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'Medical' Real Estate Development in Sousse City Toward's 'Medical Urbanism'

Leila Ayoub[1], Sahar Ftini[2], Tahar Dhahbi[3]

[1] Leila Ayoub, Department of Urbanism, ISTEUB, Univerité de Carthage. ORCID Id: 0009-0001-5680-6156

[2] Sahar Ftini, Department of Urbanism, ISTEUB, Univerité de Carthage

[3] Tahar Dhahbi, Department of Geography, Faculté des Lettres, des Arts et des Humanités de la Manouba, Université de Manouba

Abstract

This study is part of an overall research is divided in two sections. The objective of theses two sections are is determining the ins and outs of the development of private medical real estate development in the city of Sousse. The present article exposes the results of section 2. Its specific objective is to identify the outcomes of private medical real estate development and to understand how it has been introduced in the city of Sousse. a new way of urban space fabric, referred to as 'medical urbanism'. This research enabled us to validate assumption 1 by attesting that, "being dependent on the public structure for the provision of medical, paramedical and educational services, the private health sector in the study areas (A, B, C and D), polarizes an offer of services of an intra-urban, regional, supra-regional, and international nature". The assumption 2 supposing that "the establishment of health facilities in each area generates an urban dynamic through the flow of local and foreign patients" has also been validated. Indeed, the generated urban dynamics increases the attractiveness of the areas which in turn polarize the activity of medical real estate development. The latter in turn generates and attracts the development of related or complementary activities in the bordering areas, thus reinforcing their polarities and centralities. Finally, the validation of assumption 3 confirmed that "medical promotion influences the composition of the urban fabric and establishes the fabric of specific urban, architectural and landscape forms".

Keywords: Medical Real Estate Development, Medical Urban Planning, Polarity, Centrality

1. Introduction

The private real estate development sector specialized in sanitary, medical and paramedical services we referred to as 'medical real estate development', has been booming since 2012 in large cities undergoing metropolization, such as Tunis, Sfax and Sousse. The number of buildings for private real estate development in Tunis peaked between 1990 and 2010 (Dhahbi, 2015). Tunis occupies the first place followed by Sousse and Sfax cities. Over the last few years in Sousse, the use of buildings has gradually been shifting. from residential to medical services. Approximately 70 % of office buildings are used for medical activities. Similarly, buildings newly constructed by private real estate developers are by majority used for medical activities. This boom has thus led to a reconfiguration of urban space. Based

on its own logic, the private medical real estate development produces specific architectural, urban and landscape forms, as well as a new urban aesthetic. It introduces a new way of urban space fabric in these cities: 'a medical urbanism'.

2. Problem

The rise of the private real estate development and sanitary sectors in the main coastal cities of Tunis, Sfax and Sousse aroused our interest. Indeed this phenomena is specific to Tunisia, is relatively recent and is very little developed in the literature. We therefore took this opportunity to explore the ins and outs of the development of private medical real estate development in the city of Sousse. To this end, the study carried out by Dhahbi (2015) and the field survey carried out by Ftini (2022) served as a reference to deepen and develop a research divided into two sections.

Section 1 enabled us to identify the tenants of the development of private real estate development in the city of Sousse and to demonstrate that it was initiated by the development of the private real estate sector since Law No. 90-17 of 26 February 1990 and of the private sanitary sector, particularly since its liberalization following the promulgation of Law No. 91-63 of 29 July 1991 (relating to the public sanitary organization and private sector), the 1995 Free Trade Agreement with the European Union (introducing general measures to liberalize services, including the sanitary sector) and later in 2007, Decree No. 2007-120 (facilitating complementary activity for doctors in the public sector).

Part 2 of section 1 concluded that the synergy between the real estate and sanitary sectors in Sousse has generated spontaneous urban dynamic transforming the territory and often bypassing the conventional and regulatory tools of planning. The liberalization of the sanitary sector has been an opportunity for the spontaneous development of the real estate market, whose supply and demand are controlled by precise criteria of territorial attractiveness. Among the criteria of territorial attractiveness that have conditioned the development of private real estate development in the study areas are accessibility, proximity to facilities and various public and private services, particularly health facilities, and location in high-end neighborhoods.

The objective of this article, which constitutes section 2 of global research, is to identify the outcomes or effects of private medical real estate development on the configuration and reconfiguration of the urban space of the city and to understand the mode of fabric of 'medical urbanism'. To achieve this objective, we have put forward the following hypotheses to be verified:

Assumption 1 : According to Amor Belhedi (1999), Sousse, which is an incomplete regional metropolis increasingly competing with Monastir, radiates over the Sahel and the governorate of Kairouan. At this stage, the aim is to validate the assumption that the private medical sector since its liberalization in 1990 has polarized an intra-urban, intra-regional, supra-regional and international private service offer dependent on the public structure of the provision of medical, paramedical and educational services;

Assumption 2 : It has been demonstrated in the 2nd section of Part 1 that the location of medical promotion practices and buildings near public health facilities in each area is an important criterion in relation to the 3 stakeholders in the real estate market for medical services: developers, providers of medical services and patients. It is then a question of demonstrating that this proximity increases the polarization of the private sanitary sector and generates an urban dynamic through the flows of national

and foreign patients. This urban dynamic in turn leads to the influx of service providers, the development of related or complementary activities in neighboring areas, attracting more real estate developers. Territorial attractiveness reinforces polarity, which reinforces existing centralities or creates new ones

Assumption 3 : The aim is to validate the Assumption that medical promotion influences the composition the urban fabric and landscape characterizing each area by a specific urban model.

3. Materials and Methods

3.1. Delimitation of Study Perimeters

The choice and delimitation and study areas were made as follows: The list of doctors practicing independently in Sousse, provided to us by Sousse regional council of doctors, has enabled us to identify through their professional addresses, the potential areas of concentration of medical offices. The geographical transposition on Google maps of these areas and the areas of concentration of private real estate development projects identified on-site, enabled us to delimit the potential study perimeters. The field visit and the observation were decisive firstly to complete the information concerning the existing medical services attributable to private real estate development (particularly for the projects under construction) and then to confirm our choice of the most representative study areas. The choice was made for the 4 areas (A, B, C and D) where private promotion is expanding rapidly (see Figure 4 and Figure 5).

3.2. Sample Selection and Stakeholders' Survey

The 4 pre-delimited areas (A, B, C and D) have subsequently rendered possible to define the 3 samples of the 3 main stakeholders involved in the real estate market specialized in the medical sector and who will be targeted by our survey:

Developers: The sample includes 19 developers who have produced a total of 21 medical real estate development buildings spread over the 4 study areas A, B, C, and D. The purpose of the semi-structured questionnaire addressed to the private developers is to find out their motivation or reasons behind the exercise of the real estate development activity and the implementation of the medical buildings in these areas A, B, C and D;

Medical Service Providers: The sample was limited to the 162 doctors and dentists occupying practices in medical promotion buildings located in areas A, B, C, D. The purpose of the semi-structured questionnaire for medical service providers is to find out the criteria that motivated these providers to practice in the study areas (A, B, C and D) and to occupy these medical real estate buildings and the premises rented or purchased for this purpose.

Patients: The survey allowed to list 756 patients in 15 of the 21 buildings located in the 4 study areas chosen: A, B, C and D. Thes sample of surveyed 756 patients is constituted of 656 Tunisian origin (representing 86.66 %) and 100 of foreign origin. The purpose of the inventory of patients was to determine the origin of the patients, to know the reasons for their visits, and the advantages of the sanitary (medical and paramedical) services offered in these specific areas and buildings. The inventory was carried out regularly during the mornings, in spring and summer seasons of 2021. It should be noted that due to the sanitary circumstances (COVID 19), the survey only covered a third of the premises identified in each building. Similarly, we were forbidden to access an entire block of one of the buildings (the Olivier building).

3.3. Database Collection and Processing

To verify the above-mentioned successive assumptions, data collection and processing were carried out in the following phases:

The verification of assumption 1 was based on investigative tools such as patient inventories, semi-structured questionnaires with medical service real estate developers and providers, and random interviews with a few users frequenting the 4 study areas (residents, shopkeepers, etc.). The processing of this database with the Excel tool has paved the way to understand the logic of the stakeholders involved in the fabric of 'medical urbanism';

The verification of assumption 2 was based on digital mapping to analyze and design the different urban forms and typologies generated by the implementation of the medical real estate development buildings.

The verification of Assumption 3 was based on on-site observation and surveying to analyze the architectural typologies (access to buildings, vocabulary used) generating urban aesthetic and landscapes specific to 'medical urbanism'.

3.4. Thematic and Empirical Contexts

3.4.1. Thematic Context

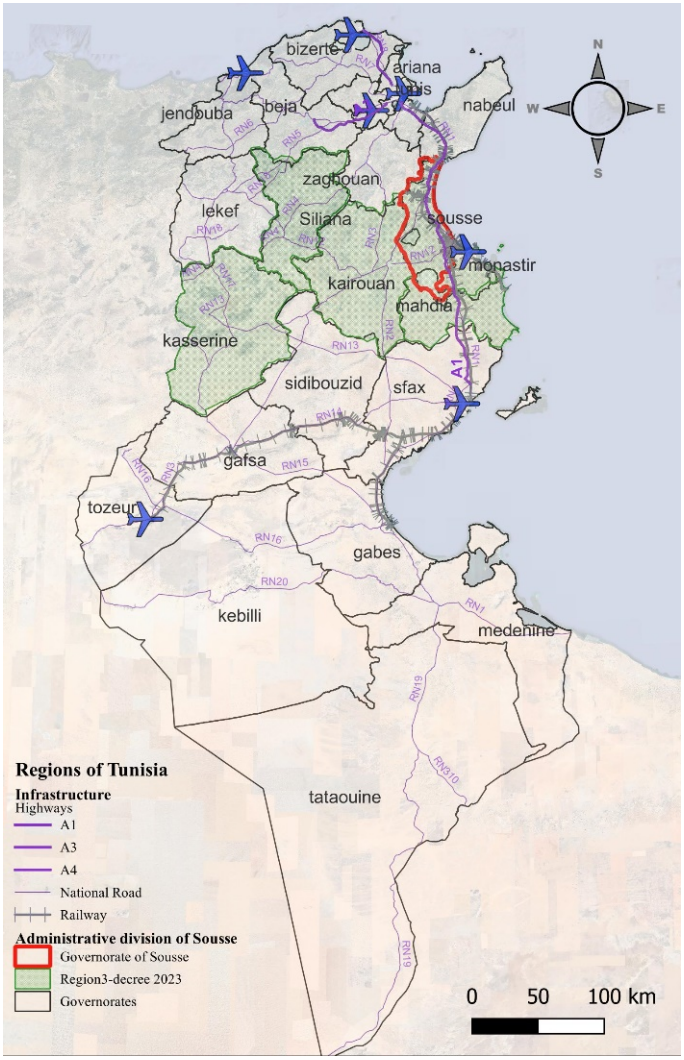
Real estate Development: According to Mourad Ben Jelloul (1999, p 7), real estate development or 'production of real estate' is 'made up of all the operations related to the production of a built structure'. The author indicates that this production requires the intervention of promotional capital that converts the capital of the construction industry from a form of housing to a form of commodity. Pierre Merlin and Françoise Choay (1988, p 729) define real estate development as 'a real estate construction most often intended for sale (generally in co-ownership)'. The same authors consider that the developer is a key player, the conductor of a real estate operation. Indeed, a developer must have skills in many areas to identify the needs of the local market, to imagine the real estate project and to supervise all the construction operations until the handover of the keys to the future landlords or occupants. In fact, the term 'real estate developer' appeared in 1954 with the French urban architect Fernand Pouillon, to replace the old term 'real estate business builder'. The 'real estate developer or real estate developer-builder is 'a natural or legal person who takes the financial initiative and risk of a real estate construction most often intended for sale (generally in co-ownership)'. (Pierre Merlin, et al.,1988, p 730).

In French legislation, Article 1831-1 of January 1, 1979, of the Civil Code defines the real estate developer as a constructor of buildings by assuming responsibility for legal, financial and administrative follow-up. The producer is generally a company that has land property on which it is responsible for constructing or rehabilitating the real estate intended for sale or rent (offices, housing, commercial premises, leisure facilities, establishments of service such as sanitary (medical and paramedical) service: medical offices, laboratories of analysis or centers of imaging).

In Tunisian legislation, the first article of Law No. 17 of February 26, 1990, of the Official Journal of the Republic of Tunisia stipulates: 'A real estate developer is any individual or corporate entity who, with a view to sale or rent, carries out the following operations on a regular or professional basis and in accordance with the regulations in force: Subdivision and development of land intended mainly for housing; construction or renovation of semi-collective individual buildings for

residential, commercial, professional or administrative use.' The real estate developer is a specialist in the sale of built properties not to be confused with the land developer, the investor, the planner or the subdiviser. He can either carry out and realize his project on his own initiative, as a project owner, or as a delegated project manager, being mandated by a project owner financing the project through a real estate development contract. In this case, the delegated project owner is responsible for controlling and monitoring the site until the complete completion of the project with respect for the project owner's constraints. The main mission of the developer is the creation and construction of real estate, whether it is new real estate projects in residential, tourist, industrial, commercial, sanitary sectors (etc.) or in renovation projects and transformation of existing buildings.

