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DECODING THE IRREGULARITY IN THE CASBAH URBAN FABRIC

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ABSTRACT

This study aims at explaining how the urban fabric of the Casbah City (Algiers) emerged and the mechanisms that produced such an urban pattern. The research focuses on the study of the impact of some Islamic laws; preemption, inheritance, the right of precedence, and endowments (waqf) on the morphology of streets, plots and blocs that constitute the irregular urban fabric. The study relies on the old maps of the Casbah and its topography to illustrate such physical and spatial impact. It concludes that the urban fabric was the result of the symbiosis of natural factors, mainly the terrain, the orientation and the waterways, and the legal mechanisms that turned into social practices. This paper can help students of architecture and urban planning understand how the urban fabric of Casbah was constructed.

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1. Introduction.

The importance of this work consists in reshaping the urban fabric of the Casbah city before the French colonization in 1830. It also contributes to understanding the mechanisms that control the development of this fabric. Although the city is somewhat modern (sixteenth century), as the first appearance, the urban fabric suggests that it is irregular and it is not subject to any rules in terms of shape and dimensions.

Since the Mesopotamian civilization, it is known that architecture has adopted right angle for buildings and streets with parallel and straight edges. However, the Casbah city is made of houses of different sizes and shapes that are not divided on right angles while streets are narrow and not straight. Thus, the importance of this work is to better understand how this urban fabric is resulted.

2. METHODS.

2.1. Problem and hypotheses.

The city is a purely human production because it is considered as the living framework for most of the world's population.

The designers have tried to create cities that respond to the requirements of inhabitants. They lay the foundations for the formation of the urban fabric and its expansion in their plans. The regular shape is the predominant form of cities, as the checkerboard division of streets and sectors is the most

regular and space-saving form, but the topographical nature, like slopes, and the natural waterways also affect the formation of cities and the construction of the urban fabric. These prevent the establishment of a regular urban fabric in the full meaning of the word.

The Arab Islamic city was not far from this human heritage of cities construction, but many of them are not formed in this way, as their streets are narrow with many deadlocks. In addition to the irregularity of the shape of the plots, The Casbah of Algeria, our case of study, is built on a plateau and has a unique urban fabric and has no trace of regularity. So, how the topographical nature of the site led to the emergence of the urban fabric in this way?

2.2. Hypothesis.

In this study, we proceed from the hypothesis that the urban morphology of the Casbah is formed according to the overlapping of many factors. On top of them is the topography of the site. Then, the social factors affected by Islamic jurisprudence which regulates all aspects of life in the Islamic society.

2.3. The morphology of the Casbah and the traditional urban fabrics.

This study complements several studies of the urban fabric of Casbah. It began with Haedo (1612), who was a prisoner of the city authorities at that time. He tried to record everything he saw and all his observations about the city of the Casbah, the houses and the population, but he was not interested in the morphology of the urban fabric of Casbah, as his work was a description of the city and its conditions. (Haedo 1612)

He was followed by Albert Devoulx, who studied the Ottoman archives and extracted from them the history of religious buildings in the city of the Casbah, the method of managing it, and the number of endowments affiliated with it. Also, he drew some illustrative plans for some of the city's buildings (Devoulx 1870). However, he did not study the form of the urban fabric and its condition before the French occupation that changed many landmarks in the Ottoman city. As a result of the significant change brought about by the French occupation of the city centre, André Raymond tried to draw the city centre before the French era. He included many famous buildings such as the El Djeneina Palace and the Al-sayda Mosque, and André Raymond relied on the work of his predecessors and the plans of Gallice and Luvini, (Raymond 1981).

Myriam Hoexter also studied the endowments of the city of the Casbah and the way they were managed during the Ottoman period, especially the endowments of the Two Holy Mosques. The study was socio-economic and did not concern the city's urban fabric. (Hoexter 1998)

André Raymond wrote in 1998 regarding the major cities during the Ottoman period and analyzed the urban and social fabric of the major cities in that period (Raymond 1998).

