

The Influence of Mother-City Urban Planning on Satellite Cities: A Case Study of Constantine, Algeria

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Article Info

Volume 83

Page Number: 2712 - 2725

Publication Issue:

March - April 2020

Article History

Article Received: 24 July 2019

Revised: 12 September 2019

Accepted: 15 February 2020

Publication: 20 March 2020

Abstract:

The urban planning policy that has been applied in the city of Constantine has contributed to the creation of an urban dynamic towards its periphery and satellite cities. The policy sought to solve the problem of urban growth, in the face of concern about the preservation of agricultural land and the spread of areas of natural hazards such as landslides and floods. In this context, satellite cities appear as a strategic option to solve this problem according to the direction of successive urban development plans. Satellite cities are supposed to contain urban growth; in Constantine, this is achieved through the redirection of surplus population and the provision of extensive land for urbanization. These opportunities offer significant possibilities for extension and the realization of different residential and equipment projects. The aim of this paper is to highlight the variety of relationships as well as their intensity with the mother city, without forgetting to appreciate the degree of dependence on Constantine.

Keywords: Urban growth, urban planning, urbanization, mother city, satellite city, city of Constantine, Algeria.

I. INTRODUCTION

Since the twentieth century the growing urbanization of large cities has been of great importance to planners regarding what should be done to control it. Many experts argue that the problems arising from the unprecedented urbanization of the largest cities and the growing number of their population differ, from a quantitative perspective, from previous urban problems, thus it requires a new form of urban planning (Sorensen, 2001). International examples have served as models for solving such problems at a broader spatial level to include urban areas surrounding large cities, as these areas are characterized by intermingling and multi-functionality, it has complex urban structures in terms of the dynamics of population growth, transformation of the economic structure and complex change in land use (Follmann et al., 2018). This fact calls for the development of centers spread

in areas surrounding Large cities within the concept of satellite cities that emerged more clearly in Britain and the United States of America, in order to reduce the pressure of life, employment and traffic problems in the mother city, by giving these satellite cities a fixed function to achieve a level of independency based on the principle of rational and balanced urban planning (Yan, Li, 2015). Thus, the majority of world's largest cities have adopted urban planning strategies aiming at decentralization, the development of satellite cities that represent annexes urban centers, the formation of inclusive patterns of urban growth in metropolitan areas (Cohen, 2004), to address the various problems of high population growth, the broad urban extension, employment opportunities and upgrading the level of services so that there will be no need to go to the mother city (Merrilees, 2013). In Algeria, the urban phenomenon has been confirmed since independence in 1962 and even earlier, and the number of agglomerations is

growing at a steady pace. The 95 agglomerations listed in 1966 had increased to 751 in 2008, giving rise to an urban system that manifests itself in the predominance of four major cities: Algiers, Oran, Constantine and Annaba (ONS, 2011). This is evident in the presence of small and medium-sized cities in a diffuse national framework, but their distribution is unbalanced, with large agglomerations in the north and a vulnerable network in the south (Boulbir, 2004).

Urban growth in major cities has been somewhat saturated since the 1987 census and official readings remain optimistic. Indeed, since 1980, major Algerian cities have undergone a policy first of limiting growth through the halting of job-creating investment and, secondly, since 1986, by narrowing social housing programs (Boumaza, 1994). Rapid urban extension has attracted more rural residents and deepened the problem of imbalance between existing housing and population (Lakehal, 2003), particularly given the shortage of infrastructure and facilities accompanying housing (Rahmani, 1982). This reality motivated the creation of new residential suburbs in the form of large urban settlements without due attention to their functional composition. However, at the beginning of the 1980s, urban gained a further dimension through the creation of new urban residential areas. This occurred due to the speed in achieving and absorbing a large number of modern housing enterprises (collective, individual) (Hafiane, 1983) which contain different facilities and jobs.

II. PROBLEM AND HYPOTHESIS

Constantine, the third city in the Algerian urban framework, continues to be a receptacle of population growth and its demands. Acting under the spell of urgency and, to meet the needs of its population, urbanization of the city has taken two forms (Boudjabi et al., 2018). A first form was planned and supported by the local services of the State, using the tools of urbanization. A second, spontaneous, form has been the result of the private initiative of the inhabitants, in the margins of the

official city and its planning structure (Benidir, 2007). Even before finding a solution to the situation prevailing in Constantine, the very high demand for housing and facilities combined with the small size of the territory and the lack of urbanized land forced officials to postpone growth. The first report was made regarding Khroub, Ain Smara, Didouche Mourad and Hamma Bouziane, all satellite cities. The latter had served as a land portfolio to cover the needs of the mother city (Constantine). Even before these had reached saturation, Constantine had carried out another postponement of growth and thus a satellite city was started on the plateau of Ain El Bey. Thus was born the new city "Ali Mendjeli".

The city of Constantine and its satellite cities (Khroub, Ain Smara, Didouche Mourad, Hamma Bouziane and Bekira) represent a model that helps to clarify the role of the satellite cities in relieving pressure on the mother city. The Lack of equipments in the satellite cities as well as the spatial organization which link them to Constantine have introduced an intense mobility of the inhabitants of the satellite cities, whose flow is essential directed towards the mother city and which imply a certain dependence of these satellite cities, thus derogating from the principle which implies that their the majority of the population will be faithful to them on a daily basis, the objective of this study will be to examine this mobility in order to highlight the types of relations that these satellite cities maintain with the mother city, the role of each, and the differences between them.