Figure 1. Regional Situation of Sousse Governorate
Source: Authors



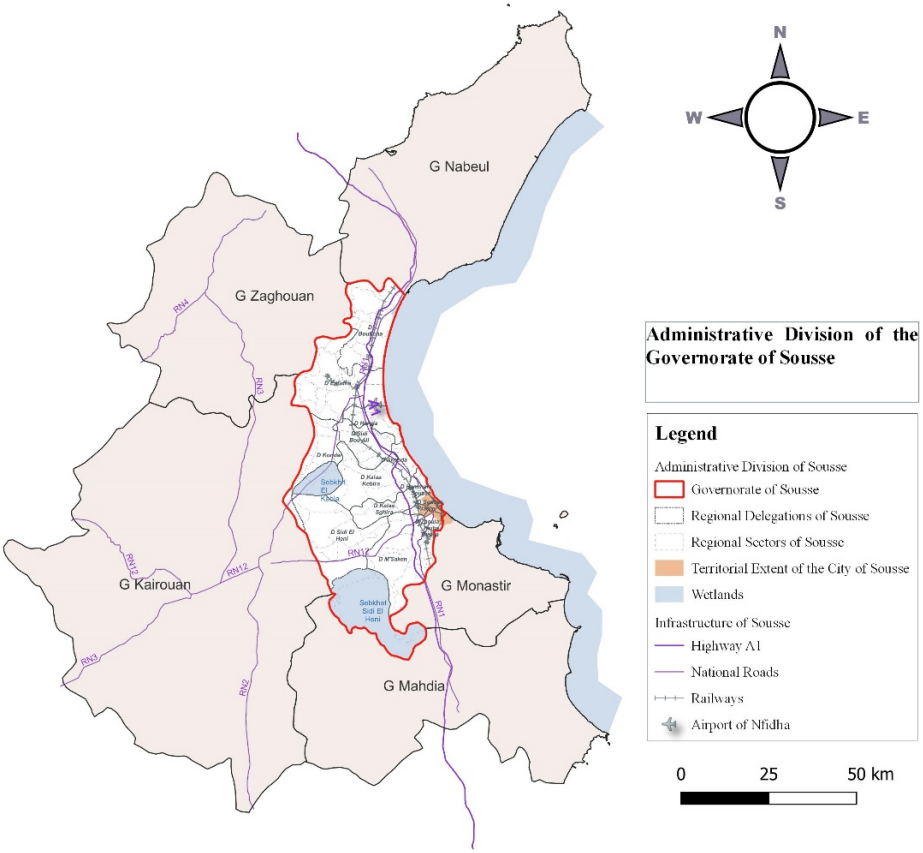
Real estate Development Buildings: Real estate development buildings are governed in Tunisia by Law No. 2001-65 of 10 July 2001 promulgating the Real Estate Development Buildings Code, which defines the different types of buildings intended for development or sale as follows:

- Residential buildings, which are divided into individual apartments or houses (individual ownership; of the property) or collective buildings (several co-owners in the same property);

- Commercial buildings such as retail (store, boutique), shopping centers (several businesses under the same roof) and commercial offices intended for administrative or commercial activities;
- Mixed residential and commercial buildings (the ground floor and 1st floor are for commercial use and the floors for residential use);

In addition, this code does not refer to buildings for industrial, logistic (warehouses, production facilities) or tourist use and to real estate buildings referred to in Law No. 91-35 of 14 May 1991 promulgating the Spatial Planning Code (CATU), urban planning tools, Law No. 93-120 of 27 December 1993 on the development and management of industrial areas and in Law No. 94-2002 of 10 November 2002 promulgating the Tourist Code.

Figure 2. Neighboring Governorates of Sousse
Source: Authors



3.4.2. Empirical Context

The Centre-East Region and Region 3: The central-eastern region of Tunisia was located on the eastern coastal coast. According to the former administrative division subsequent to Decree 589 of 21 September 2023, it included the four governorates of Sousse, Mahdia, Monastir and Sfax (See Figure 1). The Centre-East region and the Greater Tunis region (each sheltering 24% of the total Tunisian population) represented the most populous regions in the whole of Tunisia. Since September 2023, Sousse has been part of a new region that stretches from East to West: Region 3, which now includes the governorates of Sousse, Mahdia, Monastir, Kairouan and Kasserine.

The Governorate of Sousse: The governorate of Sousse is bordered by the governorates of Nabeul to the north, Zaghouan to the east, Mahdia to the west and Monastir to the south (see Figure 2). It covers an area of 2669 km2, or 1.6% of the country's surface area, and runs along 75 km of the Mediterranean and Tunisian Sahel coast (Digital Atlas of the Governorate of Sousse, 2021). The governorate of Sousse Shelters 6% of the total population, equalizing the governorates of Ariana and Ben Arous and occupying the third position after the governorates of Tunis and Sfax (containing 9 % each of the total population), followed by the governorate of Nabeul (7 % of the total population) (The Ministry's Direction of Equipment & DRCPS, 2021). The governorate of Sousse is composed of 16 delegations (Akouda, Bouficha, Enfidha, Hammam Sousse, Hergla, Kalâa Kebira, Kalâa Seghira, Kondar, M'saken, Sidi Bou Ali, Sidi El Hani, Sousse Jawhara, Sousse Médina, Sousse Riadh, Sousse Sidi Abdelhamid, Zaouiet Ksiba Thrayet), 104 sectors and 17 municipalities (see Table 1 and Figure 3).

The City of Sousse and the Metropolis of Greater Sousse: Administratively, the city of Sousse, is the administrative head town of the governorate of Sousse. It includes 6 delegations from its governorate (See Table 1): Sousse Khezama, Sousse Medina, Sousse Jawhara, Sousse Riadh, Sousse Sidi Abdelhamid and Sousse Hached. The municipal perimeter of the city of Sousse includes 5 municipal districts, 4 of which have perimeters that correspond to those of the delegations of the same name: Sousse Khezama, Sousse Medina, Sousse Jawhara and Sousse Riadh. The fifth district of Sousse Sidi Abdelhamid covers only part of the delegation of the same name (Municipality of Sousse, 2023). It should be noted that Sousse is the third largest municipality after Tunis and Sfax. Being located on the east coast and at center of Tunisian territory and encompassing a communication crossroads linking the North to the South, this harbor city enjoys a strategic geographical position that has allowed it to play the role of a central city and an administrative and socio-economic hub. This explains its rapid evolution from a city to a regional metropolis. The city of Sousse was considered the capital of Sahel. In 2014, it assembled most of the governorate's population, i.e. 221,530 out of 674,971 inhabitants (INS, 2014) with a density of 4913 inhabitants/km2. Its constantly growing population demonstrates the demographic dynamics that characterize it and grants it considerable advances in its economic and urban development. As a driver of development to its entire urban region and its surrounding regions, the city of Sousse has evolved from the fourth largest urban agglomeration in Tunisia (after Tunis, Sfax and Nabeul) to a regional metropolis: Greater Sousse (see Figure 4).

The metropolis of Greater Sousse includes the communal districts of Sousse, Zaouiet Sousse, Akouda, Ezzouhour, Hammam-Sousse, Kalâa Kebira, Kalâa Seghira, Kssibet-Thrayet, M'saken, Messaadine (Ministry of equipment 2022) and has significant potential in terms of road and transport infrastructure:

- The highway A1;
- Two national roads:

Figure 3. Territories of the City of Sousse and Greater-Sousse
Source: Authors

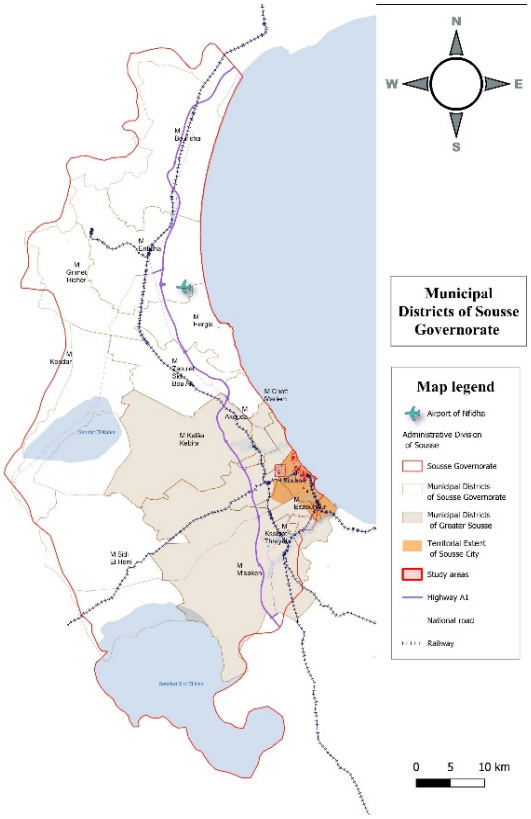
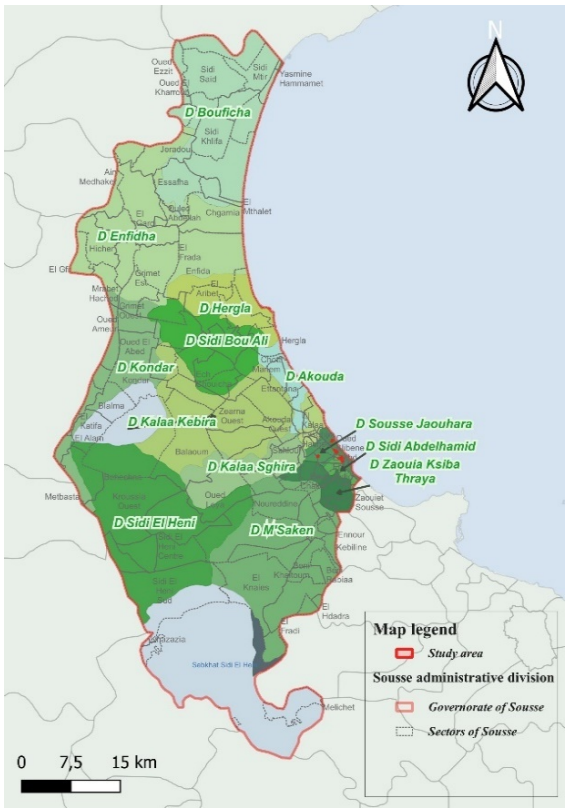


Figure 4. Delegations of Sousse Governorate
Source: Authors



⇒ The RN1 road (or GP 1) connects to the North, Sousse to Sidi Bou Ali and to the South, Sousse to M'saken;

⇒ The RN12 (or GP 12) road connects Sousse to Kairouan;

- The regional road RR 82 connects Sousse to the cities of Monastir and Mahdia;
- Four local roads :

⇒ RL 818 connects the city center to Sahloul;

⇒ RL 819 connects Sousse to Kalaa Sghira and Kalaa Kebira;

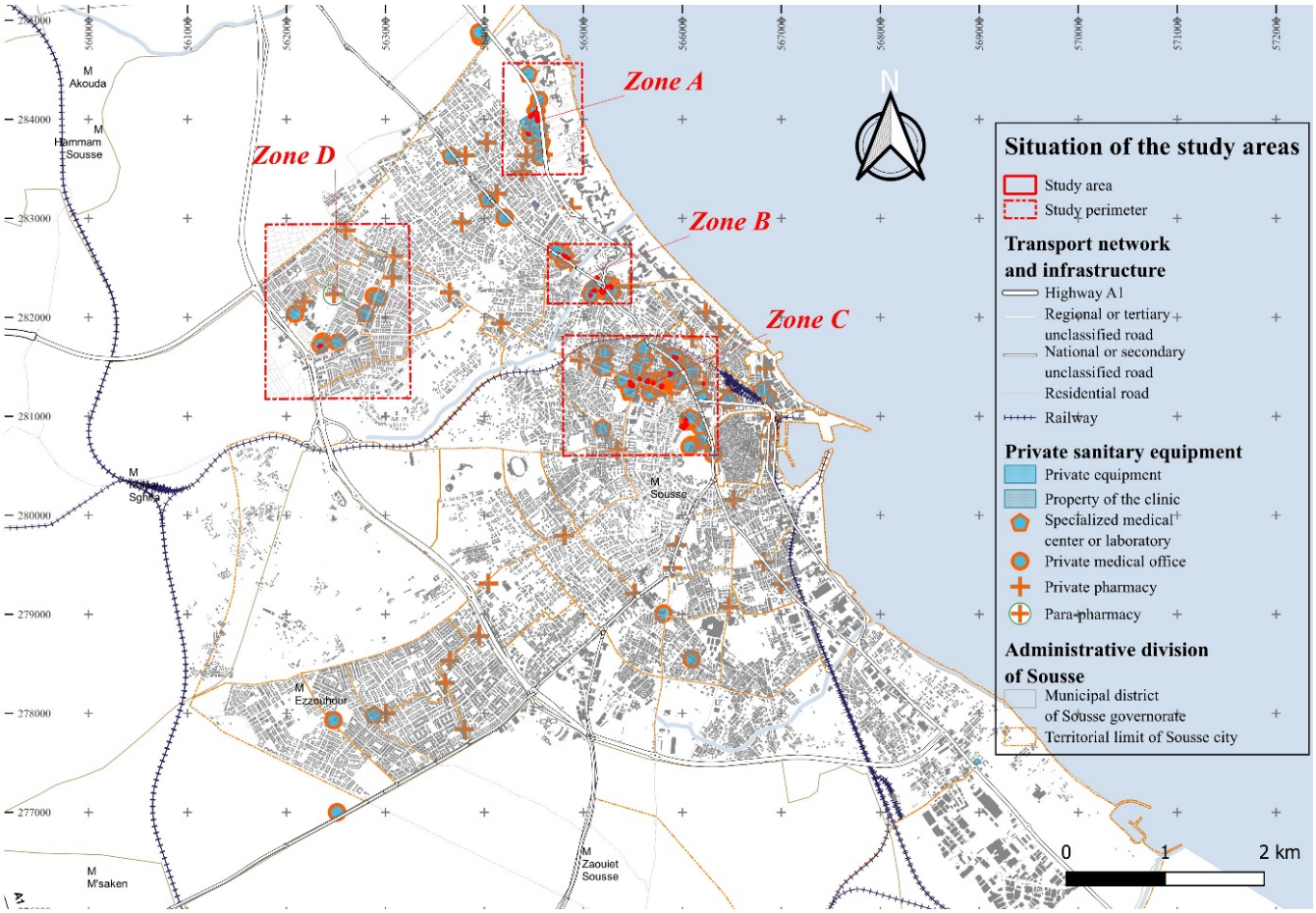
⇒ RL 820 connects the barracks area to the city of Erriadh;

⇒ RL 845 road serves Sousse to Hammam Sousse and Kantaoui tourist area.