Tal Shuval also studied the history of the Ottoman Casbah in advance of his work entitled (*La ville d'alger vers la fin du XVIII siècle*), in which he comprehensively described the city, its people, and life at that time, but from a descriptive historical view. (Shuval 2002)

Ben Hamouche and Belkadi presented a book in which documents were first published containing drawings of some of the Ottoman Casbah's landmarks. In their book, they dissected the Ottoman city of the Casbah into complexes and gave a general presentation of the urban fabric in detail, in addition to naming the streets. However, they didn't ask the question of how this urban fabric arose. (Bedredine belkadi-Mustapha Benhamouche - Albert Devoulx 2003)

In 2003, Sakina Missoum collected several previous studies in one work that includes a general and detailed presentation of the city with a census of religious buildings, markets and baths, in addition to presenting an analytical study of the traditional houses during the Ottoman period. That was without addressing the shape of the urban fabric too. (Missoum 2003)

Nabila Cherif researched the baths of Casbah city in terms of their locations in the urban fabric, their legal nature, their management and water supply. (Chérif-Seffadj 2008)

Mustapha ben hamouche discussed the irregular urban fabric in Islamic cities through his 2009 paper entitled *Can Chaos Theory Explain Complexity in Urban Fabric? Applications in Traditional Muslim Settlements* and tried to find the link between individual authority and public authority in the construction of the urban fabric of Islamic cities (Ben-Hamouche 2009a).

In 2009, Ben Hamouche studied the urban management of Casbah city and the active authorities in the control of its urbanization in addition to the management of markets and residential neighbourhood; and the role of residents and administration in organizing such a city, but without paying attention to the factors that affected the manner of formation of the urban fabric. (Ben-Hamouche 2009b).

Samia Chargui also presented research in the same direction. However, she dealt with the mosques of Casbah city during the Ottoman period, but the two studies did not care about the shape of the urban fabric. (Chergui 2011).

In 2011, she published a paper entitled *Fractal Geometry in Muslim Cities: How Succession Law Shaped Morphology*. This research focused on the impact of inheritance laws in Islamic legislation in shaping the morphology of the urban fabric (Ben-Hamouche 2011).

After that, Asma Hadjila and Nabila Cherif published an article that discussed the law of expropriation and the opening of streets in Casbah city (Hadjilah and Chérif 2020), followed by another research by Mustapha Benhamouche in 2020 about the same previous issue, but from a social point of view. It tackles the extent of the law's impact on the urban fabric, mosques and religious buildings, and how this urban change was dispelled (Ben-Hamouche 2020).

With regard to the urban fabric of Islamic and Arab cities, this topic has been an area of research for many advanced studies. In 1988, Djamil Akbar wrote his book entitled "Crisis in the Built Environment: The Case of the Muslim City" (Djamil Abdelkader Akbar 1988), in which he presented the position of Sharia on the architecture of the land and the anatomy of Arab cities, old and modern, indicating the advantages of traditional architecture. In the same sense, Saleh Ben Ali Hadhloul wrote a book entitled *The Arab-Muslim city: Tradition, continuity and change in the physical environment*, published in 1996, in which he presented a description of the traditional urban environment and its rules of organization, as well as the institutions and principles that run this environment (Hadhloul 1996).

So, in our study, and in the light of the afore mentioned studies, we will try to shed light on the factors that led to the emergence of this irregular urban fabric by redrawing the urban fabric of the Casbah of Algiers to the pre-colonial period, researching and highlighting the mechanisms that led to the establishment of this irregular fabric.

2.4. Concepts of study.

2.4.1 Urban fabric in old Islamic cities.

Built environment in old Muslim cities was an outcome of activities that were guided by principles of Islamic jurisprudence, which turned into endogenous mechanisms. Each of these mechanisms had its own effect on the urban fabric and combined factors that led to gradual complexity over time. (Ben-Hamouche 2009a).

Algiers was divided into two parts which corresponded strongly to the natural layout of the site, but also to two different destinations of the urban space. The lower town housed the administrative and military political centres, and the upper town was devoted almost exclusively to residential areas. (Shuval 2002). The Casbah was located with a gradual skyline which retained the sea view for each house that required a specific cache of the site (Nadia Boudalia 2018).