III. LITERATURE REVIEW

The Greater London Plan of 1944, prepared by Patrick Abercrombie, represents the first study of satellite cities as a solution to the problems of the growing of large cities (housing problems, transport, overcrowding, pollution) from the point of view of decentralization (Sorensen, 2001), in the 1970s and 1980s, emphasis was placed on the practical assessment of urban planning and development strategies (Fung, 1981), urban planning is then related to addressing sustainability issues in terms of

energy, transport, pollution, noise... and its impact on the general patterns of urban form. In the beginning of 2001, interest in studying the role of satellite cities emerged again in Tokyo metropolitan area by developing some cities located on the Yamanote railway, such as Shibuya, Shinjuku and Ikebukuro, to absorb the increasing growth in the Tokyo metropolitan area, to enhance urban development with multiple centers and their impact on living patterns, employment and mobility, taking into consideration that Tokyo is one of the largest urban areas in the world (Sorensen, 2001).

This is followed by the publication of several studies that dealt with the problems of satellite cities, the majority of these studies focused on Chinese cities, particularly the satellite cities of Shanghai (Fung, 1981; Atash, Wang, 1990; Xiaopei, 1994) to increase the number of economic activities and to achieve the decentralization that results in offering employment opportunities and high level of standards of life in satellite cities. Another study conducted in 2013 concerned with the promotion of the satellite cities brand as a policy to address the problems facing satellite cities and the stressful lack of some economic, social and cultural, activities through focusing on two satellite cities in Australia, namely Ipswich and Logan (Merrilees et al., 2013). There was an interest to analyze the nature of the relationship between the satellite cities and the mother city in 2015 by looking for a model suitable for the development of satellite cities, relying on its domestic resources to achieve some kind of relative independence from the mother city and promote balanced and harmonious urban development. The city of Mancheng provides an example of this study in Hebei province in China (Yan, Li, 2015).

In 2016, an evaluation was made of the urban planning of the satellite cities and the shortcomings of this planning which resulted in lack of modern and future amenities and missing the features of sustainable cities in satellite cities. This phenomenon is represented in the case of the satellite cities around the city Dekka in Bangladesh, which was

accomplished in order to solve the housing problems facing the mother city Dekka, while there are limited opportunities for finding lands for construction in the urban area the fact that suggests the need to integrate land use, transport, urban design and local plans to make housing projects in satellite cities for the future while maintaining open spaces and marine spaces taking into account the sustainability dimensions of wastewater treatment and management of Solid waste in the context of good urban governance (Hasnat, Hoque, 2016). On the other hand, attention was paid to the urban planning of the satellite cities in LATVIA and to its role in improving the welfare of the inhabitants of these satellites based on eight (08) indicators which allowed the identification of 14 satellite cities around the mother city of "Riga", while ensuring the well-being of society by the local government through its various administrative, financial and political tools within historical, demographic and political challenges (Jekabsone et al., 2016). Recently, modern technologies have been used (Mayunga, 2018) to analyze the dynamic changes in land use in the periphery of large cities where the satellite cities exist, through the development of modern maps of urban and semi-urban development using high-resolution satellite imagery and geographic information systems. the rapid loss of agricultural land, and a significant shift in land use from rural to urban areas (Follmann et al., 2018).

IV. METHODOLOGY

Based on the fact that satellite cities vary in their characteristics and conditions of development depending on the problems experienced by the mother city and the adopted policy of urban planning, this required to rely on a methodology based on the theoretical references related to urban growth in large cities, as well as published scientific researches to find out the most important case studies that dealt with the role of satellite cities in reducing the pressure on the mother city and solve the problems facing these satellite cities. The field survey was also based on the sample questionnaire

distributed to a random sample of 10% of the total number of households in each satellite city, to form a statistical database for analyzing and comparing the level of functional independence achieved in each satellite city, in order to understand the influence of mother-city urban planning on satellite cities in Constantine (Algeria).

Constantine's urban growth under urban plans

Constantine occupies an important position in the north-eastern part of Algeria; it is located in the middle of Algeria's eastern region, which is one of the main economic and demographic regions in Algeria (Bouchareb, 2006). It is located between two distinct regions: the tell region in the east and the high plateau region in the south, and two important urban networks: the littoral urban network in the north and the interior network in the south (Boussouf, 2008). This geographical situation allows Constantine to act as a radiating pole and form regional and even international relations (Figure 1).

