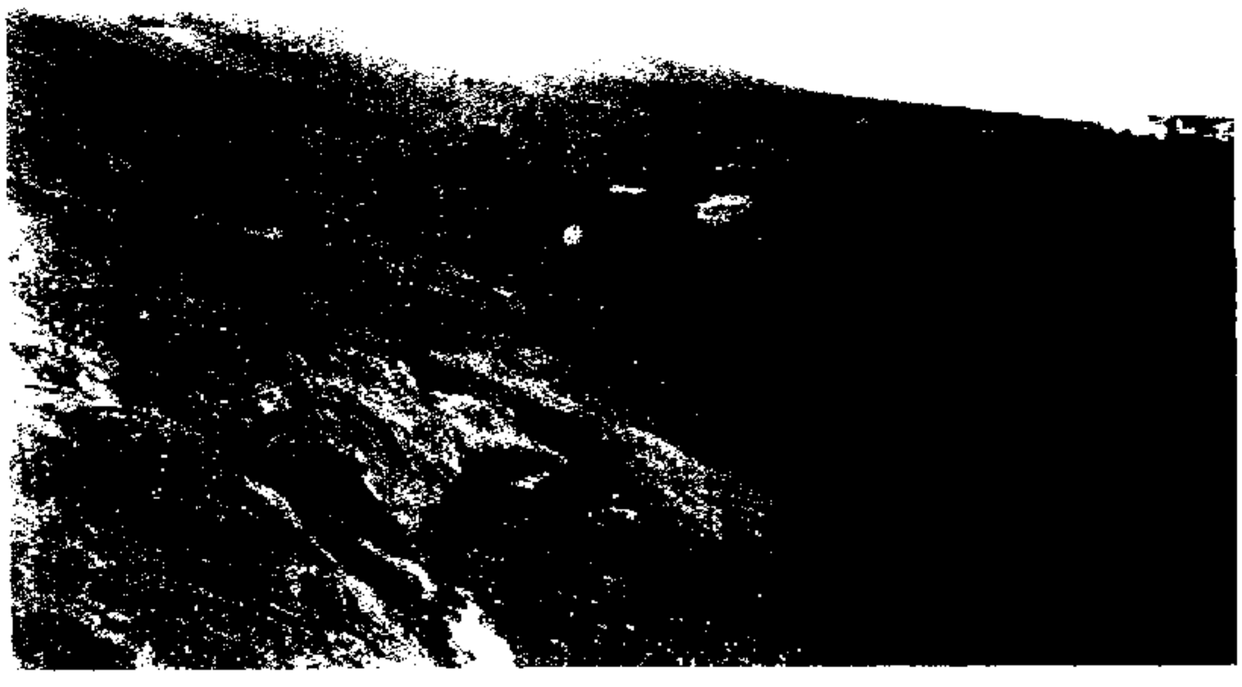

Fig. 32. Illicit occupation at Tniet-el-Mekhzen: the slope of the valley is illicitly occupied.

Fig. 33. Photograph showing an illicit district at *Chaabat Abbas* on the North of Ghardaia: it is constructed on the valley bed and contradicts the traditional style.

replaced by a new version named "*Plan Directeur d'Aménagement et d'Urbanisme*" or *P.D.A.U* in 1990.

- Allocation of space document "*Plan d'Occupation des Sols*" or P.O.S introduced in 1990 as a complementary document for the *P.D.A.U*.