2.4.2 The street in old Islamic cities.

During the Ottoman era, Algiers contained 12,200 houses, most of which had courtyards. All the streets were narrower than the narrowest streets of Granada, Toledo or Lisbon. They could barely give passage to a rider, but not to two men abreast. Only one street is an exception. It is the main street of Socco (Haedo 1612).

Algiers also presents a division between commercial zone and residential zone which adapts to the topography of its place of establishment. The commercial area is located mainly in the lower part, where the grid inherited from the Romans has been relatively well preserved. The residential area occupies the hill. The result of integration with this rugged topography gives a network of intertwined streets without apparent order. However, this labyrinth reflects a structure perfectly suited to the peculiarities of the site. (Missoum 2003).

Sharia laws have allowed flexibility in dealing with trespassing on parts of the street and closing lanes, because the street opposite the property is considered part of the property, and trespassing is considered legitimate if there is no harm or complaint from others. This gives a temporal dynamic to the shape of the fabric (Hadhoul 1996).

2.4.3 Deadlock and right of way.

The deadlock is the result of the hierarchical transformation of main street, socially considered public, into Secondary Street, semi-private and private spaces. This is the logical consequence of the shift from public life to the family unit. (Missoum 2003) Much of the streets of Algiers, especially in the residential area, ended in deadlocks: in 1830, Battalion Commander Collas had 180 streets and almost as many impasses throughout the city. E. Pasquali specifies that the number of impasses in 1830 rose to more than 151. But this large number of impasses (151 out of 331, or 45.6%) was not shared in a balanced way between the two parts of the city: while in the lower town the number of impasses in the inside road network was only 24.5%, in the upper town, on the other hand, their percentage reached 59.9%. This concentration of impasses in the upper town was directly linked to its quality as a residential area: the impasse is the type of street best suited to the main requirement of residents, namely isolation from privacy. As a result, it constitutes the basic element of traditional Arab urban planning. (Shuval 2002) **(Fig:1).**

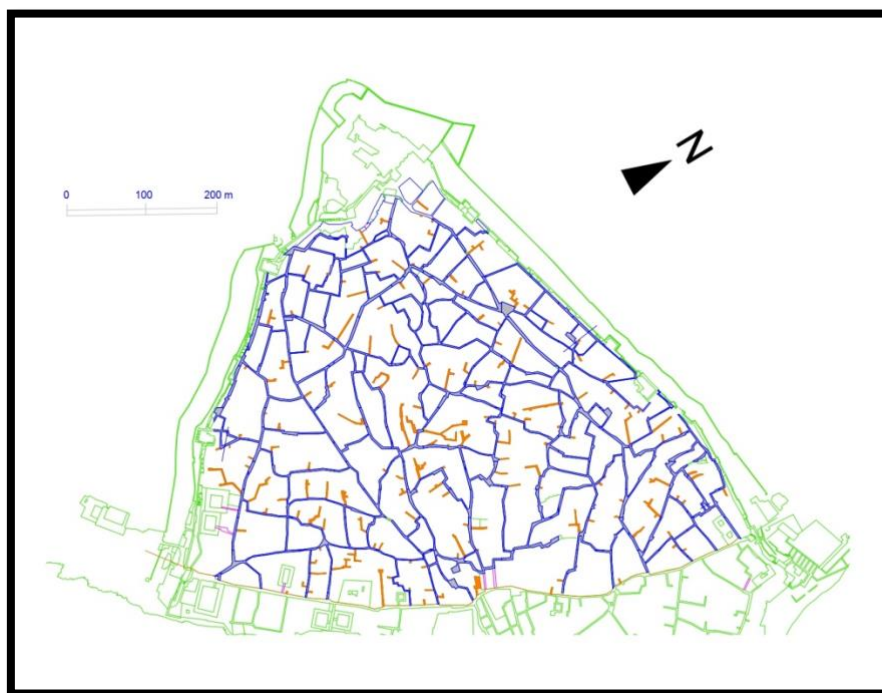


Figure 1. *Deadlock in upper Casbaha (a sketch based on a plan provided by Gallica).*

The paths are created as a result of the right of passage through the outer plots overlooking the street towards the inner plots resulting from the division; this passage can be purchased by the owner of the inner plot (Hadhoul 1996).