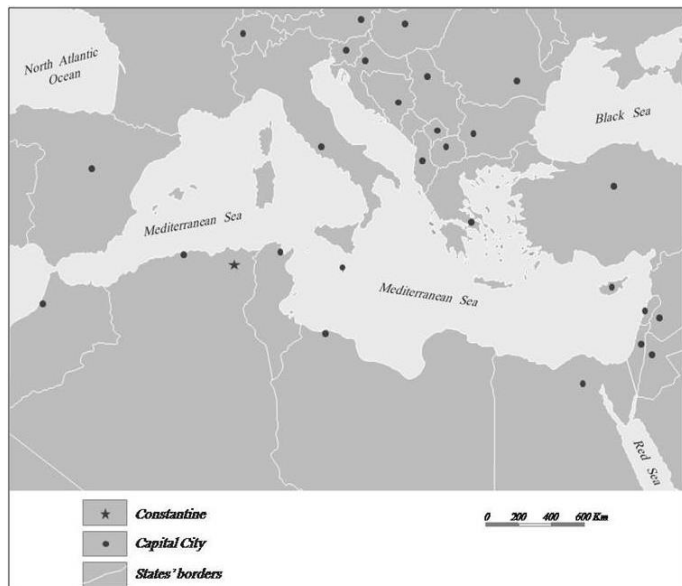


Figure 1. Geographical situation of the city of Constantine.

Source: WWW.MAPSOFWORLD.COM, 2016 + Personal treatment for researcher.

Constantine is the largest city in the east of Algeria and the third largest city in terms of population size. This is due to significant influxes of migrants that have contributed to the rise of net migration (Table

01). In terms of physical aspects, Constantine demonstrates unique characteristics. It is composed of a number of high hills and plateaus, and the valley of Oued Rhumel and Boumerzoug, besides steep slopes and Rhumel gorges. The complexity of the relief affects the discontinuity of the topographic units, the structure of the urban morphology and prevents the harmonious extension of the city (Boudjadja, 2014). This limits the available urbanized land, such that it becomes very scarce in light of the preservation of agricultural land and the spread of natural hazard areas (for example, landslides and floods). As a result, the city suffers from spatial dysfunctions, revealed through increasing demand for land and the difficulty of obtaining it to meet the needs of its population, making the possibility of further extension on the site very limited. In order to control the organization of the city's growth, many urban plans have tried to find adequate solutions to this constraint. This considered that the growth of Constantine lies within the boundaries of its local urban environment (Nait-Amar, 2015). This option facilitated the provision of housing on the 'Manssoura' Plateau, and the hills of Bouferika and Bellevue, in addition to industrial areas of 650 hectares on the banks of Oued Rhumel and Boumerzoug, while restructuring the city's urban area and ensuring the fair distribution of administrative and service facilities (CALSAT, 1961). However, after national independence, the annual growth rate increased to 3.15% because of a rural exodus, resulting in the spread of spontaneous neighborhoods in natural hazard areas coupled with the growth of unplanned quarters. These urban problems prompted the elaboration of another urban plan in 1974. The plan proposed a city extension towards two axes: the eastern axis and the western axis. With additional major facilities such as a university, sports compound and industrial areas, only 250 hectares of land was left within the city's urban perimeter (Figure 2). To address the scarcity of land for development, the urban plan required the orientation of Constantine's urban growth towards satellite cities (Khroub, Didouche Mourad and Aïn

Smara) to take advantage of their facilities and location on the main national road axes. infrastructure, as well as the proximity of their

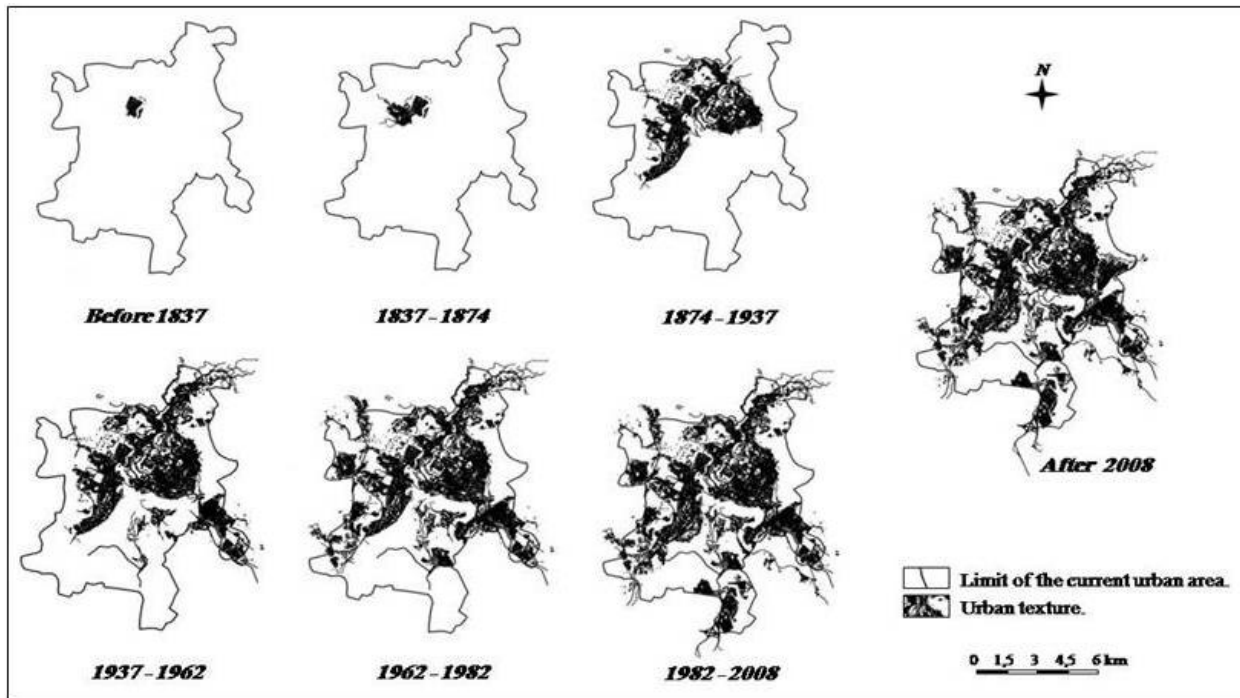


Figure 2. Urban expansion of the city of Constantine.