The Greater Sousse also possesses:

- Concentric belts and several exchange nodes: Boulevard Mohamed Karoui, the D 4 ring road deviating from the RN 1 road;
- The international airport of Enfidha;
- The deep-water port of Enfidha;
- The port of Sousse as being a commercial and pleasure port but where commercial exchanges prevail;

Figure 5. Situation of the Study areas A, B, C and D.
Source : Authors



Finally, the city and regional metropolis of Sousse also have several industrial, tourist and university facilities (see Figure 17). Sousse is an attractive city for both pleasure and business. This attractiveness is also reinforced by its extensive public and private sanitary infrastructure. It has been shown in a previous article that the development of the private sanitary sector in Tunisia was initiated by the sanitary policy that favored the polarization of the public sanitary sector in coastal areas and in the main economic cities in the process of metropolization: Tunis, Sousse and Sfax. The capital of Tunis alone has 13 university hospitals (CHU) out of a total of 24 throughout the country (Directorate of Equipment & DRCPS, 2021). The liberalization of the sanitary and real estate sectors in the 1990s further accentuated the polarization and metropolization of these cities. Indeed, according to the Ministry of Health (Directorate of Equipment & DRCPS, 2021), the governorate of Sousse has 8 hospitals, including:

- 2 university hospitals: Farhat Hached and Sahloul;
- 1 regional hospital in M'saken;
- 5 district hospitals with a capacity of 1460 beds and 101 basic sanitary centers.

Regarding the private sanitary sector, the governorate of Sousse has:

- 9 private clinics, most of them of international scale;

- 139 pharmacies;
- 41 laboratories of analysis;
- 555 private medical offices in 2020 (Sousse Medical Council 2021).

The city of Sousse, capital of its governorate, concentrates most of these public and private medical and paramedical sanitary services (see Figure 5).

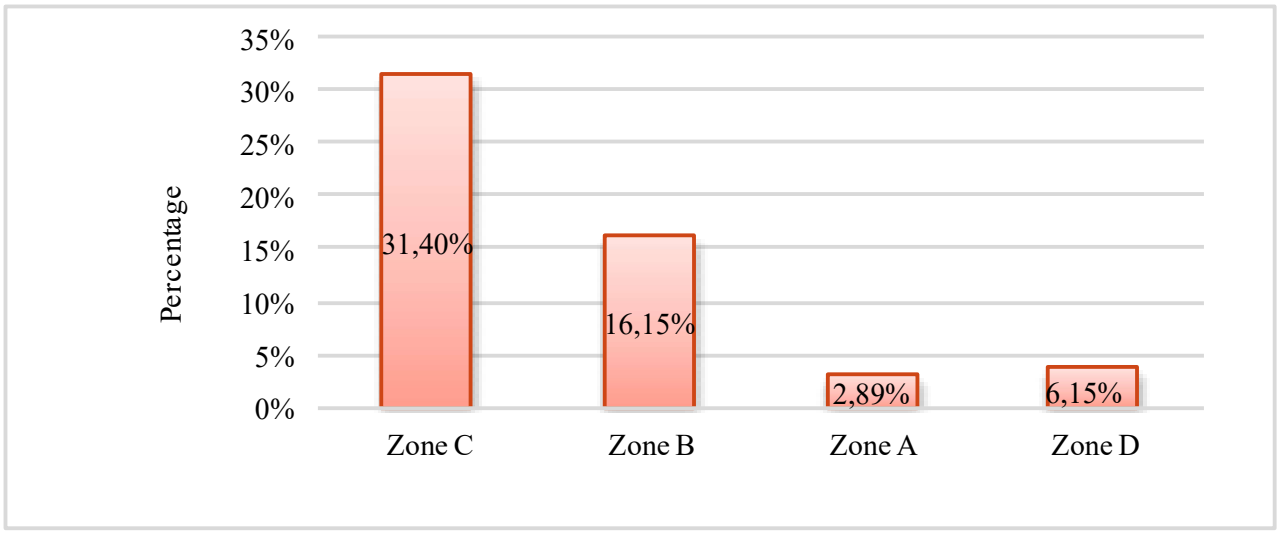
4. Results and Discussion: Medical Real Estate Development and the Making of Medical Urbanism

4.1. Influx and Polarity of the Medical Real Estate Development Study Areas

The verification of the assumption 1 'that the private sector since the 1970s and 1990s (period of the liberal economy) has polarized an intra-urban, intra-regional, supra-regional and international private service offer dependent on the public structure of the provision of medical, paramedical and educational services' was based on the inventory of patients. The latter allowed us to observe that the private medical services provided in the medical real estate development buildings of the four study areas polarizes influx of Tunisian and foreign patients. This polarity represented by the movement of patients from their points of departure (places of residence) to their points of arrival (the study areas) is of a national and international nature, since out of a total of 756 respondents, 86.77 % or 656 are Tunisian residents and nationals and 13.22 % (100 patients) are visitors of foreign countries.

4.1.1. Intra-Urban Medical Polarity

Figure 6. Influx by Area of the Tunisian Patients
Source: Authors (Semi-directive Quest with Patients)



The intra-urban polarity implies a radiance that is limited to the governorate of Sousse. It is therefore a question of analyzing the influx of Tunisian patients from the delegations of the governorate of Sousse to the 4 study areas:

- **Intra-Urban Medical Polarity of the Entire Study Area:** The survey has allowed us to ascertain that the intra-urban polarization of private medical services in all four study areas generates a flow originating from 15 of the 16 delegations of Sousse governorate (See Table 1, Figure 11). Indeed,

no patient is from the delegation of Bouficha located at the northern administrative limit of the governorate. We also noted the importance of the influx of patients from the delegations of the Greater Sousse: Sousse Medina, Sousse Riadh, Sousse Jawhara, Sousse Sidi Abdelhamid, Hammam Sousse, Akouda, M'saken, Kalâa Kebira and Kalâa Seghira;

- **Intra-Urban Medical Polarity in Areas A, B, C and D:** The intra-urban influx is distributed as follows:
  - Areas C and B: Area C attracts 206 Tunisian patients out of a total of 656, representing 31.40 % of the total number of patients from the delegations of the governorate of Sousse. Indeed, area C (Figure 10) is in the city center and contains the oldest medical center in the city of Sousse and its first university hospital. This area is characterized by a significant polarity of private medical services, resulting in an increase in real estate medical operations and the densification of the surrounding urban fabric. Area B (Figure 7) attracts 106 of the 656 Tunisian patients. With an influx of 16.15 %, it is the second most attractive area in the governorate of Sousse. Indeed, located in the peri-center, this area C includes several medical buildings attracting many patients;
  - Areas A and D: With a smaller number of buildings, areas D (Figure 9) and A (Figure 8) attract only a small influx of patients from the delegations of the governorate of Sousse respectively corresponding to 3.65 % and 2.89 %.

If we consider that Greater Sousse includes the delegations of Sousse Medina, Sousse Riadh, Sousse Jawhara, Sousse Sidi Abdel Hamid, Hammam Sousse, Akouda, Kalâa Kebira, M'saken and Kalâa Seghira the city of Sousse includes the delegations of Sousse Medina, Sidi Abdel Hamid, Zaouiet Ksiba Thrayet, Sousse Jawhara and Sousse Riadh, it can be acknowledged (see Table.1) that for:

- Area A: 68.42 % (i.e. 13 out of 19 patients residing in the governorate of Sousse) are from Greater Sousse, of which 23.07 % (i.e. 3 out of 13) reside outside the city of Sousse;
- Area B attracts a flow of 86.79% from Greater Sousse (i.e. 92 out of 106 patients residing in the governorate of Sousse) including 26.8 % (i.e. 24 out of 92) from outside the city of Sousse;
- Area C attracts a flow of 95.14% from Greater Sousse (i.e. 196 of the 206 patients in the governorate of Sousse) of which 14.79 % (including 29 out of 196) outside the city of Sousse;
- All the patients from area D flock from Greater Sousse and more precisely from the city of Sousse.

It should therefore be noted that in terms of centipede flows from Greater Sousse; (delegations located in Greater Sousse outside the city of Sousse) to the study areas located in the city of Sousse (areas A, B and C in Sousse Medina delegation and area D in Sousse Jawhara (a delegation situated at the northwestern administrative limit of the city of Sousse)); the 1st place is occupied by area B followed by area A and then C. In addition, all four study areas show negative correlation coefficients, indicating an inverse relationship between patient influx and mobility distance. The greater the distance (between the delegation and the study area), the more the flow of patients decreases. The coefficient of area D (-0.67) indicates a strong inverse relationship between patient flow and mobility distance. It would therefore seem that the distance is a significant criterion related to the attraction of patients from the various delegations of Sousse to area D. This criterion is of medium importance compared to areas B and C implemented in the central and pericentral areas undergoing change (densification). It is low because it

is closer to 0 for area A, which is located on the outskirts of the city of Sousse. In contrast to areas B and C, area D remains a secondary medical center with little influence because the Sahloul area has been the subject of a land intervention perimeter and a relatively recent regulated subdivision of the Land Agency of Housing (Agence Foncière de l'habitat: AFH). Containing a total of only two medical development buildings, it is not exposed to the phenomena of functional change and real estate speculation. (see Table 1).

Figure 7. Intra-Urban Polarity of Area B
Source: Authors (Semi-directive quest with patients)

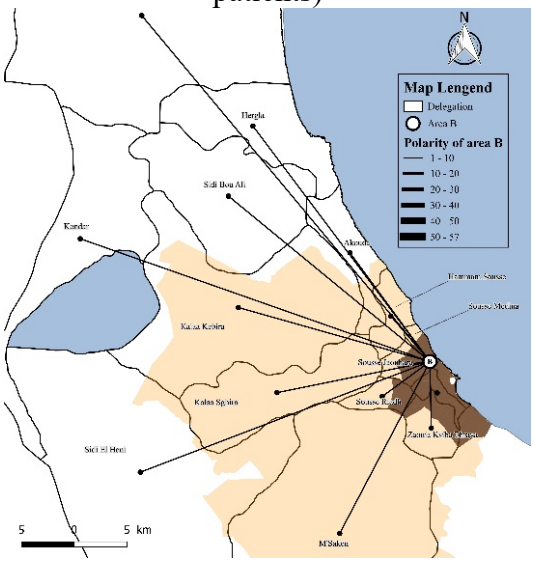


Figure 8. Intra-Urban Polarity of Area A
Source: Authors (Semi-directive quest with patients

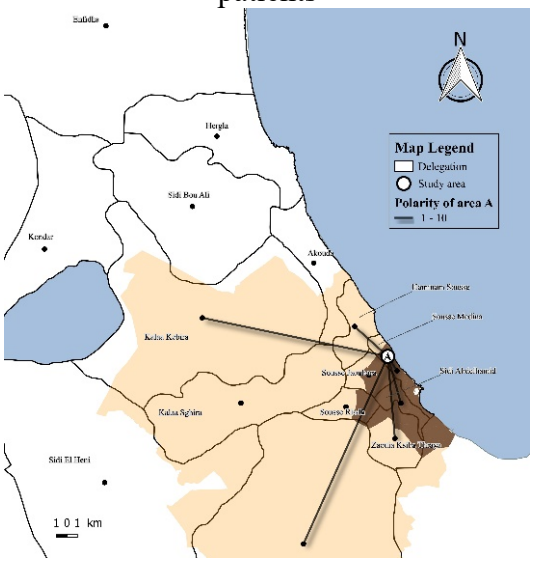


Figure 9. Intra-Urban Polarity of Area C
Source: Authors (Semi-directive quest with patients)

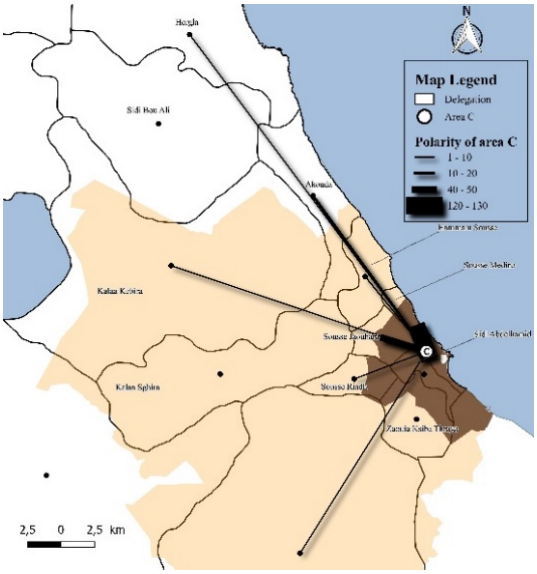


Figure 10. Intra-Urban Polarity of Area D
Source: Authors (Semi-directive quest with patients)

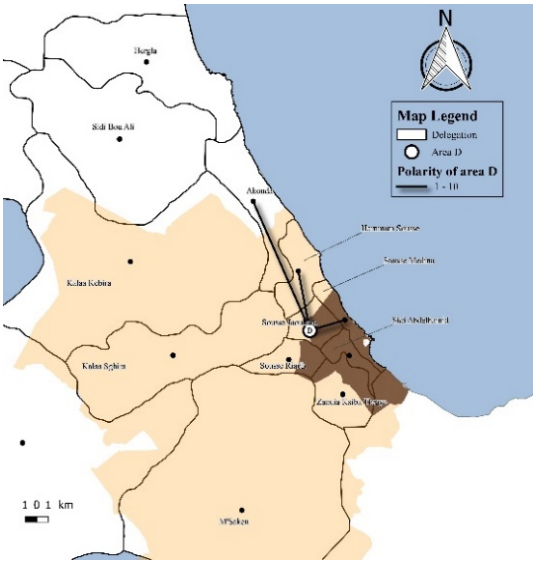


Figure 11. Intra-Urban Polarity of the Study Perimeter
Source: Authors (Semi-directive quest with patients

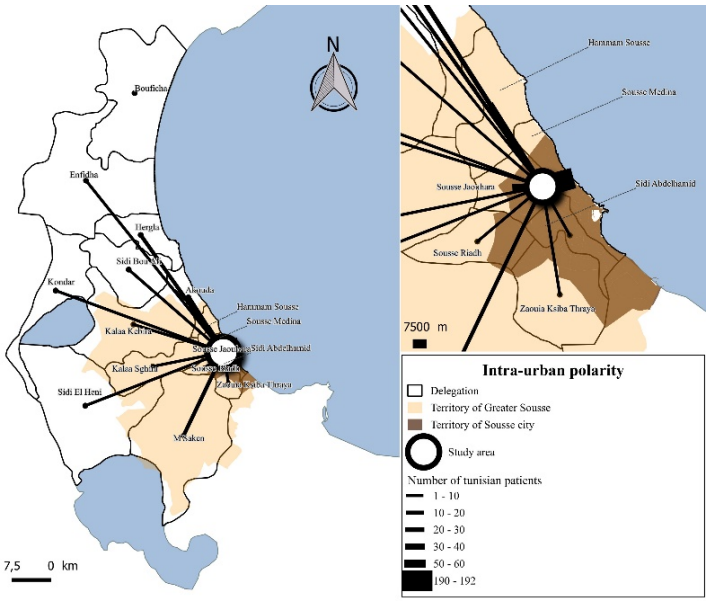


Table. 1. Influx of Tunisian Patients from the Delegations Of Sousse Governorate to the Study Areas