2.5. Conduct of study.

The Ottoman city of Casbah dates back to the 16th century. Since that period, the urban fabric has undergone several changes, including the division of property between the heirs and the establishment of new Deadlocks. Therefore, the urban fabric in its current form has undergone several changes. And to study the morphology of the Ottoman Casbah, we must reconstruct the urban fabric as

it was during the Ottoman period, then we calculate the areas of the resulting plots to try to determine the division unit approved at that time, of course if it existed.

In the second stage, we tried to find a relationship between the form of the urban fabric and the topographical nature of the site to show the extent of its latter effect on the resulted form, in addition to comparing the street paths in relation to the natural water corridors.

After redrawing the urban fabric and calculating the areas, most of the urban blocks were taken into consideration, except for those that we were not able to re-create again. We have obtained a satisfactory logical result. Therefore, these urban blocks excluded from the study were not included in the table of areas, but they do not affect the general result because most of the urban blocks were calculated.

2.6. Data and Area of Study.

In this study, we relied on the military Map of the city of the Casbah during the French colonization, which is one of the oldest existing documents that show the shape of the fabric in the Ottoman administration, in addition to the current Maps of the city.

2.7. Study area.

The geography of the site and historical situations have divided the city into two separate areas: The city perched on a hill is the Upper Casbah.

And the lower Casbah was built on The Roman plateau near the seaside.

The somewhat regular grid street layout was preserved in the Lower Casbah. In addition to their distinct morphologies, the city's two parts served quite different purposes: the upper area mainly residential and "private" and the lower area housing the governor's residence, two prominent mosques, and the market. (Ben-Hamouche 2003) In this work we limit the study area to the upper Casbah (Fig:02).

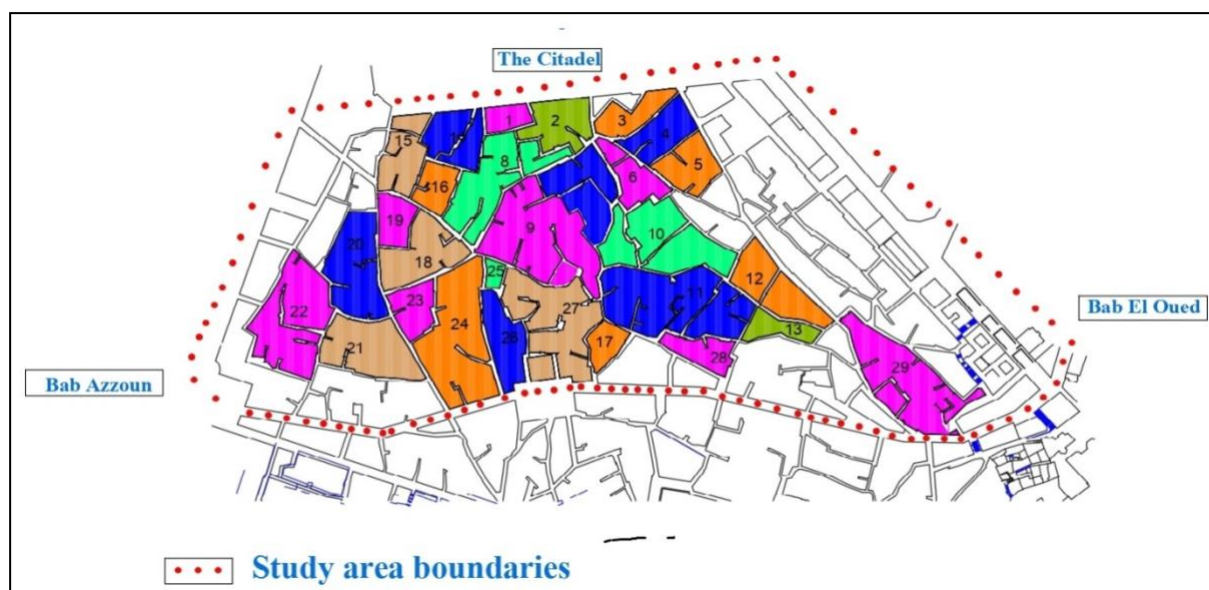


Figure 2. Boundaries of upper Casbah and block numbering (Source: Atelier Casbah).