Source: Yahia, 2017.

However, the programmes established in the plan were no longer adequate to meet all of the city's spatial needs. Urban development continued to be chaotic because of the shortage of site resources and the scarcity of land for urbanization. In order to solve the problem of the city's growth, another plan was established in 1982. This urban guidance scheme included an urban group, which consisted of the following agglomerations: Constantine, Khroub, Ain Smara and Didouche Mourad (CNERU, 1982). The scheme included the following directions:

- The transfer of Constantine's population surplus to the small cities located on the axis of national roads No. 05 and No. 03, namely: Khroub, Ain Smara and Didouche Mourad, in order to benefit from the availability of infrastructure which was realized within the framework of the urban planning programmes.
- The creation of a new city on the plateau of "Ain El-Bey", 13 km south of the city of Constantine.

- The conception of new urban residential areas in the western side (Bousouf) and in the north-east (Djabal El-Wahsh, Bekira and Sarkina).

In 1998, a new urban development plan proposed the growth of Constantine within the regional area of the city. Therefore, the plan covered only five

municipalities: Constantine, Khroub, Ain Smara, Didouche Mourad and Hamma Bouziane. The goal was to solve the problematic of the city growth and to balance the distribution of population in the surrounding municipalities. In addition, the plan focused on the new town Ali Mendjeli to make it an urban pole to alleviate the pressure on the municipality of Constantine (URBACO, 1998). These factors motivated the creation of new towns as a strategic option to solve the expansion crisis. Indeed, the satellite cities absorbed the excess growth and the extension of the city of Constantine. The site of these settlements offers larger opportunities in terms of land for different

residential and infrastructural programmes to meet the needs of the transferred population (URBACO-EDR, 2006). The roles attributed to the satellite cities reinforce their position and relationships with the mother city.

Satellite cities as poles for growth and expansion

The importance of these satellites is their proximity to Constantine and along the most important national roads (NR number 03, 05, 20 and 10) (Figure3).

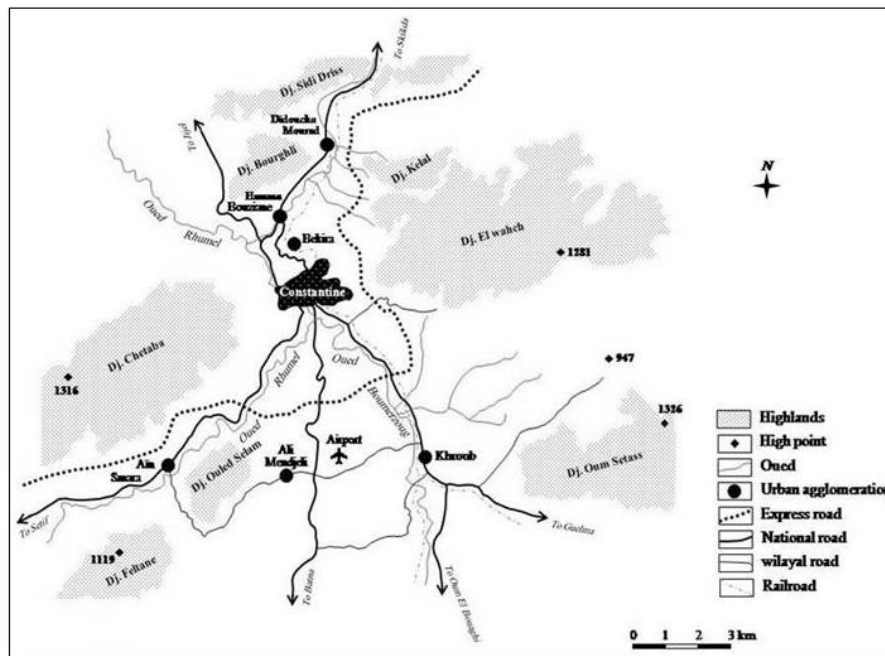


Figure 3. Geographical situation of the Satellite cities.

Source: Benghadbane, 2001.

During the French colonization period, these satellite cities were built as transit centers in the form of villages to accommodate the European arrivals. During the 1970s, as part of Algeria's intensive industrialization process within central development plans (Cherrad, 1999), the satellite cities benefited from several industrial zones based on many mechanical industry units. which reached the extent of a spatial crisis towards the surrounding towns (Lakehal, 2013). The latter presented an important potential for the area to receive the new population of Constantine. Thus, this situation presented a spatial dimension in the renewal of relations between Constantine and its satellite cities.