(*): Delegations of Greater-Sousse

Source: Authors (Semi-directive quest with patients)

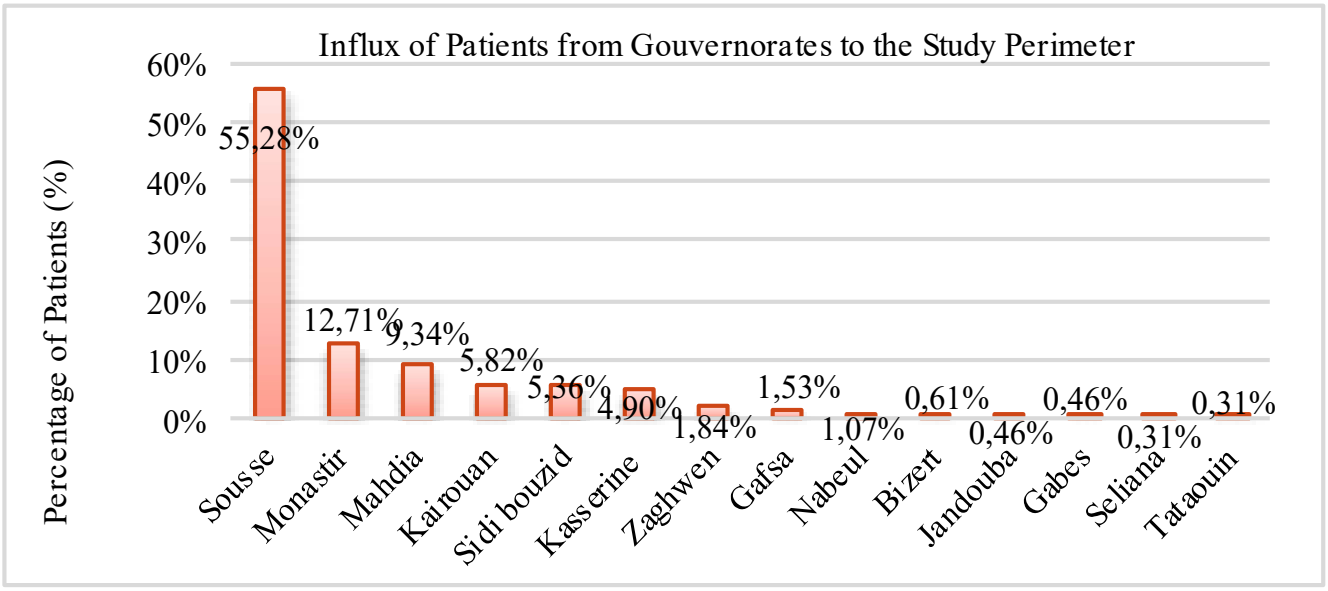
Delegations of Sousse Governo-rate	**Popula-tion 2014**	**Popula-tion 2023**	**Influx by Numbers of Patients**					**Distance (km) of Displacement Between the Origin and the Study Area**			
			Area A	Area B	Area C	Area D	Total	Area A	Area B	Area C	Area D
3151.Sousse Médina (*)	35288	38519	7	57	125	3	192	1.63	0.34	1.47	3.16
3152.Sousse Riadh (*)	64532	75208	0	3	1	0	4	-	5.61	5.76	-
3153. Sousse Jawhara (*)	86517	101415	0	4	41	10	55	-	2.35	3.34	0.64
3154. Sousse Sidi Abdel Hamid (*)	52787	55757	1	0	0	0	1	4.61	-	-	-
3155.Hamma m Sousse (*)	42691	47520	4	10	8	10	32	4.24	5.69	7.21	5.22

3156.Akouda (*)	34494	40503	0	4	18	1	23	-	12.82	14.35	12.17
3157.Kalâa Kebira (*)	59132	63264	1	3	1	0	5	18	18.89	20.08	-
3158.Sidi_Bouali	19543	20596	0	2	0	0	2	-	24.74	-	-
3159.Hergla	9343	10014	0	5	10	0	15	-	27.87	29.50	-
3160.Enfidha	49335	52317	0	1	0	0	1	-	42.74	-	-
3161. Bouficha	26760	28405	0	0	0	0	0	-	-	-	-
3162.Kondar	13565	14792	0	1	0	0	1	-	35.16	-	-
3163.Sidi El Heni	13505	14456	0	1	0	0	1	-	29.41	-	-
3164.M'saken (*)	97225	103512	4	9	2	0	15	19.51	18.43	17.75	-
3165.Kalâa Seghira (*)	37797	44220	0	2	0	0	2	-	14.81	-	-
3166.Zaouïa Ksiba Thrayet	32304	43242	2	4	0	0	6	7.82	6.31	-	-
Total	674818	753740	19	106	206	24	355				
Correlation Coefficient	Area A: Cr= -0.36 (Negative week correlation close to 0) Area B: Cr= -0.45 (Negative middle correlation) Area C: Cr= -0.54 (Negative middle correlation) Area D: Cr= -0.67 (Stronger correlation close to -1)										

1.1.1. Intra-Regional Medical Polarity

An intra-regional polarity implies radiance beyond the limits of the governorate. In 2007, 4.5 % of the patients of the clinics of the Greater Tunis' were flocking from the Sousse governorate (Dhahbi 2015, p122). Even if today this trend has not been verified, the survey showed us that the medical real estate development buildings located in our study areas polarize a flow from the Governorate of Sousse representing 46.95% of the total surveyed patients (355 out of 756 respondents) and 54.11 % of the total of Tunisian patients (355 out of 656 Tunisian patients). The Greater Sousse polarizes 94.36 % of the Tunisian patients from the governorate of Sousse (i.e. 335 out of 355 patients). This may be justified by the evolution of health facilities in the Greater Sousse and indicate that the governorate of Sousse meets the needs of its inhabitants in terms of private medical care, thus reducing their travel to neighboring governorates. However, it cannot be said with certainty that the governorate is self-sufficient, as this requires the consideration of exhaustive data. On the other hand, the influx of patients to the governorate of Sousse from all the neighboring governorates (Nabeul, Zaghouan, Kairouan, Mahdia and Monastir), which is more pronounced from the governorates of Monastir, Mahdia and Kairouan, confirms the regional polarity of its private medical services (Table 1, Figure 7, 8, 9, 10 and Figure 11).

Figure 12. Influx of Patients from the Governorates of Tunisia to the Study Perimeter
Authors (Semi-directive Quest with Patients)



1.1.2. Supra-Regional Medical Polarity

The supra-regional polarity implies a radiance beyond the Tunisian regions. However, in our case, it would be impertinent to base out study on the new Tunisian administrative regions dating from 2023 since these did not serve as a basis for previous Tunisian planning and development policies. Instead, it seemed more interesting to take into consideration the previous regions, the Centre-East region (which included the governorates of Sousse, Monastir, Mahdia and Sfax) or the Sahel region (including the governorates of Sousse, Monastir, Mahdia). To this end, the field survey (See Figure 12 and Figure 13) confirmed the influx of patients from the 'Centre-West', 'South' and 'North' regions and from the 'Sahel' region to the study perimeter:

- **Influx of patients from the 'Sahel' Region:** the Sahel region accounts for 48.16 % of the total Tunisian patients and is the starting point of the largest supra-regional influx. The latter is distributed between:
  - The governorate of Monastir with 28.09 % of patients;
  - The governorate of Mahdia with 20.07 % patients.
- **Influx of Patients from the 'Centre-West' Region:** This region represents the 2nd largest influx with a percentage of 35.79 % of the total Tunisian patients distributed as follows:
  - Sidi Bouzid accounts for 11.71 % of the total number of patients;
  - Kairouan accounts for 13,38 %;
  - Kasserine accounts for 10,7 %.
- **Influx of Patients from the 'North' and 'South' Regions:** Influx from the northern regions represent a percentage of 7.69 % of the total patients. This influx is close to that of the Southern region, which is 8.36 % of the total number of patients. Although low, these two values reflect the importance of the influence of these medical buildings. Logically, (bearing in mind that the 'Programme for the establishment of sanitary establishments in metropolitan cities' aims, through the fifth plan of 1980, to reduce the burden carried by the Greater Tunis), patients from the North should head for Greater Tunis, those from the South to Sfax, those from the center to Sousse. However, in our case this logic is not valid but can be justified. The field survey revealed that patients from the South are mainly looking for specialized services that are lacking in their own regions, while those from the North are mainly looking for the quality of services.

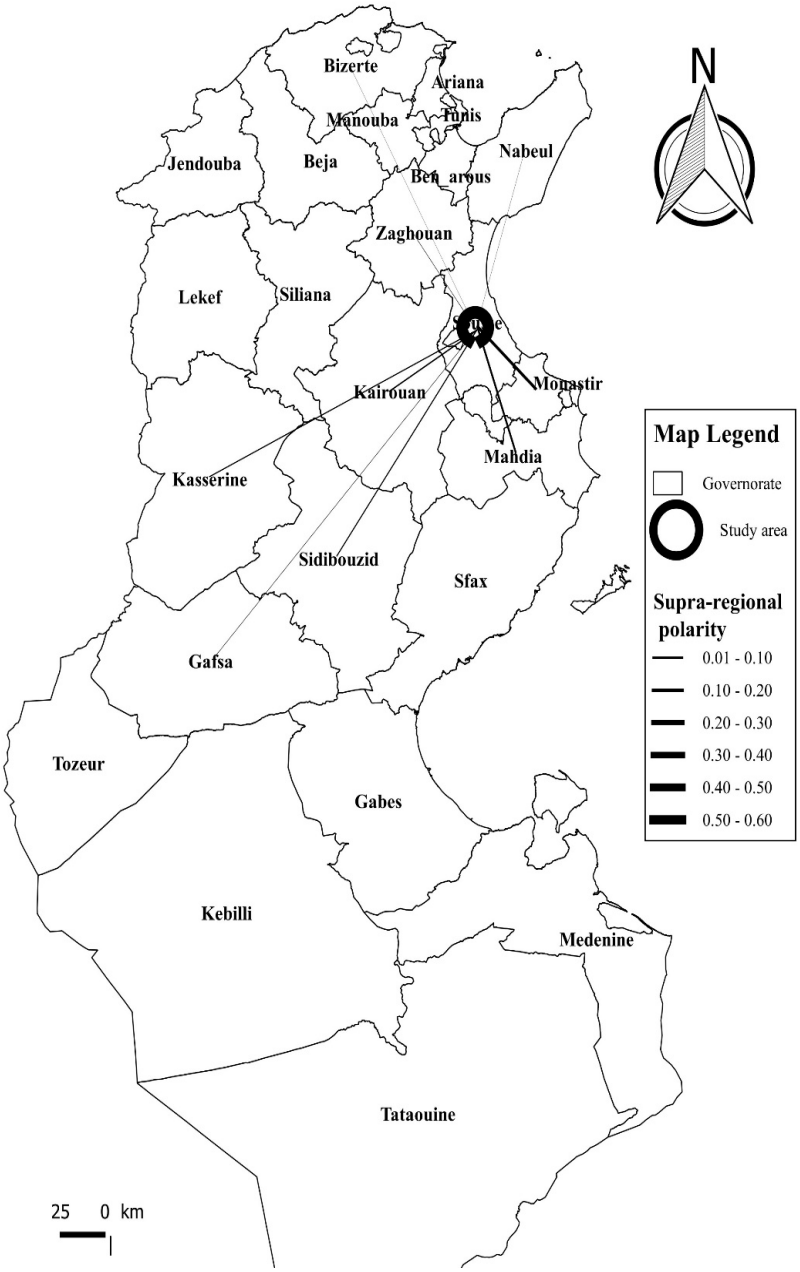
In conclusion, the supra-regional polarity of the 4 study areas is confirmed.

1.1.3. International Polarity

The inventory (see Figure 14) revealed the presence of a relatively large number of patients from Maghreb countries, mainly from Libya, Algeria and Mauritania. Sousse is therefore a medical tourist hub for nationals of Maghreb countries. Usually (except for covid conditions), the number of foreigners is higher. Before the advent of the revolution and the Covid crisis, Tunisia relied heavily on medical tourism: Tunisia 'has sanitary resources equivalent to those of developed countries (in terms of the qualification of practitioners, the standardization of therapeutic protocols, sanitary infrastructure, medical equipment, etc.) at very competitive prices on the world market (Lautier, 2013, p2). Despite the geographical proximity to the European Union (EU), it is patients from neighboring countries on the southern shore of the Mediterranean who have mainly responded to the private medical offer that has developed in Tunisia.' (Rouland, Jarraya, & Fleuret, 2016, p 2).

Indeed, both the tourism and sanitary sectors have been affected by the revolution of January 14, 2011, and the Covid-19 pandemic in 2019. This fact was confirmed by one of the doctors surveyed. The number of patients, especially foreign ones, has decreased significantly over the last two years: the number of local and foreign patients has been affected by the decrease in the number of flights, the closure of borders, confinement and the fear of contamination. Doctors only work during emergency cases and upon clients' appointments. Despite these circumstances, the number of patients remains very high, especially among national and foreign patients of neighboring countries in emergency situations, forced to be admitted to Tunisia (Lycian, sub-Saharan and Syrian refugees).