3. Results and findings.

3.1. Redrawing the urban fabric.

In order to know how the urban fabric of the Casbah was produced, it was necessary to redraw it as it was in the initial state. So, we began by erasing the deadlocks (in the drawing) because the deadlocks were not intended by themselves, but the deadlock is a solution to enter some of the pieces resulting from the division that takes place on the basic propriety.

After redrawing the urban fabric and calculating the areas, most of the urban blocks were taken into consideration, except for those that we were not able to re-create again. Therefore, these urban blocks excluded from the study were not included in the table of areas, but they do not affect the general result because most of the urban blocks were calculated.

3.2. Division of plots

Physical growth of some Muslim cities' demonstrates that land was typically distributed to tribes, military units, or individuals. The first city quarters were created from these grants or *khitat*. The residents of the *khitat* or grants have discretion over dividing the land. Furthermore, the layout of Baghdad and Samarra demonstrates that this method was still in use in the eighth and ninth centuries. Additionally, the members of a *khittah* could have easily prevented anyone from entering the quarter by using their right to preemption (Hadhoul 1996).

The city of Algiers is characterized by large population diversity. The inhabitants of this city are generally divided into three categories: Moors, Turks and Jews. The Moors are of four kinds those born in the city and who, are called, in their language, *Baldis* (*Bildi*); that is: city-dweller. The second kind of Moors comprises the *Kabyles* who come from mountains to live in Algiers. The 3rd type of Moors is the Arabs who continually come to Algiers from their *Douars* where they were living in open fields under tents. The 4th category of Moors are the *Andalusians*, those who are from the kingdoms of Granada, Aragon, and Valencia (Haedo 1612). The cities of the Maghreb were formed of governments characterized by a form of relations related to neighborhood and co-residence in the same space. The historical reading biased to the government in the Ottoman city of Algeria is strongly linked to the city model. Consequently, due to the absence of the outlines of the boundaries of plans and governments in Algeria (Grangaud 2013), it seems logical to suggest that the division of regions was based on the population diversity of the city. It is possible that the city was divided between them in the form of grants or *khitat* (Hadhoul 1996).

3.3. The unit (plot).

To reach the plot unit, we retraced the Urban fabric of the Casbah, first by erasing the deadlocks, and secondly by collecting the small proprieties resulting from the division into larger proprieties, taking into account the shape of the resulting proprieties and trying to deduce neighboring proprieties in terms of area and homogeneity. That is almost regular with interfaces overlooking the main or secondary streets, because there is no completely isolated property from the street without access.

After studying the location of the deadlocks, it was found that the deadlock leads to private property, meaning that it is not from the public domain, but rather is a private area that leads to one or several private houses. So, these houses do not have other access than this deadlock, which means that they were designed specifically for this purpose. Thus, the deadlock represents a solution to the problem of accessing some of the pieces that resulted through division as the original proprieties before the division had their entrances in the main or secondary streets. By erasing the deadlocks, it is possible to return to the original urban fabric before the division.

However, it is not possible to be sure of the shapes and areas of all the plots that were divided, as the possibilities of division are linked to the Islamic jurisprudence which depend on the number of inheritors, their gender and the degree of their kinship to the inheritance, but it can be found in the current fabric. (Fig:03).



Figure 3. Reconstitution of blocks
(Author restitution: a sketch based on a plan provided by Atelier Casbah).

Through the tables of plots areas (figure:02), we notice a divergence in terms of spaces as they differ, which shows the absence of a general pattern in the basis of which the plots were divided. This is logical compared to the nature of the Arab Islamic cities, as it is not the result of a modern urban fragmentation process. But it is based on the principle of the appropriate space for each person, in terms of need and material ability. Also, it is logical that a large well-off family needs larger houses and larger spaces than small unaffordable families. Thus, the unit here is not measured in terms of the unified area, but it is the unit of acquisition criteria represented in the number of individuals and the material capabilities of the building. So the unit here is not physical or geometric, but it is rather a unified selected criterion.