A demographic dynamic towards satellite cities

Through the various demographic data indicated in Table 1, we record a continuous decline in the

annual growth rate of Constantine's population. In contrast, the satellite cities (Khroub, Aïn Smara, Hamma Bouziane, Didouche Mourad and Bekira), registered a progressive increase of their annual population growth rates as a result of their reception of the population surplus. This transfer of population differs from one city to another and from one period to another. The aim is:

- First, to preserve the agricultural land surrounding the satellite cities especially with regard to Hamma Bouziane.
- Secondly, to achieve a balance in the distribution of the population within the urban group of Constantine.

Thus, the satellite cities are the receptors of the growth and expansion of Constantine through the policy of emptying its population surplus. This

reality is confirmed by the ratio of net migration during all the periods from 1966 to 2008. In addition to the new urban policy adopted in Constantine after the social and economic transformations, the city benefited from many major urban projects such as the giant bridge Saleh Bey, international hotel chains

and tramway (Rebai, 2010). This prompted the transfer of inhabitants from chaotic, ill-planned and crowded neighbourhoods (such as in Manssoura and Bardo) and those neighbourhoods located in areas of natural hazards to the satellite cities, especially Bekira and the new town of Ali Mendjeli.

Table 1. Constantine and the satellite cities: Annual Growth and Net Migration Rates (1966-2008).

Variables Cities	Population (inhabitants)					(% Annual growth rate				(% Net migration rate			
	1966	1977	1987	1998	2008	66/77	77/87	87/98	98/08	66/77	77/87	87/98	98/08
Constantine	245,621	345,566	441,651	478,969	418,672	3.15	2.48	0.74	-1.34	-0.86	-41.39	-58.33	-31.18
Khroub	9,529	14,962	36,924	65,344	89,251	4.18	9.45	5.32	3.17	+15.45	+77.58	+10.18	+17.99
Hamma Bouziane	11,473	19,252	29,203	36,698	41,945	4.81	4.25	2.09	1.34	+26.24	-17.50	-41.11	-4.30
Ain Smara	3,564	4,932	8,839	28,292	40,819	2.99	6.00	11.15	3.73	-3.14	+10.01	-153.30	+25.68
Didouche Mourad	2,082	2,815	10,558	19,980	32,057	2.78	14.13	5.97	4.84	-6.34	+205.86	+22.46	+41.85
Bekira	1,406	2,370	4,850	14,076	30,000	4.86	7.42	10.17	7.86	+27.02	+35.44	+123.46	+94.53

Source: Data from general population and housing censuses.

Multi-faceted transformations of satellite cities

The most important of these transformations are demographic mutations, the data in table 1 on the demographic development of these satellites, the size of these cities has doubled in 30 years and their annual rate of growth and the net migration ration

have increased at an accelerated pace, accompanied by a continuous decline of these population indicators in the city of Constantine. This can be explained by the role of migration through the process of population transfer in different periods. The study of the geographical origin of the satellite cities population confirms this trend. The study relies on survey data as illustrated Table 2.

Table 2. Size of the Population Arriving in the satellite cities (2018).

Population Satellite cities	Indigenous population		Expatriate population		Total	
	Number	(%)	Number	(%)	Number	(%)
Khroub	1,667	19.73	6,783	80.27	8,450	100
Hamma Bouziane	1,739	42.62	2,341	57.38	4,080	100
Ain Smara	766	19.00	3,264	81.00	4,030	100
Didouche Mourad	698	22.09	2,462	77.91	3,160	100
Bekira	360	12.00	2,640	88.00	3,000	100

Source: Field investigation, 2018.

It is evident from the table that the percentage of the population coming to the satellite cities is higher than that of the original population, and they vary according to their geographical origin. The percentage of people coming to these cities from Constantine ranges from 82.01% as the highest value, in Bekira and 48.14% as the lowest value, in

Hamma Bouziane. This can be explained by the process of population unloading by the city of Constantine towards all the satellite cities, and mainly Bekira, Didouche Mourad and Khroub .In addition, the cities receive people from the various municipalities of Constantine and some other wilayas, as shown in Table 3.

Table 3. Geographical origin of the population coming to the satellite cities.

Expatriate population Satellite cities	From the city of Constantine		Of the rest of the municipalities of Constantine		Municipalities of other wilayas		Total	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Khroub	5,495	81.01	965	14.23	323	4.76	6,783	100
Hamma Bouziane	1,127	48.14	747	31.91	467	19.95	2,341	100
Ain Smara	2,068	63.36	884	27.08	312	9.56	3,264	100
Didouche Mourad	1,306	53.05	862	35.01	294	11.94	2,462	100
Bekira	2,165	82.01	258	9.77	217	8.22	2,640	100

Source: Field investigation, 2018.

We record here that the majority of those coming from outside the wilaya of Constantine are cadres of the university or the industrial zones and areas of commercial activities scattered in the satellite cities and in Bekira. The reasons for people migrating differ according to Table 4.

Table 4. Reasons of immigration to satellite cities.

Satellite cities Causes	Khroub		Hamma Bouziane		Ain Smara		Didouche Mourad		Bekira	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Search for accommodation	1,087	19.78	334	29.64	367	28.10	784	37.91	1,026	47.39
Work	3,033	55.20	418	37.09	532	40.74	718	34.72	524	24.20
Disasters	1,237	22.51	268	23.78	279	21.36	558	22.15	539	24.9
Other reasons	138	2.51	107	9.49	128	9.80	108	5.22	76	3.51
Total	5,494	100	1,127	100	1,306	100	2,068	100	2,165	100

Source: Field investigation, 2018.