All these instruments were designed to deal with planned development of the valley. The first *Plan d'Urbanisme Directeur* was elaborated and presented in 1963 to the municipality of Ghardaia by the French architect André Ravereau. However, the urbanization was so accelerated and uncontrolled that his plan became obsolete. The second *P.U.D* was prepared in 1972 by Albert Speer (a German architect) to cover a period of 15 years from 1973 to 1988. Unfortunately, this plan was not completed until 1977, when it also was no longer feasible. The planned population of 66 000 was by 1977 found to be 80 000. In 1992, the *P.D.A.U* was prepared by a state agency in architectural and town planning (URBATIA) to cover the period of 20 years starting from 1992. Unfortunately, this plan as well was not completed until 1998. The planned population of 126 096 was found by the end of 1997 to be 128 087. For this population, the number of houses calculated on the basis of 6 persons per house, was assumed to be 21 018 by 1997, was found to be in fact 26 853 by the end of 1997. The discrepancies explain how planning instruments are not able to predict reality and urbanization has in fact been largely uncontrolled. This has exacerbated problems, and has led to the appearance of anarchic and illicit buildings everywhere in the valley (Figs. 32 and 33), to the detriment of vegetation and the harmonic development of traditional settlements. Fig. 34

Fig. 34. Photograph showing a new type of districts in *Sidi-Abbaz* near Bounoura designed by *Ravereau*: traditional and modern principles are mixed.

Fig. 35. Photograph showing the new type of buildings at *Beni-Izgen* extension which lack of integration with traditional style.

shows the district of Sidi-Abbaz, which was designed by André Ravero (a French architect). Fig. 35 shows Beni-Izgen extension which blights the original architecture of the Ksar. Most of these buildings are on areas threatened by flooding. The P.D.A.U of 1992 does not give strategic solutions to the problem of urbanization of the valley. On one hand, the P.D.A.U recognizes of the importance of preserving traditional architecture of the valley, but on the other hand, it programs future urbanization in the valley allowing more construction on the valley of Mzab and its tributaries.

The space occupation plans are complementary documents to the P.D.A.U and cannot be put into action until government approval of the entire plan. For the valley itself, the P.D.A.U was approved only in 1998, and this has aggravated the problem of urbanization. However, the launching of POS operation in the valley has not solved the problem of decline of original urban forms and expansions. Most of these plans, which are in their first stage of study, proposed and enhance modern urban forms, which contradict the original style of Ksurs. Fig. 36 shows the POS of *Smaoui Smail* near El-Atteuf Ksar designed by SETPLUS (a professional body in architecture and town planning).

Because of urbanization, and the need to make up for lost time, local authorities have imposed a planned allocation of urban space by a parceling-out process, based upon the ordinance of 20 February 1974, the absence of adequate plans before 1990, and the need to comply with legislation concerning the establishment of land reserves for the benefit of communes. Parceling-out has contributed significantly to the imposition of modern planning projections with orthogonal and gridiron planning. Fig. 37 shows a typical parceling out of Belvedere near Bounoura designed by ARCAU (a professional body in architecture and town planning).