4. Discussion.

4.1. Analysis of the urban fabric.

After redrawing the urban fabric, these plots were numbered and their areas were calculated to get the basic unit of area in this urban fabric. After studying a range of areas from 73.12m² to 657.10m², we found that there is no unitary space on the basis of which this fabric was created, but there is a kind of consistency in the spaces in each section. The existence of unitary spaces repeated in several sections confirms that the urban fabric contains varying properties in terms of area.

4.2. Natural factors.

Topographical shape of the site.

The Casbah was built on a high-altitude (Amoura and Dahmani 2022) mountain plateau, with 118 meters above sea level (Saliha DJEDDI 2021), and this general shape of the site played a major role in the urban planning of main and secondary streets. The streets network is different from the regular form -usual in the regular urban planning; we hardly find a straight street, and this is due to the topographical shape of the site, which led to changing the direction of the street every time to avoid steep slopes.

4.2.1. Site topography.

After redrawing the urban fabric and calculating the areas, the urban fabric was studied in terms of topography. After matching the leveling lines with the built framework of the urban fabric, we obtained the following figure.

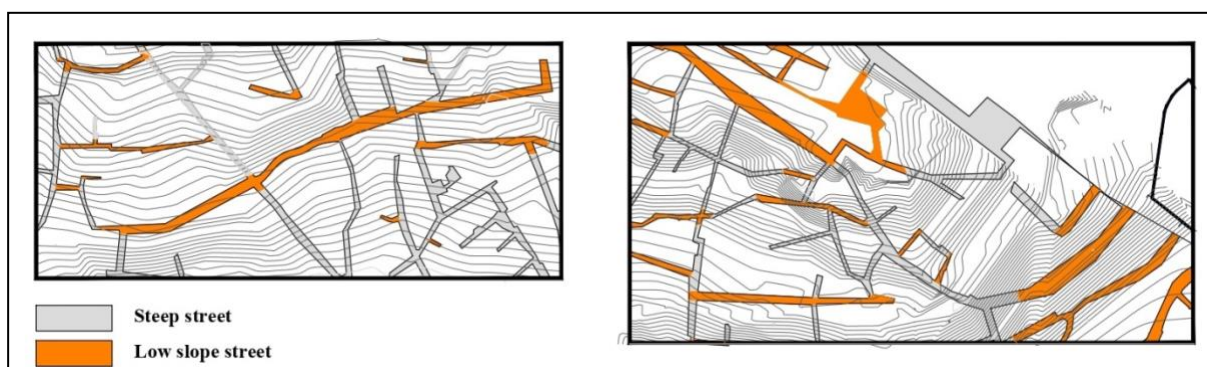


Figure 4. Topographic analysis of urban fabric (a sketch based on a plan provided by CNERU).

After analyzing the results, it was found that no specific slope was followed in the construction, but the site of the buildings was sloped from flat to very steep inclines. However, the streets schema designate that they follow light slopes, respecting the leveling lines, as we notice a change in the direction of the street on steep slopes and follow the leveling lines until the slope decreases in order to continue the upward trend.

But, this tracking of leveling lines was not the general case for all streets.

4.2.2. Waterways.

The location of the city of Casbah on the banks of the Mediterranean Sea with a Mediterranean climate and rainy winters, and its construction on a steep plateau led us to study the water flow lines of Casbah, and after matching the water flow lines with the built framework of the urban fabric, as we see in (figure: 05), it was found that the latter does not constitute an obstacle to water flow. Heading downward towards the sea, as in many cases the line of flow of water descending towards the sea coincides with the direction of the street.

Through our study of these two factors: the topography of the site and the water flow lines towards the sea, it was concluded that these two factors had a significant impact on structuring the urban fabric of the city of the Casbah. There is a great link between these two factors and the street network of the Casbah. The latter two natural factors were not the only ones that produced this urban fabric; however, there are other social factors that contributed to its structure.



Figure 5. Analysis of urban fabric (a sketch based on a plan provided by CNERU).