The data show that the major reason for migration (38.39%) is to seek employment in the industrial zones, and to access commercial activities and public services (such as education and health). A further 32.56% of the influx population moved to the satellite cities to search for better housing conditions. In addition, an average of 12.21% migrated because of urban disasters that occurred in the city of Constantine mainly consisting of landslides (such as in Boudrah Saleh and Sidi M'sid), floods (Bardo) and the collapse of their dwellings in the old city (Souika). The lowest percentage, 6.11%, represents other reasons for migration especially related to property ownership and social and family relations. In addition to the rapid increase in the population size and annual growth rates, there are other transformations related to the rate of urbanization which ranged between 53.51% as the lowest value recorded in Didouche Mourad, and 77.62% as the highest value recorded in Ain Smara in 1987. In 1998, the lowest value was estimated at 62.6%, recorded by Hamma Bouziane and the

highest rate was 85.16% in Didouche Mourad. This increase in urbanization continued in 2008 and was estimated at 91.22% in Hamma Bouziane and 86.64% in Ain Smara (ONS, 2011). This increase is mainly due to the arrival of population from the city of Constantine and to the administrative promotion of 1984, which contributed significantly to this increase. On the other hand, the statistical data for the census of 1966 recorded an increase in the proportion of workers in the agriculture sector to 49.85%. Almost half of the total workforce in this sector, however, saw a relative decrease in 1977, to reach 13.64%. This is due to the transfer of the labour force to the service sector (38.8%) after the localization of the industrial zones (Prenant, Semmoud, 1978), particularly the Industrial Zone of Oued Lahmimin that became operational in 1974. This mutation coincided with the movement of the discharge of the population surplus in Khroub city and the establishment of 450 housing units in 1976. This stimulated construction activity, which absorbed the labor force. The decline in the

percentage of workers in the agricultural sector in 1987 was evident with a fall to 7.36%.Hamma Bouziane presented the highest proportion of workers in this sector, at 14.29%, while the lowest rate was recorded in Khroub, at 3.56%.This is because all of the satellites cities became concerned with the process of population transfer, and the establishment of a number of facilities, which allowed the revitalization of the civil engineering and services sectors. In 2000, the rate of agricultural workers continued to decline to reach 4.46%. However, the percentage of workforce in the civil engineering and services sectors rose respectively to 38.21% and 37.18% to respond to the urban expansion requirements in terms of housing and infrastructure projects (Benghadbane, 2001). In 2018, the results of the field investigation confirmed this trend. On average, 41.23%of the labor force in the satellite cities is in the services sector (education, health, trade and transportation, for example). This rate reached 47.05% in Khroub, followed by Ain Smara with 43.67%, and Hamma Bouziane with the lowest rate at37.84%. However, the agricultural sector registered a large decline in the rate of its workforce, which increased on average to 4.11%.

Thus, there is a radical shift in the percentage of employees in the agricultural sector, which dropped 11 times in 34 years to the benefit of other sectors, or towards urban functions. This change has affected their economic specialization. This tendency has been accentuated by the transfer of a significant number of workers in sectors other than agriculture through the process of diminishing the population surplus of Constantine. It was also marked; the satellite cities are characterized by rapid urban development, which led to a rapid consumption of land and a high rise in the annual increase rate the area. The reason for this development is due to the availability of flat and suitable sites (Benghadbane, 2001).This potential allowed the creation of different types of housing. This corresponds with the state housing policy to control urban growth and respond to the growing demand for housing. The urban area of the satellite cities before independence (i.e. before 1962) did not exceed the average of 23.94 hectares. The town planning policy accelerated the process of urban extension and the high consumption of urban areas. Table 5 shows the evolution of the annual increase rate of urban areas in each satellite city.

Table 5.Evolution of the urban area of the Satellite cities (1962-2008).

Satellite cities	Urban Area (e)					Annual rate of increase (e / year)			
	Before 1962	1977	1987	1998	2008	62/77	77/87	87/98	98/08
Khroub	12.90	28.25	203.00	751.00	980.70	1.02	17.47	42.15	28.71
Hamma Bouziane	63.00	113.00	347.00	659.00	670.30	3.33	23.40	20.08	1.41
Ain Smara	11.80	27.50	102.00	400.00	475.80	1.04	7.45	22.92	9.47
Didouche Mourad	24.00	40.00	72.00	487.00	664.50	1.06	3.20	31.92	22.19
Bekira	08.00	17.00	56.00	191.00	431.82	0.60	3.90	9.00	30.10

Source: URBACO, 1998 : 98-102, adapted by the author.