Figure 13. Influx from Tunisian Governorates and Regions, Intra-Regional and Supra-Regional Medical Polarity
Source: Authors (Semi-directive Quest with Patients)



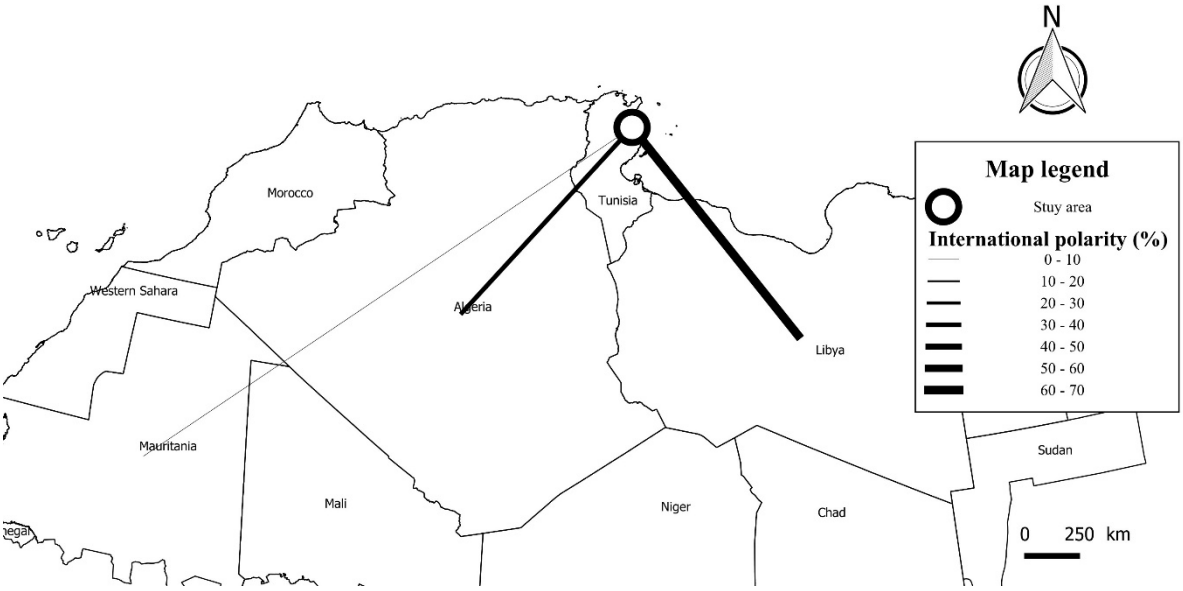
In conclusion, each of the four study areas (A, B, C et D) attracts a centripetal influx of patients (from the origin to the real estate medical buildings of the study areas) of four levels: national, intraurban, intraregional, supra-regional and international. The influx and mobility of patients vary in intensity and distance depending on the area and building. This mobility is not only centripetal but also centrifugal and lateral, departing from the building or medical office to other medical service providers:

- Other buildings which are occupied by diverse sanitary medical and paramedical services;

- A temporary or permanent transitional relay (place of leisure, place of work, place of short-term stay, place of residence);
- Several buildings that are occupied by various services.

The impact of medical real estate development goes beyond the national scale. Indeed, when the medical sector and the tourism sector intertwine, an economically advantageous synergy is created, encouraging the polarization towards the areas of buildings intended for medical real estate development.

Figure 14. Influx of Patients from Foreign Countries and International Medical Polarity
Source: Authors (Semi-directive Quest with Patients



1.2. Influx, Polarity and Economic and Urban Dynamics

In the following, we will analyze the impact of medical real estate development on urban space. The aim is to understand how this urban dynamic contributes to the reconfiguration of urban space and defines a specific mode of fabric: a medical urbanism that obeys the logic of its main actors, the real estate developer, the medical and paramedical service provider and the patient.

1.2.1. Polarity and Centrality

In order to have an idea of the radiation of the medical services and the medical polarity of the study areas, it was assumed that the approximate measure of the distance between the departure point of the most distant patient (the centroid of his or her delegation of origin) and his arrival (the study area where the medical building is located) constitutes the spatial or territorial extent to the medical polarity of the study areas. This method permitted to observe that:

- **Area A** constitutes an intra-urban polarity with an approximate radius of 19.51 km (M'saken delegation) attracting 4.178 % of patients (i.e. 17 out of 355) from Greater Sousse (Table.1, Figure 8). However, this radius and the flow of patients from Greater Sousse are likely to increase after the completion of two buildings under construction;
- **Area B** has approximately the same territorial extent of intra-urban polarity as areas A. Indeed, the delegations of M'saken (18.43 km) and Kalâa Kebira (18.89 km) are the furthest from area A. However, in terms of influx, area A attracts 23.38 % of patients in Greater Sousse (83 out of 355).

The concentration of medical buildings in this same area has increased the attractiveness of other tertiary activities (services shops, etc.), gradually generating the development of areas of urban centrality and mixity;

- **Area C** forms a polarity of 20.08 km (delegation of Kalaa Kebira). The field survey revealed that the polarization of medical services in area C has gradually led to the strengthening of the existing urban centrality and mixity in downtown Sousse. Indeed, area C alone attracts 55.21 % of patients in Greater Sousse (196 out of 355). The number of patients per medical office is 25 patients/day. Since this area is composed of 8 buildings containing 145 premises occupied by medical and paramedical service providers, it can be assumed that the latter polarizes a daily number of 3625 patients towards the city center, not counting the number of accompanying people. This means that the medical real estate development buildings act as a catalyst for medical services, which attract other related services and activities;
- **Area D** forms a polarity with a radius of 5.22 km (delegation of Hammam Sousse) attracting 6.76 % of patients from Greater Sousse (i.e. 24 out of 355).

In conclusion, it has previously been shown that the city of Sousse is characterized by a concentration of medical services polarizing influx of patients at the national and international levels. The proximity of several medical buildings in the same area of Sousse city encourages the development of the offer of medical and paramedical services and of the tertiary activities. As a result, an economic and urban dynamic is created reinforcing the polarity of the areas and their urban centrality. The analysis revealed that the intra-urban polarization and the influx patients from the Greater Sousse to the study areas, have further reinforced the centrality of areas B and C (already located in the city center) and induced the emergence of a secondary centrality in area A.

1.2.2. Transformation of the Surrounding Urban Fabric

Being the most relevant way to analyze the transformation of the surrounding urban fabric, the cartographic analysis made allowed to analyze the urban evolution of the study areas from 2003 to 2024 and to identify the buildings of the medical real estate development built between 2011 and 2024. This gave us an idea of the rise of medical real estate development (especially in 2011) and its impact on the surrounding urban fabric and landscape. The cartographic analysis of urban evolution from 2003 to 2024 (Figure 15, Figure 18-Figure 21) supported by the interviews carried out on-site enabled us to observe the implementation of:

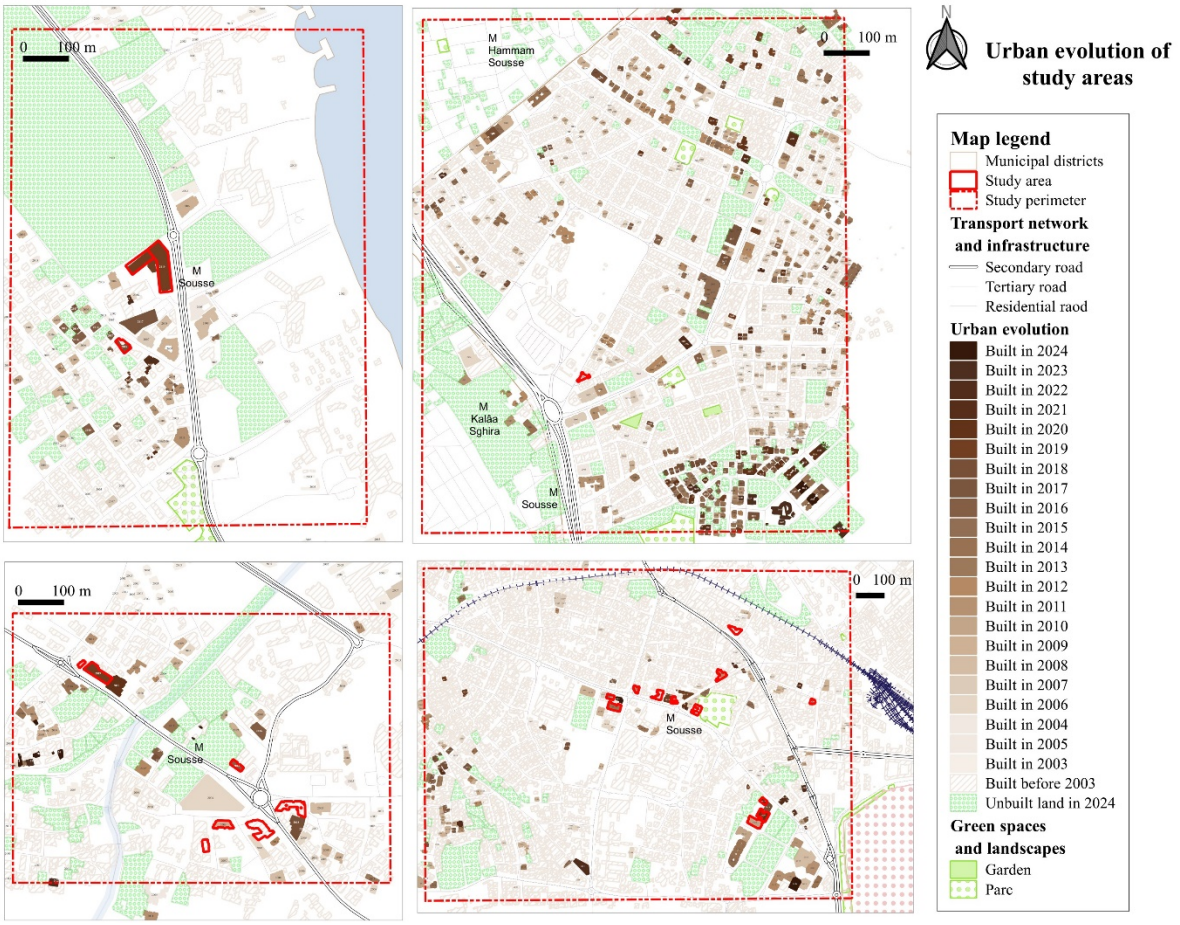
- New medical real estate development buildings in the areas and their surroundings;
- New medical offices;
- New services, particularly paramedics;
- New pharmacies (1 or more depending on the width of the extents of the area);

- **Area A** is in the tourist area of Khezema. During the field visit, it was noted that area A is surrounded on the east side by an area allocated mainly to tourist services and on the west side by a residential area and large areas of small local groceries. The survey revealed that the establishment of the medical real estate development buildings along the street led to the progressive implementation of several aligned services (Figure 31). A share of 73 % of these services are made up of medical services: doctors' offices, dental practices, laboratories, etc. The rest of the services

represent activities related to the needs of visitors, especially of foreign visitors and tourists. We note the presence of:

- Café-restaurants;
- Car rental services;
- Small shops (drugstores);
- Agencies acting as intermediaries to facilitate the stay of foreign visitors: travel agencies as mediators for medical tourism, real estate agencies for seasonal rentals or car and scooter rental agencies.

Figure 15. Urban Evolution of the Four Study Areas (A, B, C et D) from 2003 to 2024
Source: Authors



- **Area B** is also near a tourist area. The on-site survey allowed us to observe that several of the existing activities were established in area B after the construction of the medical buildings. Among the existing sanitary medical and paramedical services (Figure 31), we note the presence of:
  - 2 opticians;
  - 2 pharmacies;
  - 5 medical offices;
  - 1 center of radiology;
  - 1 a shop of medical and paramedical equipment;
  - 1 physiotherapy office;

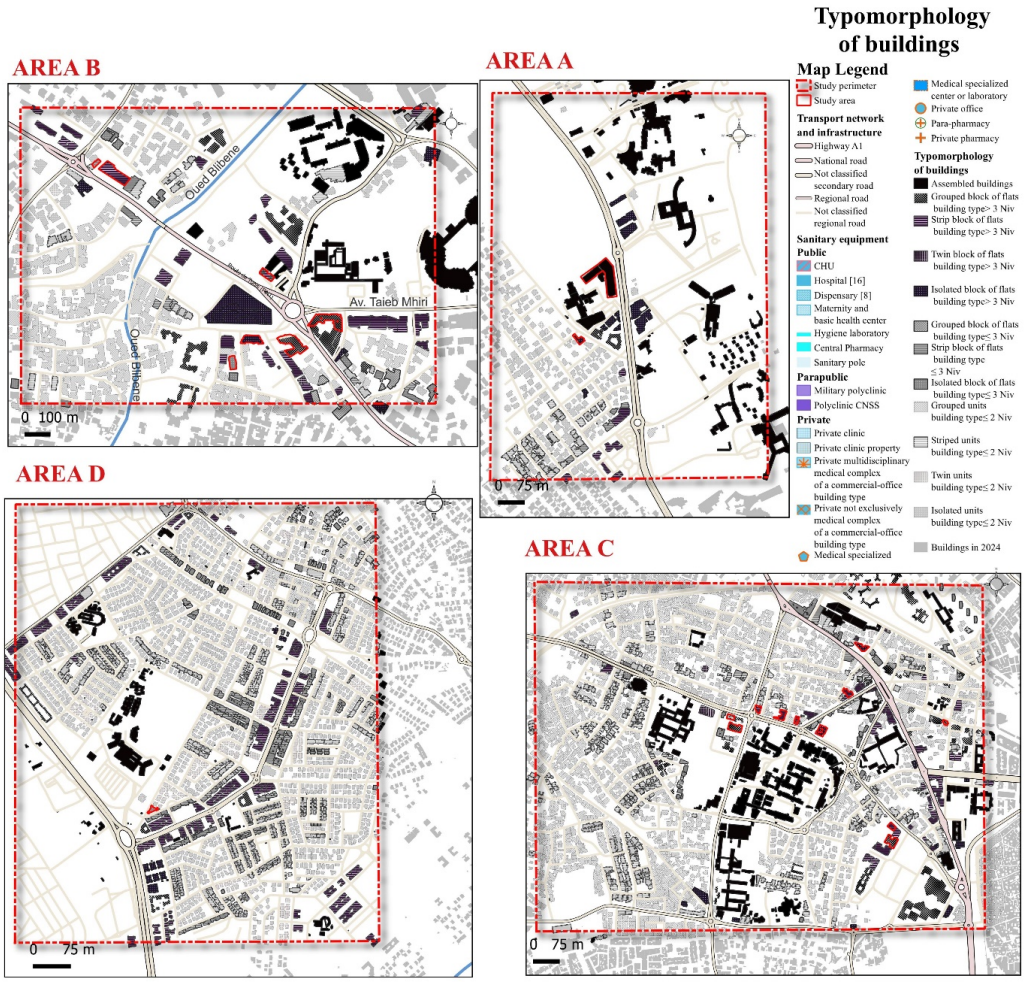
- 1 parapharmacy.