4.3. Human factors.

4.3.1. Preemption.

As we have seen before, the concept of division in Sharia leads to the fragmentation of the original property into small plots and leads to more complexity in the urban fabric and the schema of roads. However, the right of preemption leads to this complexity through enlarging the original properties into larger ones, by collecting - through sale - the property offered for sale to the remaining neighbor in the place. This also, cannot be definitively determined through the study of the urban fabric even if the existence of extended spaces in the plots of the urban fabric can prove this. For instance, Document No. (59) Box (49) dating back 1166 AH in the Algerian National Archives proves the right of pre-emption without specifying the location of the property subject to pre-emption on the map.

4.3.2. Right of precedence.

Right of precedence means the rights of any pre-existing buildings on the site prevail over those built later. That is, when making a change in the existing building or making a new one, the owner must take into account the existing elements in terms of privacy, shade, wind, etc. (Ben-Hamouche 2009a) In a survey carried out by Saleh Hathloul in the neighborhoods of Medina, he found only two opposite doors out of four hundred houses, but Ibn Al-Rami stated that what was happening in Tunisia did not prevent the doors to meet when the streets are wide (Hadhoul 1996). It is clear in the city of the Casbah that this principle is widely used and has contributed to the construction of the urban fabric, as we find that the doors correspond to a general situation in the city (see Figure 6).



Figure 6. The entrance doors are in position to avoid the face to face (a plan provided by CNERU).

4.3.3. Subdivision of the heritage.

Division of the heritage (in Islamic jurisprudence) among the elements of the study: we studied the urban fabric in its current form in terms of the courtyard inside the buildings. Because of the Casbah's houses, the architecture is characterized by the omnipresence of this element (Figure 07).



Figure 7: Examples of subdivision
(Author restitution of Casbah map1983 (Source: Parcel plan Atelier Casbah 1983)).

In Example: 11

I The partition proportions are $2x(1/2)$ which are the partition proportions of a deceased who left behind two heirs of the same degree of kinship.

II The division proportions are $(1/2)$, and $2(1/4)$ which are the sharing proportions of a deceased who left behind One Son $(1/2)$ and Two Daughters $2x(1/4)$.

During our study of the courtyards (Figure 06), we found traces of division, as some of them are divided between two neighbors, because the original courtyard is supposed to be in the middle of the house, but in these cases it was found at the end of the house, parallel to the neighbor's courtyard, which indicates that original courtyard was divided, and therefore the two houses were originally one house, and the courtyard was in the middle of this house.

4.3.4. The Waqf (endowment).

The waqf or Habous means, literally, to hold, to stop, to immobilize, and expresses in a generic way the fact of consecrating or destining particular goods to a religious use: to make of one's property a devout legacy, the purpose of which is to dedicate it to the attention of the needy in the community for worship, public service or humanitarian aid (Missoum 2003). waqfs were often large-scale projects, generally clustered around a religious foundation, and buildings of an economic nature that were supposed to provide the funds needed to achieve the waqf 's intended goals. Thus, large urban waqfs could cover a very large area and (Figure 8), as such, constituted real urban planning processes. (Raymond 1998).