The total area consumed through the process of population transfer in different phases is estimated at 1,753 hectares. This area is divided between housing, at 1,419 hectares, and industry, at 334hectares. This land use pattern transforms the land function from rural and agricultural land to urban activities and functions. The urbanization process undergone by the satellite cities resulted in a

significant change in their urban appearance. These satellite cities were formerly colonial villages inherited from the colonial era with a plan that is structured of orthogonal roads, which converge on the main road (National Roads n°: 03 and 05). In the center of these settlements were gathered the church, school, market, some shops and other establishments providing services for the rural area. Rapid

urbanization transformed the colonial villages. Many buildings were converted into administrative uses; the churches into mosques. Many deteriorated dwellings have been renewed using modern building materials such as reinforced concrete and green tiles with a new urban style. The ground floors of the majority of these houses were allocated to trade uses. This mutation process led to a high concentration of activities and services to meet the needs of the new expansion population. These morphological mutations transformed the satellite cities from rural to urban settlements and resulted in new urban forms, especially collective housing (new urban housing areas) to meet housing needs (Lakehal, 2004). However, these housing neighbourhoods have been lacking most of the necessary amenities. In addition, the allotment procedure resulted in individual houses with different architectural forms. Despite the fact that this policy covered the growing demands for housing, these neighbourhoods are still in need of different networks, which affect the quality of life of residents.

Different functional links with the mother city

Through the process of transferring Constantine's population surplus, the satellite cities gain huge possibilities in terms of residential, educational, and commercial opportunities. This diverts them from their original function, and attaches to them different urban functions that correspond to the needs and requirements of the newly transferred population in order to stabilize them in their new residence in search of better neighbourhood relations. However, despite this, there are currently functional relations between Constantine and its satellite cities (Larouk, 1997) that are revealed through the attachment of these inhabitants to the city of Constantine for various purposes (work, study, health, or shopping, for example) to meet their various needs. In order to clarify this, the results of the field investigation concerning the motives of the movement of urban dwellers towards Constantine were based on the following results (Figure 4). In the field of work, the city of Constantine attracts the employed population in several economic sectors, with an average rate of

48.53% in the satellite cities. The highest rate of residents employed in Constantine 58.14% in Bekira city, while it is lowest (32.8%) in the city of Hamma Bouziane. These employees constitute the new resident population in the context of the policy of reducing the population surplus in the satellite cities. They have retained their jobs in the city of Constantine despite the change in their place of residence. An average of 15.20% are employed in the municipal area of each satellite city, especially within the industrial zones (for example in the industrial zone of Oued Lahmimin, the industrial zone of Ain Smara, a cement factory in Didouche Mourad, and a pipe factory in Hamma Bouziane) and in some agricultural activities. The employed population in the satellite cities represents an average rate of 20.14%. The majority are in different activities within the third sector. Most of them are teachers in the first and second grades and secondary education. The largest proportion of these is female heads of households from Constantine. In addition, there are employees within the health sector (such as nurses and doctors), traders, and officials of the municipality. With regard to the means of transport to their place of work, especially to Constantine city, the results of the field investigation revealed that 41.35% of workers prefer the bus, primarily because of the high availability of buses. Transportation by private cars and taxis comprises a further 16.13% and 12.65%, respectively. The remaining 29.87% use semi-collective cars or mini buses as internal transport in the satellite cities. And moving to study, due to the relative adequacy of all satellite cities in the educational institutions of the first, second and even intermediate schools, a focus is made on the movements of students in secondary education. The results of the field investigation show that Bekira presents the highest rate of students' movements to secondary education institutions in the city of Constantine at 18.75%. This was followed by Ain Smara at 5.24%. This is due to the lack of secondary schools. The results of the field investigation indicate that Bekira's traffic to Constantine for health services is high, at 68.34%, followed by

Hamma Bouzianeat 47.19%, and Didouche Mouradat 42.48%. This is due to the absence of hospitals and a lack of clinics and doctors. This rate declines in Ain Smara (33.15%), because of relatively improved healthcare services, and the search for more advanced health services and specialties that are not available at the level of the university hospital and specialized private clinics, such as the clinic of Mohammed Mahdi. For commercial services, despite the availability of shopping facilities, people move to Constantine greater variety and a higher quality of commercial services. The proportion of traffic rises to 38.47% to the weekly markets and especially to the street of butchers in the old city (Souika). This quarter represents the original place of residence for most of the population and thus there is nostalgia for their old neighbourhood and the services it offers. Bekira remains the most unable to meet the population's needs where the percentage increases to 61.12%, followed by Hamma Bouziane (35.73%), Didouche Mourad (35.08%) and Ain Smara (31.8%). The lowest percentage (28.65%) is recorded in Khroub city. Due to shortages recorded in recreational and sports facilities, in the satellite cities, most of their inhabitants go to Constantine to practice their hobbies and for leisure. This frequency differs from one city to another. Didouche Mourad has the highest proportion of movements to Constantine (estimated at 82.04%). This was followed by Bekira (81.73%), Hamma Bouziane (70.12%) and Ain Smara (53.50%), while the lowest percentage is recorded in Khroub (24.95%). Thus; there is a large difference between the highest and the lowest proportion, which is estimated at 57.09%. This reflects the large variation in entertainment facilities between satellite cities. The ratio of administrative links between the satellite cities and Constantine rises to an average of 39.28%. This is due to the lack of some administrative infrastructure in the satellite cities, according to the administrative rank of each city. The data show that Constantine meets the administrative services of Bekira with the highest rate of 52.15%. Demonstrating a similar pattern to

the infrastructural elements described above, this is followed by Hamma Bouziane (45.07%), Didouche Mourad (38.44%), (36.6%), and Khroub (24.17%). This variation in the ratio of flows from satellite cities to Constantine and their multiplicity allowed the synthesis of these percentages within what is known as the ratio of the functional link of each satellite city with Constantine, which means that the average ratio of functional links for each satellite city. Despite the potential acquired by these satellite cities, the ratio of functional links varies from one satellite city to another. The highest values are recorded in Bekira and Didouche Mourad at 56.70% and 40.48%, respectively. This value decreases to 25.11% for the city of Khroub, with Hamma Bouziane and Ain Smara occupying an intermediate rank of 38.83% and 35.95% respectively. Thus, a lower percentage of functional links shows a higher autonomy of the city; this is the case of the city of Khroub. Accordingly, Bekira and Didouche Mourad are the most dependent cities on Constantine, illustrating their function as dormitory towns.