Concerning tertiary activities, we note the presence of:

- 3 premises for seasonal rentals;
- 1 hypermarket;
- 6 café-restaurants;
- 2 supermarkets;
- 3 Small shops.

The owner of the supermarket informed us that the choice of its location was conditioned by the presence nearby of the medical real estate development buildings. He explains: Patients and especially their companions, who often come from other regions, have typical behaviors: they all tend to go for a walk and buy different specific products, particularly food and goods for children. This testimony was confirmed on site, where it was possible to observe visitors shopping after their medical consultations. Similarly, it has been possible to observe that tertiary spaces are mainly frequented by doctors, secretaries and patients. The medical and paramedical staff of these buildings tend to frequent the dining areas during day (mainly for lunch) and night (mainly for dinner), while patients from foreign countries or distant Tunisian regions tend to spend hours waiting there.

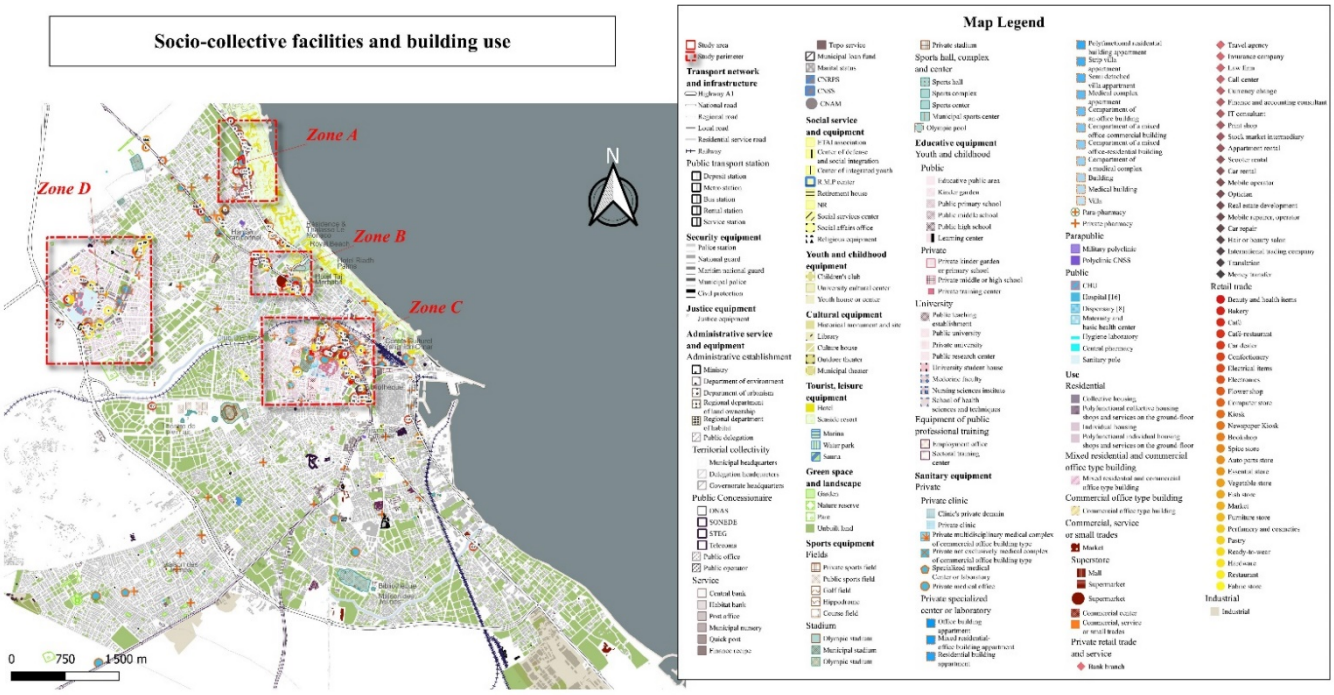
Figure 16. Typo-Morphology of Buildings
Source: Authors



- **Area C** is characterized by the presence of several real estate development buildings. We noted on-site the establishment of medical real estate development buildings grouped together on a plot previously (in 2012) occupied by a barracks. Today, less than 70 % of these office buildings are occupied by medical offices. Even if the probability that these buildings will acquire an exclusively medical vocation is very high, these buildings cannot be classified in the category of medical real estate development for the time being. Indeed, several offices are being marketed. As for the sanitary services surrounding the buildings, we note the presence of:
  - 2 pharmacies;
  - 1 optician;
  - 1 shop for medical and paramedical equipment;
  - A building containing medical offices, particularly dental practices, which is likely to be occupied mainly in the future by sanitary services.

  Concerning the various other tertiary activities, we note the presence of:
  - Several café-restaurants;
  - 1 supermarket.

Figure 17. Facilities and Use of Buildings
Source : Authors



- **Area D** is not subject to major changes because. It is located near Sahloul hospital but within a land intervention perimeter (PIF) of the Housing Land Agency (AFH) (see Figure 22). The medical real estate buildings are located in a commercial area with several services related to the medical field including:
  - 4 shops of medical equipment ;
  - Several Medical and dental offices;

- 1 radiology and 1 imaging centrers.

Regarding the various other services, we note the implementation of:

- An office and residential building located right next to the medical buildings;
- Several catering services (restaurants, tea rooms, etc.), similar to other areas where patients' companions spend hours waiting;
- Several ready-to-wear, beauty and various retail boutiques.

Figure 18. Facilities and Use of Buildings in Area A
Source: des auteurs

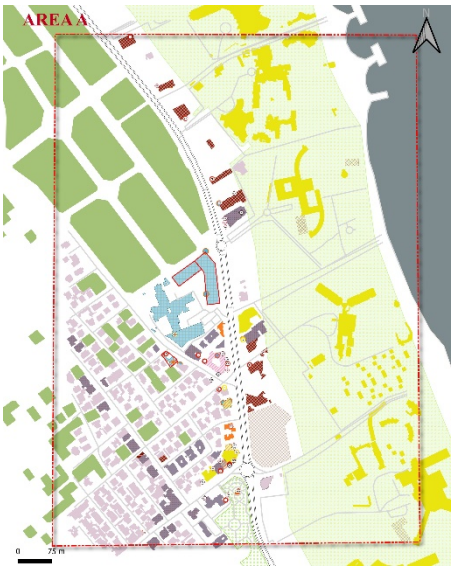


Figure 19. Facilities and Use of Buildings in Area C
Source: Authors

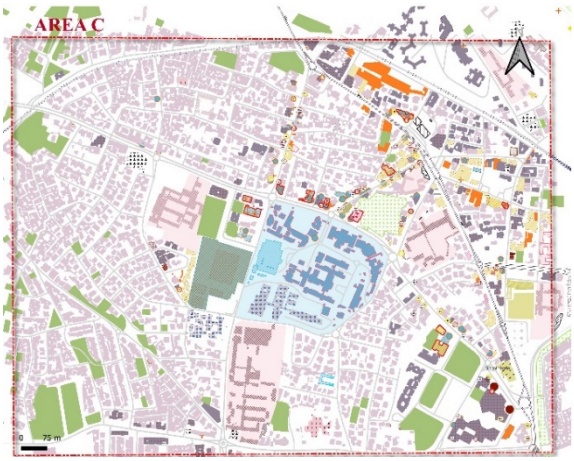


Figure 20. Facilities and Use of Buildings in Area B
Source: Authors

Figure 21. Facilities and Use of Buildings in Area D
Source: des auteurs

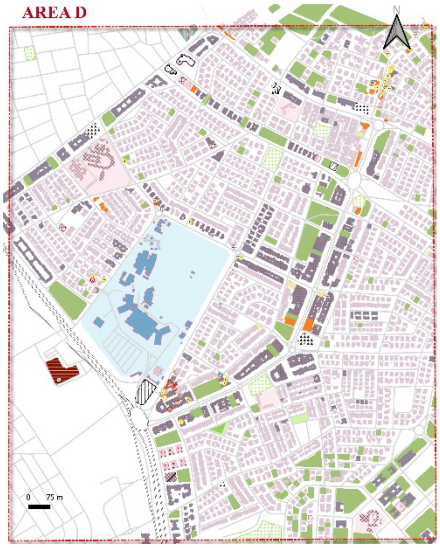
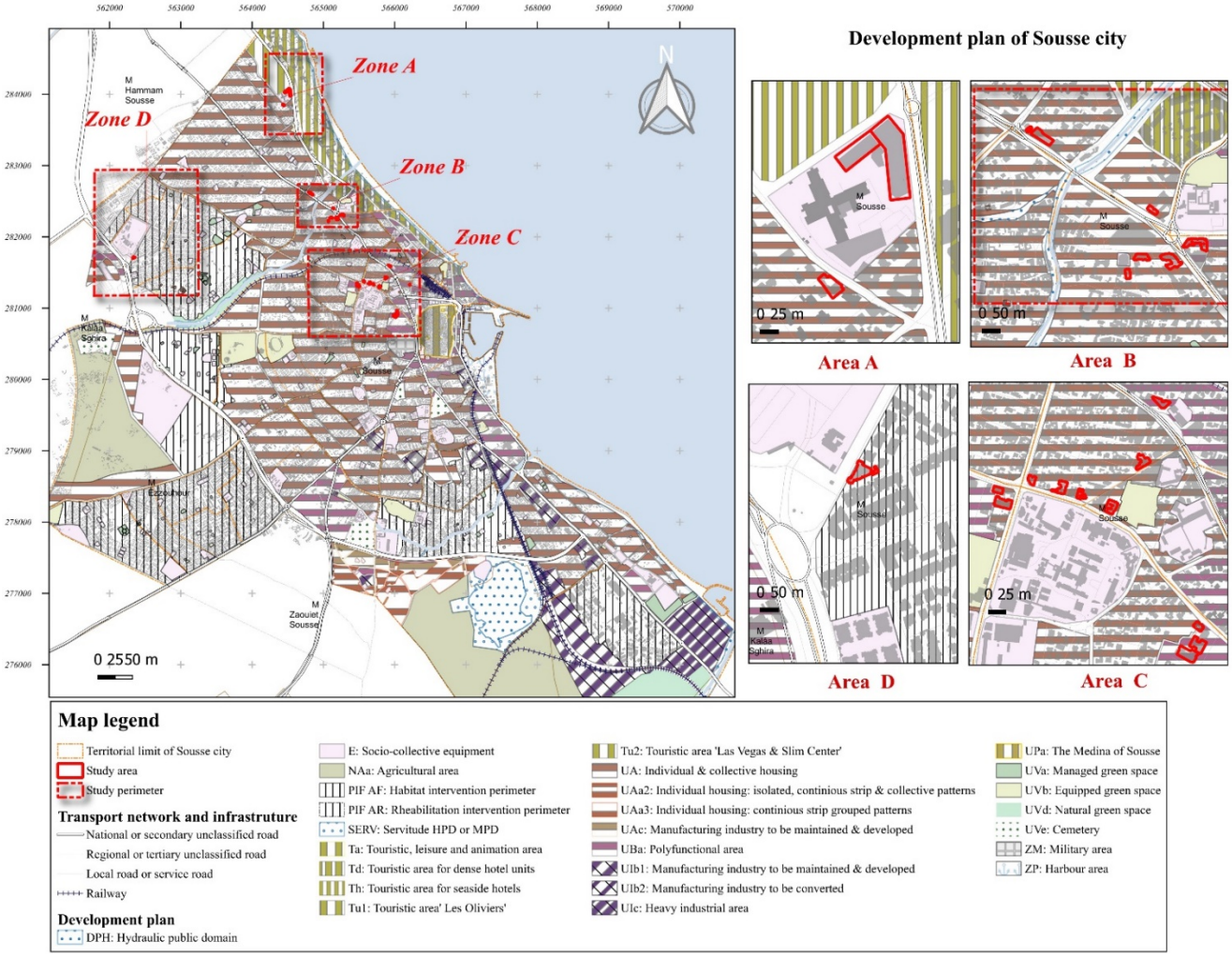


Figure 22. Zoning Allocation of the Four Study Areas (A, B, C et D) According to 2008 Sousse Development Plan
Source : Sousse 2008 Development Plan



To conclude, the analysis has allowed us to observe that the presence in a particular area of real estate development buildings represents a factor of attractiveness for the establishment of other activities and the influx of service providers related in any way to the sanitary medical and paramedical services. These related activities complement the sanitary service offer to meet all the needs of patients and service providers. The interview with the managers of these premises confirmed that medical real estate development is one of the reasons that attracted various traders and service providers. According to the results of the survey, the majority of tertiary activities (supermarkets, shops or drugstores) were set up because of medical buildings. The establishment of certain commercial and service activities has in turn led to the establishment of other services and shops such as cafés, tea rooms, restaurants, drugstores, florists, etc.

Indeed, the daily flow and the frequentation of the buildings by a large number of visitors increases the socio-economic dynamics of the area in question and the probability of welcoming more customers or

patients. This mechanism, which works like a snowball effect, makes it possible to renew the clientele of the medical or paramedical service providers. Among entrepreneurs, 79 % believe that the proximity of medical promotion buildings is very advantageous in relation to the prosperity of their business. It has been observed on-site, in an office building (where the ratio of medical practices is less than 70 %) adjacent to a medical building (targeted by our survey), that the offices are mainly intended for the sale of medical equipment. There is also a radiology center.
In addition, according to the 2008 Sousse development plan, the medical real estate buildings were built in areas intended as 'multifunctional office buildings'. The ground floor is reserved for businesses and the upper floors for services (see Figure 22).