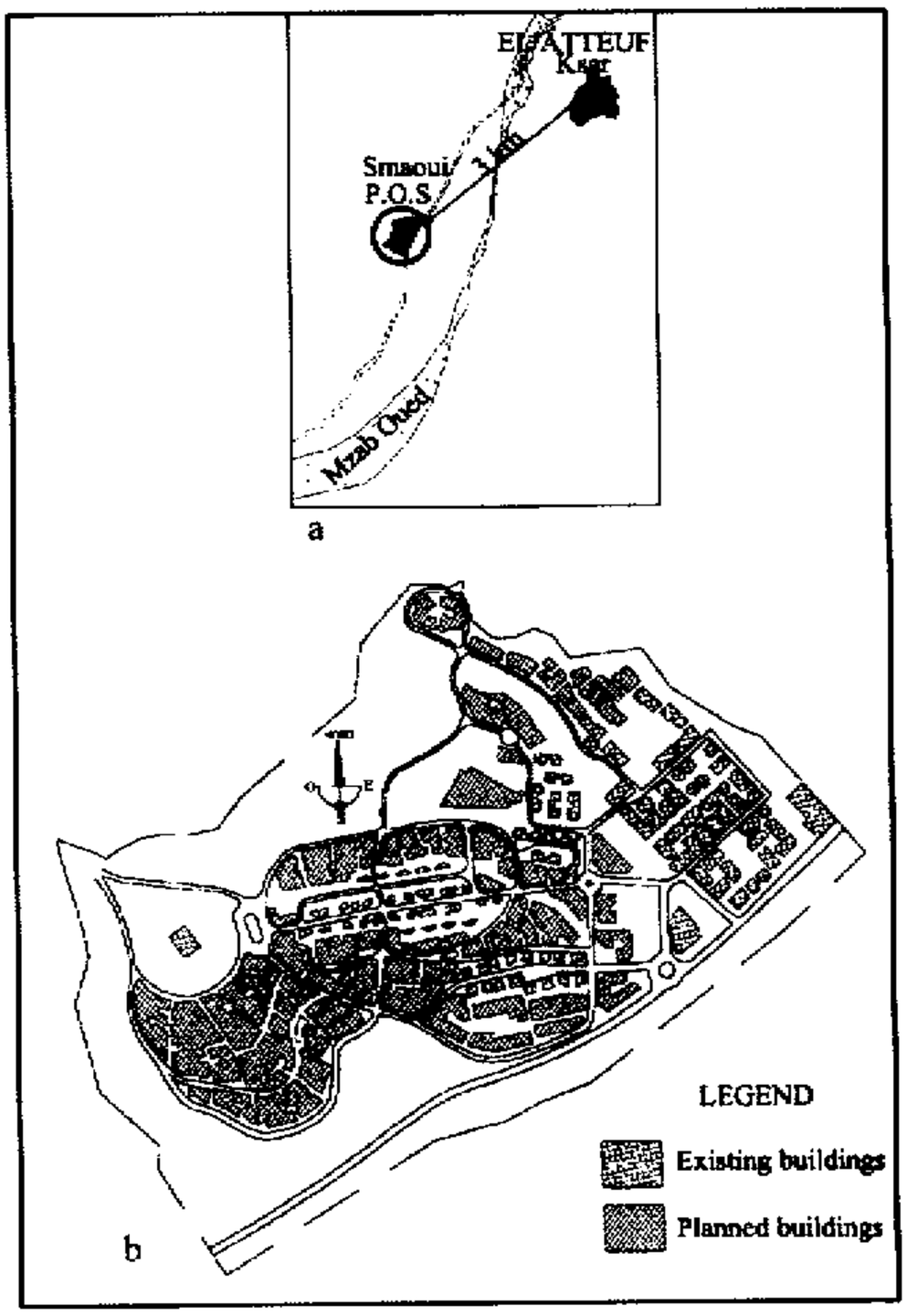

Fig. 36. Space occupation plan of *Smaoui Samil* near *El*-Atteufv confirming the modernist tendency (a: location, b: space occupation plan at larger scale).

5.5.2. Endogenous factors

5.5.2.1. Openness of Mzab society and the decline of cultural barriers The migration of Mzab people to the North of the country for work has a great impact upon the decline of cultural barriers within the Mzab community. Little by little migrants accept and are influenced by the occidental