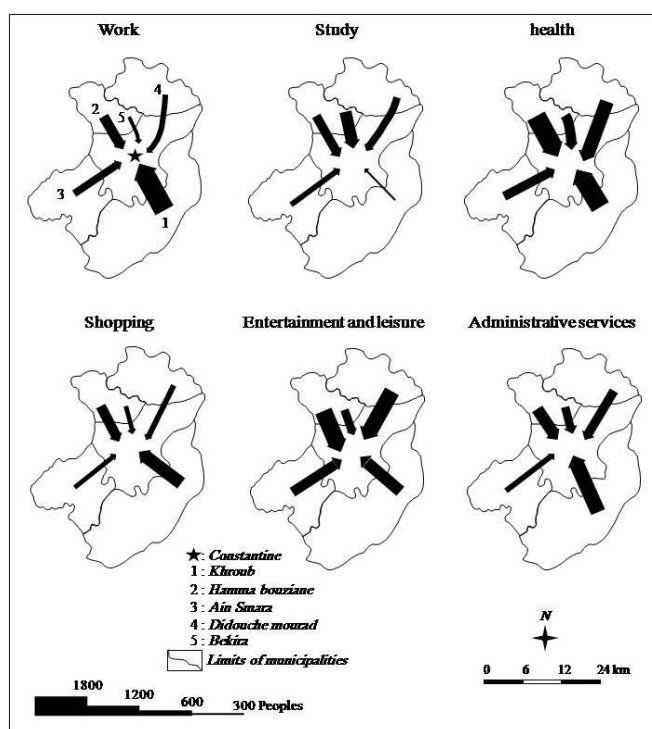


Figure 4. Functional links with the mother city of Constantine.

Research results

In sum, the study reveals the following results:

- Constantine is suffering from multiple urban problems such as (housing, transportation, services, work ...etc) as a result of its rapid and growing urban growth, and the difficulty of obtaining land for construction. This situation is similar to many of the large cities in the world, whether they are in advanced or developing countries such as the city of London (Britain), which was the forerunner, followed by Tokyo (Sorensen, 2001), Shanghai (Xiaopei, 1994; Yan, Li, 2015), FaridaBad (India) (Follmann et al., 2018), Dhaka (Bangladesh) (Hasnat, Hoque, 2016)...
 - In order to solve and mitigate the urban problems facing large cities, urban plans are prepared to develop of satellite through a comprehensive and balanced planning as one of the alternatives to achieve some kind of decentralization, which was adopted by the city of Constantine following the experiences of large cities in developed countries.
 - The satellite cities (Khroub, Ain Smara, Didouche Mourad and Hamma Bouziane) give a suitable solution to the problems of urban growth by providing lands that could be reconstructed for the completion of various urban projects as they are located in the urban area surrounding the city of Constantine.
 - The satellite cities contributed to the creation of an urban dynamic in the surrounding areas of Constantine that extends over a radius of 15 km. , as well as the provision of services of different types (Educational, health, sports ...) and many commercial activities to achieve the well-being of its population like other pioneer case studies (Jekabsone et al., 2016).
- it is required to work on developing its potentials and on upgrading its services based on additional resources, which is an affirmation of the experience of the city of “Mancheng” in Hebei Province (Yan, Li, 2015).
- There is a deficiency to guide urban plans to achieve the desired urban development between Constantine and its satellite cities through

decentralization. This situation reflected the overlap of patterns of land use, which is similar to the characteristics of the surrounding area of major cities in developing countries, which is especially evident in case of the city of Faridabad (Follmann et al., 2018).

V. CONCLUSION

Constantine is experiencing a real crisis situation and spatial dysfunctions linked to its urban growth which resulted of the interaction of several factors: natural, demographic and pressure spatial. In this context, satellite cities have been used as a strategic solution through the orientations of the successive urban plans; the latter offered wide possibilities in terms of urbanization land, to receive and contain the growth of Constantine. On the other hand, their relations with Constantine go back to historical periods, as they were villages dependent on the mother city. From the 1970s to the present day, this relationship became more pronounced and took on new aspects. It must be said that besides the existence of a road network, the satellite towns are geographically close to the parent city and well-articulated. The intensity of the dependence of those satellite cities is variable according to its degree of urban development as the city of Khroub which reduced its heavy dependence to the mother city. All this has happened despite the great potential of urban development, and the fact that the solution adopted dates back to a relatively distant period. It should be noted that the impacts of the operation were multiple and affected different aspects.

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