Whether they are medical complexes exclusively intended for the private medical service or commercial office buildings housing various services including the medical service, the field survey revealed (Figure 16-Figure 21) that the majority of medical real estate buildings correspond to the multifunctional 'multi-storey building's typology (offices on the upper floors, commerce and services on the ground floor).
Medical real estate development is a very important source of attraction for tourists and plays, through the dynamics it generates, a crucial role in the economic development of the country. From the design phase to the marketing and occupancy of medical buildings, the medical real estate market generates employment (design offices, construction companies, industrial companies, development companies), encourages the development of medical buildings and of related activities: rental, trade, particularly catering, transport, tourism, etc. According to the 2017 statistics of the Ministry of health, Tunisia usually received an annual number of foreign patients exceeding 1 million and reports foreign currency inflows equivalent to 2500 million Tunisian dinars (flocking for consultations in private offices, analysis in laboratories and medical imaging centers, etc.). It goes without saying that the economic dynamic created by this market, the flows of patients and the polarities generated at different scales in each territory, contribute to its gradual transformation. This urban dynamic often goes beyond the forecasts and orientations of the planning instruments.

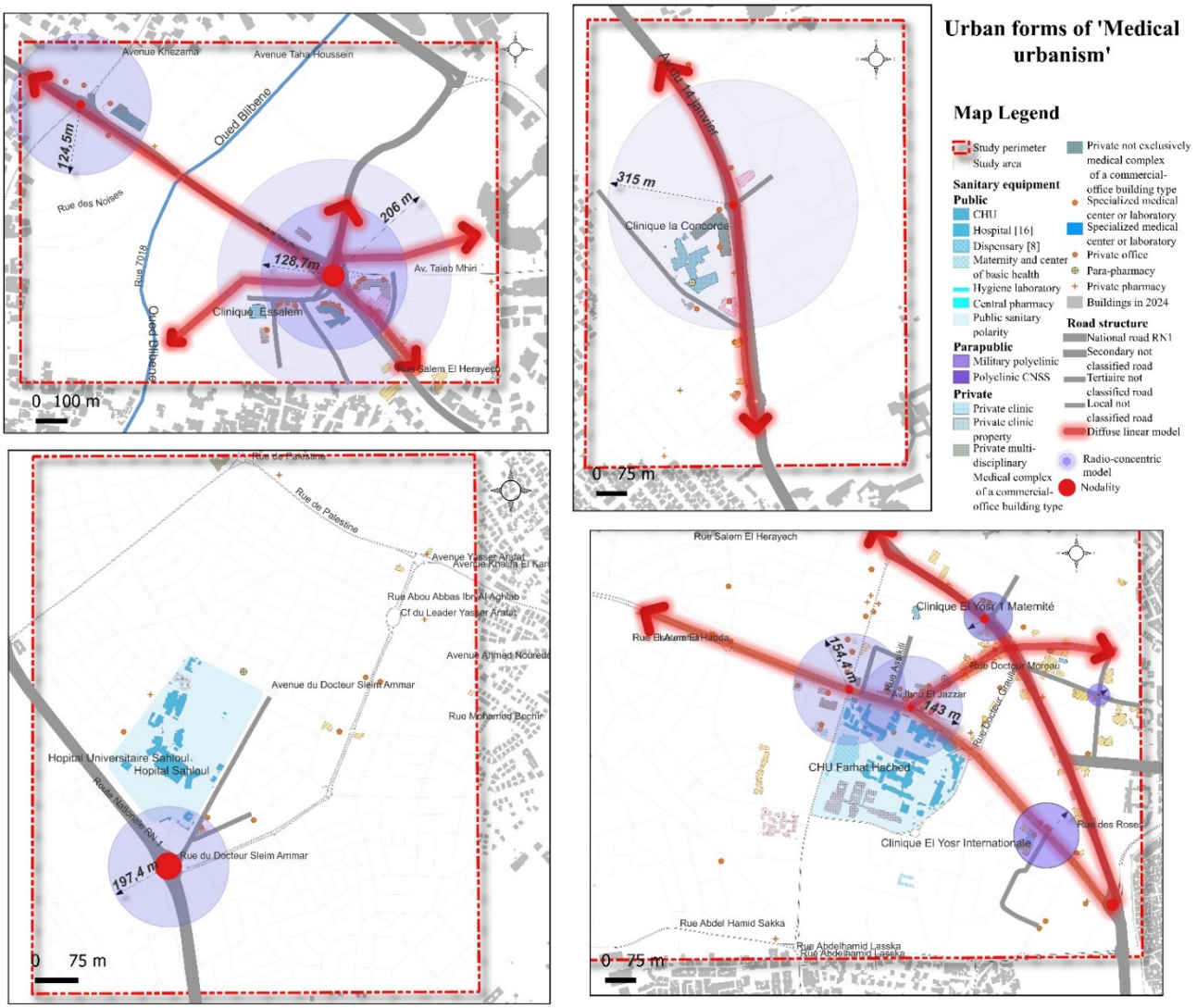
1.3. Urban Forms Composed by 'Medical Urbanism'

The analysis revealed that for the three areas A, C and D, the medical real estate development buildings are concentrated near public and private hospital sanitary infrastructures. In area C, the medical real estate development building is located opposite the Farhat Hached hospital. In area D, the building is located opposite the Sahloul hospital. In area A, the medical offices and buildings are situated near a clinic and juxtaposed as close as possible to it, within a radius of less than 500 m (see Figure 23-Figure 25). According to the investigation, the private medical real estate development buildings in areas A and B were built after the construction of the clinic. In fact, in 2000, several medical real estate development buildings, like the buildings in areas A and B, did not exist.

The semi-directive questionnaires revealed that for both real estate developers and doctors, the proximity of the buildings to hospital sanitary infrastructures (hospital, private clinic), their accessibility and location on a main road or around a road junction or node represent determinant criteria for the choice of the areas. This choice was justified by their desire to minimize the travel to be made, especially in situations of emergency. The combination between public and private hospital infrastructures and medical and paramedical real estate development buildings operates differently in the four analyzed

areas. However, it was possible to identify 2 models according to this combination and its articulation to the road infrastructure: the compact model, the diffuse model. Area D does not represent any model of consolidation since it is a single building occupied by 70% of medical services.

Figure 23. Urban Forms Composed by 'Medical Urbanism'
Source: Authors



1.3.1. Compact Radio-Concentric Model

The compact model can be divided into two depending on the type of combination in the urban fabric:

- **Area A: The Sanitary and Hospital Infrastructures and the Medical and Paramedical Real Estate Development Buildings have a Functional and Spatial Connection**

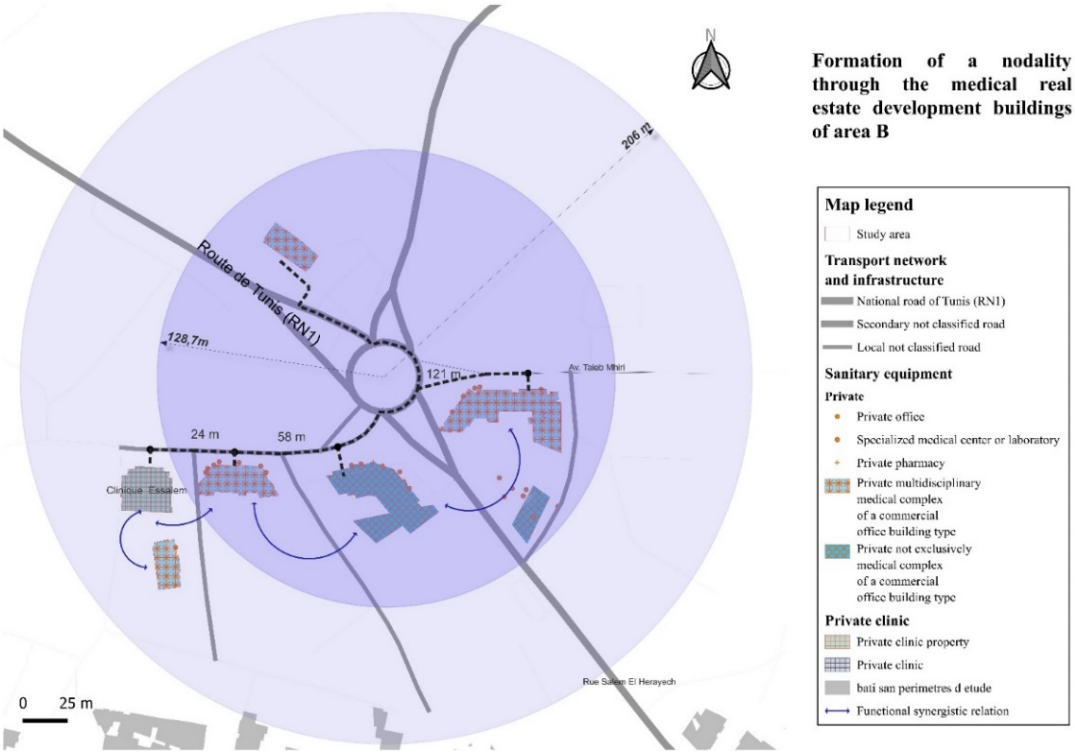
  Concerning area A (see Figure 23), the medical real estate development buildings and the clinic are located on the same block, without any separation by a fence or any physical bollard. Only a medical real estate development building is being constructed on the other side of the street opposite the clinic. The main access to this building is connected with the secondary entrance of the clinic. A distance of 8.29 m separates the 2 entrances. All the 2 medical real estate development buildings and

the clinic function as a medical city. Indeed, among the respondents, one of the real estate developers confirmed that his initial intention was to form a medical city: he created a spatial articulation between the buildings and the clinic to facilitate the professional practices of doctors, their mobility, movement and that of the patients. Moreover, the intention to create a city can be reflected through urban aesthetics (architectural vocabulary and styles) where we note (Figure 28) the standardization of the architectural vocabulary, the use of the same colors, shades and textures for the exterior walls for both the clinic and the private medical real estate development buildings. The latter are assembled to create a single urban entity.

- **Area B et C: The Sanitary and Hospital Infrastructures and the Medical and Paramedical Real Estate Development Buildings Have only a Functional Connection**

Concerning area B, the buildings of the medical real estate development are grouped together to form a circular block around a node (a roundabout). We thus observe the formation of a nodality with a radius more or less equal to 206 m (see Figure 23). Concerning area C, we can see that the radio-concentric model tends to duplicate itself around the intersection nodes, in particular along the main axes such as the Avenue ‘Ibn El jazzar’ (which runs along the block which contains the Farhat Hached University Hospital and the Faculty of Medicine of Sousse) and the Avenues of 'Dr. Moreau' and 'Mohamed Karoui’. The medical and paramedical real estate development buildings and private clinics are becoming denser all around these nodes and along with the main axes, forming a new model: the linear model.

Figure 24. Radio-Concentric Compact Model in Area B
Source: Authors



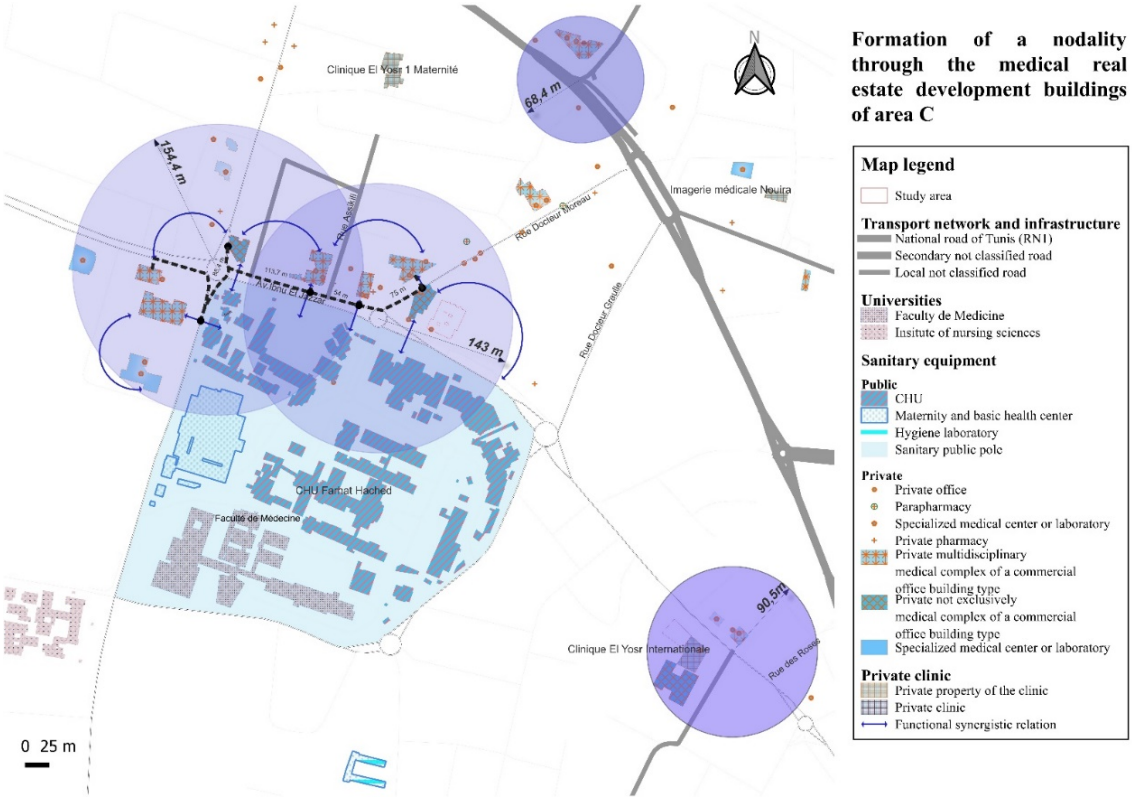
1.3.2. Linear Diffuse Model

This model can also be observed in area D, where the buildings of the medical promotion are arranged linearly along one side of the road and facing the Farhat Hached University Hospital (Figure 23 and Figure 25). The modelling of the implementation of the buildings as related to the hospital with the corresponding distances highlights the concentration of 6 buildings around the hospital, 4 of which run along the opposite bank in front of the hospital and 2 on the same side. Four other buildings are arranged more or less far away around the hospital, the furthest being located at 593 m. These buildings are arranged in a linear manner along the main roads. We also notice that the number of medical buildings decreases as you move away from the hospital.