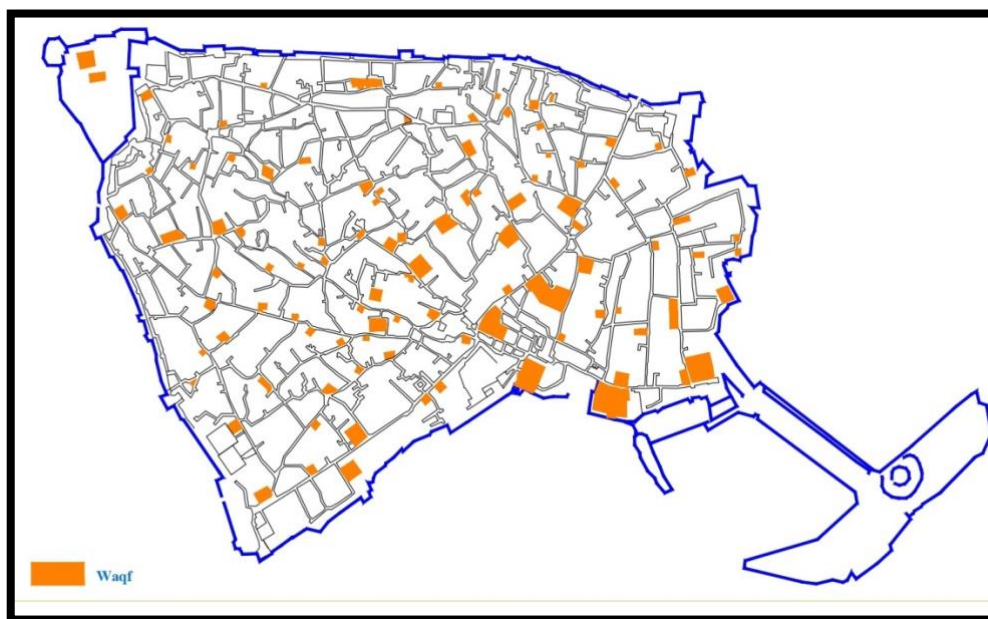


Figure 8. *Waqf (religious endowment): zaouya and mosque In ottoman Casbah (a sketch based on a plan provided (Ben-Hamouche 2007)).*

At the end of the Ottoman period, the waqf significantly influenced socio-economic life, encompassing agricultural land, shops, fondouks, bakeries, fountains, aqueducts, reservoirs and basins of water, mills, ovens lime, farms and gardens. The French consul, who arrived in Algeria in 1781, observed that the institution of the waqf of the two holy places of Islam (Haramayn) owned most of the houses in the city of Algiers and a large part of the gardens that surrounded it. (Saidouni 2009).

Accordingly, endowments constitute a large part of the city's area, and its legal nature that prevents its sale or demolition has contributed greatly to forming the urban fabric in this way.

5. Conclusion.

The concept of regularity in the Islamic city does not refer to geometric order but rather to social order, which is based on the principle of not harming others by prioritizing the interests of family members or partners over strangers, neighbours over distant ones, and the first over the interests of those who come after him, putting the interests of society above the interests of individuals.

And all these concepts take place within the framework of agreements in the presence of witnesses. If the matter is not possible, the Sharia judge concludes them in a formula in the form of a judicial ruling that derives its validity from Islamic jurisprudence.

These ideas play an essential role in the construction of streets and plot areas and their changing shapes. As inheritance laws contribute to the fragmentation of large properties into smaller ones. Additional corridors or roadways are occasionally built to enable access to the deep plots created after partition. On the other hand, the right of pre-emption increases the area of ownership by adding one or more properties to the original property, and it is also possible to add a deadlock to the property if it does not contain any other entrances that are not owned by others.

In light of these concepts and practices and the absence of an official institution for planning, the urban fabric is constantly changing streets and forms of houses.

But with the presence of this movement, the urban fabric cannot be subjected to a complete change, because endowments and Habus are fixed elements in the urban fabric and cannot be sold or divided, in addition to religious buildings such as mosques and corners that are not subject to changing tasks. However, endowments are considered as an important engine of social and economic life in the city.

Non-religious Habus buildings are for-profit buildings, and their funds are transferred to those imprisoned for their beneficiaries and those in charge of them, or to the management of religious buildings in the city.

So the social factors in addition to the topographical nature of the site and the water flow are what led to the formation of the urban fabric of the city of Casbah during the Ottoman presence in the city of Algiers.

After this study, it was concluded that the regularity of the urban fabric in Islamic and Arab cities cannot be measured by engineering standards such as in western towns. At a first glance, we notice the irregularity of the urban fabric. Still, by analogy with the rules of jurisprudence and the composition of social values for the city's residents, we find it in agreement with what achieves satisfaction for the population and their daily social practices. Therefore it is a very organized city that responds to the requirements of the population, and this is the goal upon which the schools of engineering and design were established. It tries to reach user satisfaction and good conduct, by participating and consulting the user in the design process. This method of construction can be compared with the urban project that requires many actors in the design of a city.

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