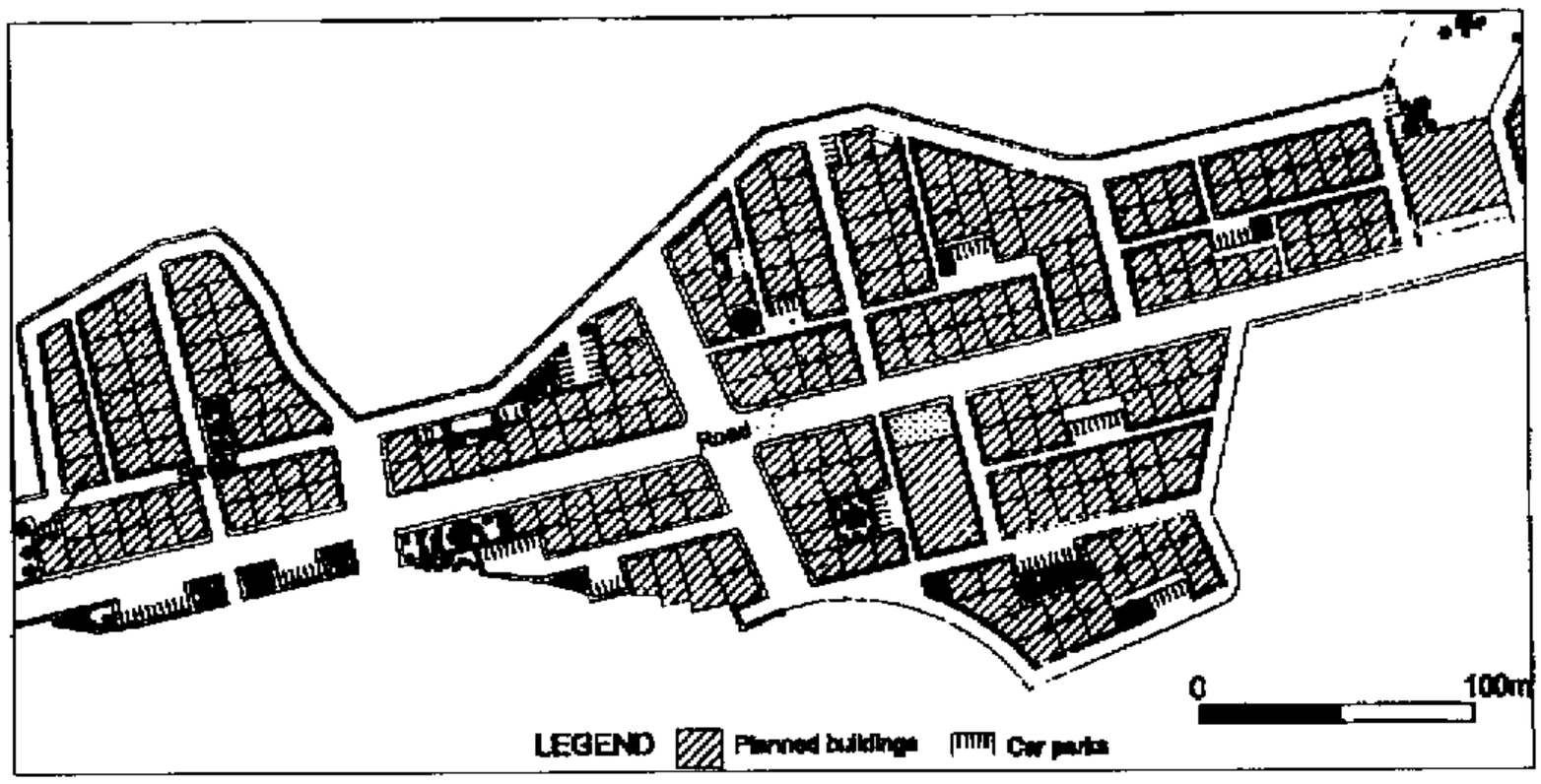

Fig. 37. Typical parceling out plan of *Belvedere* at *Bounoura* confirming as well the new tendency of modernism that does not fit with traditional style.

ways of life. So when they return to the Mzab valley they introduce these practices into their life. The media, which has now become an influence in Mzab society, has also introduced modern ideas.

5.5.2.2. Individualization and social disorganization Historically, the background of Mzab life has been the Ksurs community. But with the growth of the Ksurs, with the vast division of labor which has come in with machine industry, and with movement and change that have come about with the multiplication of the means of transportation and communication, the old forms of social control represented by the family, the neighborhood, and the local community have been undermined and their influence greatly diminished. This process by which the authority and influence of an earlier culture and system of social control is undermined and eventually destroyed can be described as a process of individualization and social disorganization.

The Mzab people now live in a period of disruption—everything seems to be undergoing a change. Custom and tradition require a relatively stable environment. Everything new is a disorganizing influence. Anything that makes life interesting causes change to the existing order. The mere movement of the population from one part of the country to another is a disturbing influence. Such a movement may assume, from the point of view of the migrants themselves, the character of an emancipation, opening to them new economic and cultural opportunities, but it is none the less disorganizing to the communities they have left behind and to the communities into which they are now moving.