1.1. Architectural, Landscape, Aesthetic and Urban Forms Composed by the 'Medical Urbanism'

The on-site analysis of the medical real estate development buildings has revealed that the latter generally have a particular architectural style. This architectural style thus generates an urban landscape specific to each of the 4 study areas. Areas A and B are particularly distinguished by the architectural style of their buildings, where the architectural vocabulary reveals a desire for modernity referring to the international style. Open façade with large bay windows and abstract geometric volumes are widely used principles.

Figure 25. Radio-concentric Model, Linear Diffuse Model, and Establishment of Nodalities in Area C
Source: Authors



However, the urban landscape formed by these buildings is far from being harmonious. There are two types of construction:

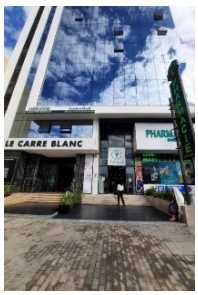
- **High-end Constructions:** The glass facades of this type are generally equipped with large windows allowing better exposure to natural light and its penetration into the interior of the medical offices. The opening of facades and the use of windows to optimize interior lighting and reflective glazing with a predominantly blue color may be motivated by the desire to provide a soothing care space and a feeling of well-being and comfort for patients (Figure 28).

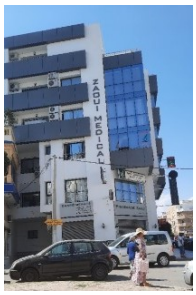
- **Medium-Standing Buildings:** This type corresponds to buildings that were not designed from the outset as medical real estate development buildings, and which have naturally acquired this vocation. (Figure 26 and Figure 27).

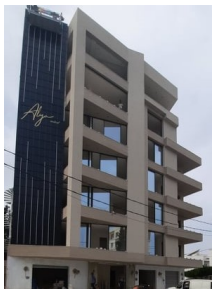
Figure 26. Medium-Standing Building Naturally Allocated to Medical Services
Source : Authors

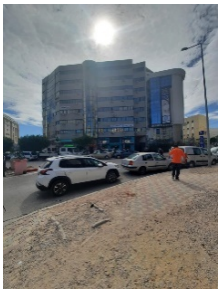
Figure 27. Medium-Standing Building Naturally Allocated to Medical Services
Source : Authors

Figure 28. Glass Facades of High-End Medical Real Estate Buildings
Source: Authors







Whether being high-end or medium standing buildings, it was possible to identify common architectural characteristics to all the medical real estate buildings. The latter must always meet the needs and requirements of the medical staff, the patients and their companions. These buildings are distinguished from the others by:

⇒ Their scale: These buildings generally dominate the cityscape and surrounding buildings. They are distinguished by their surface areas varying between 400 m2 and 4000 m2 and their heights varying between 15m (4 floors) and 27m (8 floors);

⇒ The existence of at least one car park at the entrance and sometimes a second one in the basement;

⇒ The existence of a reception hall on the ground floor preceded by a spacious exterior, a double elevator and external ramps (Figure 29 and Figure 30). The latter are designed to minimize overcrowding during extra hours and to ensure the comfort, rescue and care of patients. Indeed, the well-being and comfort of patients are conditions to be taken into consideration by the real estate developer when designing sanitary spaces. In the time of Covid 19 pandemic, this organization has proven to be very useful for social distancing. Similarly, it makes it possible to limit contagion, manage sanitary crises or other risks of incidents, facilitate the movement and transport of elderly sick patients, disabled patients with reduced mobility;

⇒ The number of cabinets, which varies between 10 and 164 depending on the size of the project;

⇒ The surface area of the offices in the same building varies between 50 m2 and 100 m2. This varies according to the specialties such as the laboratories of analysis, the dental offices, the radiology centers, etc. Specialties requiring the use of heavy equipment require more space.

⇒ The number of blocks: some buildings are composed of two blocks and therefore two different entrances and reception halls.

Figure 29. Access Corridor
Source: Authors

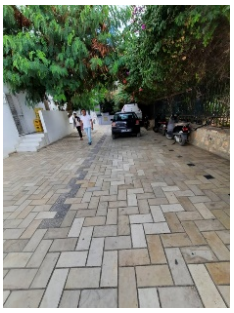
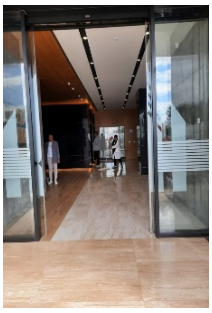


Figure 30. Reception Hall Like That Of A Private Clinic
Source: Authors



Conclusion

To analyze the effects of private medical promotion on the configuration and reconfiguration of the urban space of the city of Sousse and the mode of composition of medical urbanism, we proposed validating the following 3 assumptions.

- **The Polarization of Private Medical Services in the 4 Medical Real Estate Development Areas**

The private sanitary sector polarizes an intra-urban, inter-regional, supra-regional and international supply of services. This assumption 1 has been validated. Indeed, since the 1970s and 1990s (period of the liberal economy), the private sanitary sector, which depends on the public structure for the provision of medical, paramedical and educational services, has been polarizing at all these levels.

- **The Intra-Urban Polarization:** The intra-urban polarization of the private medical real estate development buildings in the 4 study areas generates a flow of 15 among the 16 delegations of the governorate of Sousse (the delegation of Bouficha is not included). Compared to the delegations of Greater Sousse, we note the importance of the flow of patients from Sousse Medina, Sousse Riadh, Sousse Jawhara, Sousse Sidi Abdelhamid, Hammam Sousse, Akouda, M'saken, Kalâa Kebira and Kalâa Seghira). In addition, the impact of medical real estate

development sometimes exceeds the metropolitan scale. Indeed, when the medical sector and the tourism sector intertwine, an economically advantageous synergy is created, encouraging regional, supra-regional, national and international polarization towards the areas of real estate development buildings.

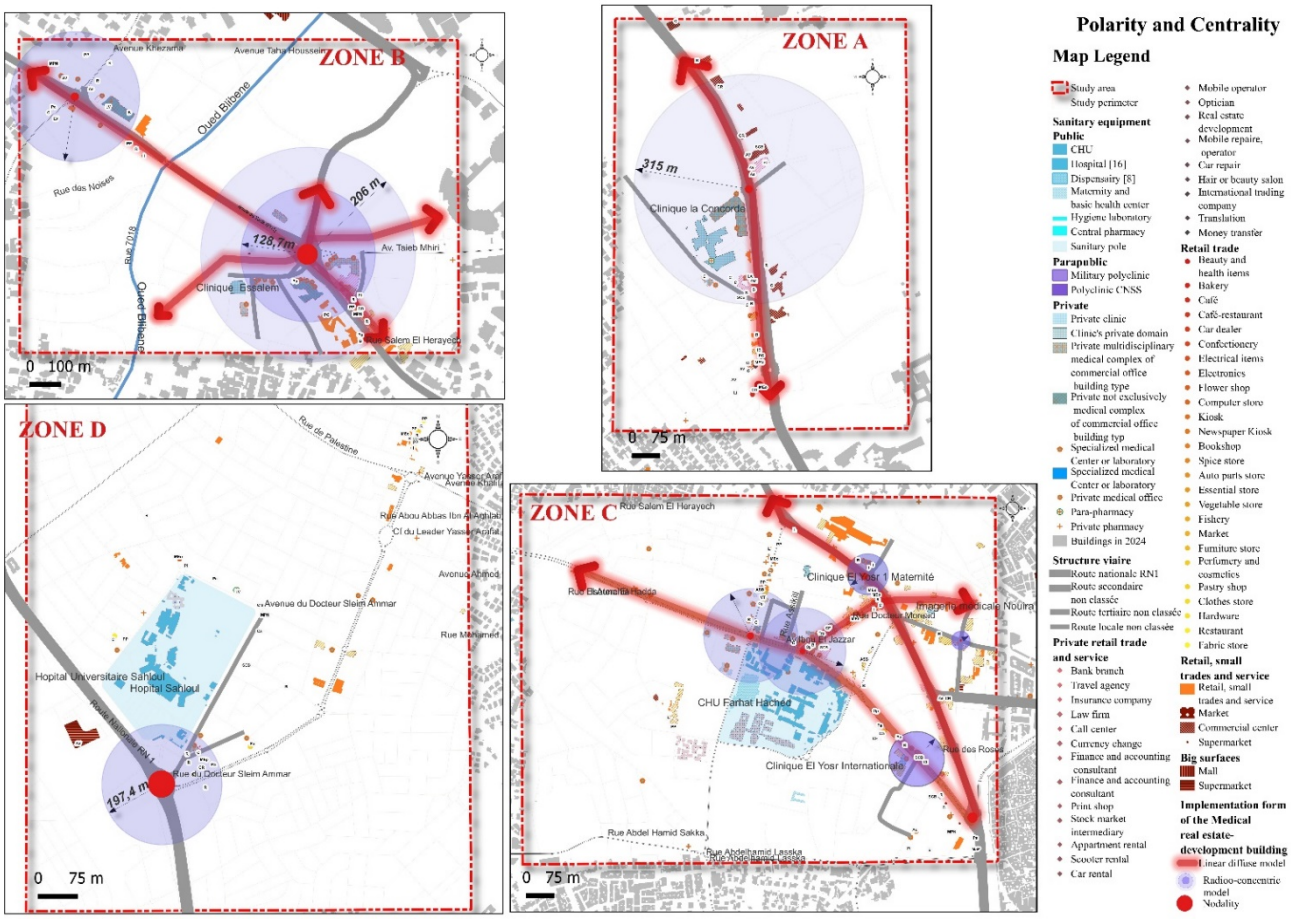
- **Intra-Regional and Supra-Regional Polarization:** An intra-regional polarity implies a radiance that goes beyond the boundaries of the governorate. A supra-regional polarity implies radiation beyond the limits of the region. The radiation and polarity of the medical services in the areas studied are intra-regional and supra-regional (see Figure 7-Figure 11 and Figure 13). The inventory highlighted the origin of Tunisian patients from the Centre-West (governorates of Kasserine, Kairouan and Sidi Bouzid), South and North regions.
- **International Polarization:** the inventory confirmed the influx of a relatively large number of patients from Maghreb countries, mainly Libya, Algeria and Mauritania. Therefore, like other Tunisian metropolises, Sousse represents, a medical tourism hub for nationals of Maghreb countries. This influx is justified by the quality and specialization of the medical services. Sousse is a tourist coastal city that has several assets. It is an agglomeration in the process of metropolisation which is located in the center of the geographical territory of Tunisia. It is easily accessible via the Tunisia-Libya highway, has a seaport and an international airport and an important hotel infrastructure. It represents a transitional relay of the flow of visitors from both inside and outside the country. The capital of the governorate of Sousse, Sousse-city is the urban center that concentrates the majority of public and private services and facilities, particularly of sanitary medical type.

- **Polarity and Centrality**

The establishment of health facilities in each area generates an urban dynamic through the influx of local and foreign patients to these areas, which in turn polarizes the activity of medical real estate development, which generates the development of related or complementary activities in neighboring areas, thus reinforcing their polarities and centralities. This assumption has been validated. This phenomenon in turn leads to the development of related or complementary activities in neighboring areas. It works in a loop and is at the origin of the creation and reinforcement of polarities and centralities. The analysis of the outcomes of medical real estate development has enlightened us on the existence of a link between the location of medical buildings and the formation or strengthening of urban centrality. The establishment of these medical buildings, which follows a logic imposed by the market of supply and demand (which is mainly governed by the 3 stakeholders: the real estate developers, the medical service providers, the patients), instantly triggers a cyclical process of cause and effect, a mode of spontaneous composition that gradually acts on the spatial reconfiguration. Buildings intended for medical promotion attract medical services, which in turn attract other complementary sanitary services and activities (medical: pharmacies, opticians, laboratories, etc.) or tertiary services (catering and food, real estate rental, tourism). The attraction and influx of patients increases, transforming space into medical polarity. This polarization of private (or public-private) medical activities creates an economic dynamic that encourages the concentration of other activities in the same area and generates functional and spatial centrality. The polarization of its services at the intra-urban level anticipates the formation of new medical centers, secondary centers and sometimes reinforces existing centralities. Indeed, it is located in the city center and already enjoys several public and private services, particularly tertiary and

medical (it contains the oldest medical center in the city of Sousse and its first university hospital). Of all the areas, area C attracts the largest total flow. It is characterized by a significant polarity of private medical services, justified by the increase in medical private real estate operations all around and resulting in the densification of the surrounding urban fabric and the strengthening of its centrality.

Figure. 31. Polarity and Centrality
Source: Authors



- **Transformation of the Surrounding Urban Fabric**: The establishment of real estate development buildings in a territory is an attractive factor for the establishment of other related activities that are supposed to complement the sanitary service offer and meet the needs of patients and service providers. The daily flow and attendance of the buildings is a guarantee of profitability for the establishment of any tertiary activity in the area. The socio-economic dynamics created over time a change in the surrounding urban fabric.

- **Urban, Architectural and Landscape forms of Medical Urban Planning**

The medical real estate development influences the composition of urban fabric and establishes a mode of production of specific urban, architectural and landscape forms. This assumption has been verified. The modeling of the combination in the 4 study areas between the various public and private hospital infrastructures, the buildings of the private medical real estate development and the road infrastructure has made it possible to identify 3 models of urban configurations: the radio-concentric model, the linear diffuse model and the compact model (medical city). The formal and functional articulation, or both,

eventually forms an autonomous urban 'set' that can be described as a 'medical city'. The on-site analysis of the medical real estate development buildings has enabled us to note that they generally have a specific architectural style and an urban aesthetic affecting the urban landscape. The style used in new buildings is generally similar to the international style (large windows and glass facades with reflective glazing predominantly blue). This style, the industrialized materials used, and the scale of the buildings denote the concern to producing high-quality, modern constructions equipped with the best technologies and with the optimum conditions in terms of comfort and equipment. In addition, this study has made it possible to identify another potential theme that deserves to be developed in the future: the impact of real estate development on territorial development by focusing on the link between medical real estate development and tourist development. Indeed, in Sousse, several hotels now include paramedical structures. Similarly, several private sanitary services are focusing on leisure and international tourism to develop both the tourism and the medical sectors. It would therefore be conducive to studying this phenomenon, especially since it is becoming necessary to consider the sanitary risk in tourism or other sectoral policies.

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