The family relationships have been broken down to a degree that each family prefers to move into a single building away from the traditional extended family. This behavior has encouraged young people to live independently free from the control of community. This has direct impact for the development of detached houses, everywhere in the valley, which contradict traditional compactness. Most buildings of the parceling out have many different features in comparison to those in Ksurs most apparent in the increasing number of openings in facades, and space between buildings, resulting in the loss of a symbol of social solidarity.

Increase of the gap of contradictions and differences between Mzab groups and communities because of their material, ideological and social differences have caused the appearance of classes with different means, interests and objectives. The community participation into the decision-making for buildings has thus been weakened, and the design of a building has become the owner's affair. This has created an amalgam of styles scattered throughout the valley and no one can interfere. The weakness of community ties can explain why Mzab people have not been able to build new Ksurs on the valley similar to traditional ones.

5.5.2.3. Spread of prestigious ideas and hope for luxurious life Popular belief that traditional buildings are no longer a basis for a luxurious life has led to the introduction of modern solutions which do not respond well to local climate and custom. Traditional decoration and ornaments were ignored when using modern materials and techniques to renew or build new homes, use of various colors and large openings in facades. The number of rooms and the size of dwellings have been increased from tradition which has impacted upon the consumption of space and of energy for air conditioning. Site investigation has also revealed that people leaving in Ksurs think that if they do not occupy larger areas of land other people from elsewhere will invade it.

5.5.2.4. Strategies and solutions to meet the challenges Mzab traditional society persisted until the last few decades when the whole region has been forced to face the

challenge of re-shaping its built form and society. If the new split-up urban forms with their detached buildings provide autonomy to the new Mzab society, it on the other hand demonstrates the loss of traditional social solidarity. The choice of this urban form affirms the weakness of the role of the religious institutions and the shifting of the centrality from Ksurs to the peripheral districts. The process of formation/transformation principles, such as the barriers concept, is in an interrupted decline and seems to have lost balance and harmony. We have to mention here as well, how the authorities and professionals still lack appropriate instruments to intervene at the right time and in the right place.

However, it is the burden on all of us to define new strategies and means of intervention to reduce damage and re-establish a desirable balance. A collective effort is called for, nationally and internationally, to prevent further destruction of traditional settlements and promulgate specific regulations and laws to protect old buildings which have historical values. The implementation of new thoughtful urbanization policy and development of reliable planning tools which take into account local traditions and culture, is necessary.

Traditional Mzab buildings are interesting for architects as examples of ingenious solutions that suit the harsh climatic conditions so that it is vital to find appropriate ways to renovate historic buildings and settlements. We should urge investigation to find appropriate sites for future extensions outside the Mzab valley and encourage the inhabitants to migrate to these areas, to reduce the urbanization pressure on the valley. In this respect, it is vital to promulgate specific regulations and laws to respect original building design and principles of urban form, to ensure continuity between old and new design, and preserve the essential link in design between culture, site and climate, working not against, but in harmony with natural processes: with the sun's path, prevailing air movement, plants, and other natural features on a specific site to achieve comfort. The experience of Mzab shows that architecture is not exclusively the work of a single person nor of groups of professionals (architects or town planners), but is in fact the product of the whole of society, and a common responsibility. Consequently, government agencies and local authorities must work together with citizens and their traditional institutions, as well as professionals, in all decision-making concerning future urban development and building design, so that we can preserve some coherence of style of housing and architectural expressions in the region.

6. Conclusion

It is clear that modernization has had a negative effect on the evolution necessary to provide a harmonious way of life for Mzab people. Planning and urban design processes and regulations applied by professionals and government agencies are based upon modern ideas imported from different cultures. This contradicts in many respects traditional practices in Mzab area. It is thus important that planners and designers should take traditional practice as a source of inspiration and make balanced integration between technological advances and traditional practices.

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