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ANALYZING URBAN SPRAWL AND URBANISATION DYNAMICS: A CASE STUDY OF BEJAIA, OUED-GHIR, AND TALA-HAMZA

Abstract: Understanding urban sprawl is crucial as it provides a dynamic perspective on urban areas, revealing the driving forces and explanatory factors behind their expansion. This study specifically examines the factors contributing to urban sprawl in Bejaia city and its neighbouring communes, Oued-Ghir and Tala-Hamza. The aim is to analyse the intricate urban systems within these areas, unveiling the diverse forms of peri-urbanisation affecting agricultural land. The results underscore the impact of various factors on urban sprawl in Bejaia City. These factors include demography, spatial population distribution, housing, transportation, access conditions, administrative urban status, economic and social development, as well as employment opportunities. These determinants collectively underpin the ongoing urban sprawl in the region, emphasising the necessity for sustainable urban planning and development strategies.

Key words: urban sprawl, urbanisation dynamics, city, periphery, communes, Bejaia, Oued-Ghir, Tala-Hamza

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Introduction

Urban areas are in a constant state of expansion and transformation, a phenomenon driven by factors such as population growth, evolving societal needs, residential development, and technological advancements (Wei & Ewing, 2018). This inexorable process of urbanisation has far-reaching consequences, reshaping the landscapes of city centres and their peripheries, a transformation often referred to as urban sprawl (Aguejdad, 2009; Glaeser & Kahn, 2004).

Urban sprawl is a concept of remarkable intricacy, one that defies a singular and universally precise definition. It represents a distinctive form of urban growth that necessitates a comprehensive conceptual approach. Urban sprawl is distinguished by the outward expansion of both population and activities from city centres towards their peripheries (Jetzkowitz et al., 2007; Rosni & Noor, 2016). It is commonly associated with unplanned and uncontrolled urban expansion, exerting pressure on developments near urban boundaries and often leading to adverse impacts. Furthermore, urban sprawl is closely intertwined with the broader context of urban development. Research underscores that urban growth is one of the essential processes within urban development, alongside urbanisation, contributing to its multifaceted implications (Bhatta et al., 2010). The emergence of urban sprawl is a response to an intricate web of economic, social, political, and physical forces (Barnes et al., 2001; Rubiera-Morollón & Garrido-Yserte, 2020).

Additionally, this paper delves into the multifaceted nature of sprawl, the myriad forms it assumes, and the imperative of assessing its consequences when evaluating various development patterns (Ewing, 2008; Yasin et al., 2021). Urban sprawl research encompasses a multitude of perspectives and approaches, spanning diverse disciplines such as urban geography, urbanism, economics, and sociology (Bueno-Suárez & Coq-Huelva, 2020; Deng et al., 2020; Rosni & Noor, 2016). These interdisciplinary analyses underscore the inherent complexity of urban sprawl and employ diverse methods, including morphological, functional, and territorial structuring approaches (Frenkel & Orenstein, 2011; STAN, 2013).

The comprehensive measurement and monitoring of urban sprawl, along with its interconnected phenomena, depend on a multifaceted approach. This approach combines data derived from land-use databases, a key component of the morphological approach, and population censuses, an integral aspect of the functional approach (Liu et al., 2018; Zhang et al., 2007). It's essential to note that determining whether an area falls within the urban environment emphasises functional criteria more than morphological attributes. This shift in perspective, articulated by scholars like Allain (Vachon, 2005), redirects the focus from spatial morphology to tangible urban reality, accentuating factors such as mobility, structural continuity, and urban morphology. The functional approach involves a comprehensive examination of the distribution and dynamics of activities, employment, population movements, transportation networks, and decision-making processes within urban landscapes, utilising quantitative statistical data to decode the intricate dynamics of a city.

Many researchers have demonstrated that urban sprawl can be effectively assessed using various specialised indices designed to measure the extent and nature of urban expansion. Some of the key indices employed for this purpose include the

Compactness Index, which evaluates the degree of urban development compactness (Steurer & Bayr, 2020), and the Land Use Mix Index (Mubareka et al., 2011), which assesses the diversity of land use types within an urban area. The Urban Sprawl Index is another valuable tool that combines multiple factors, including population density, land use mix, and land consumption, to provide a comprehensive measurement of sprawl (Horn & Van Eeden, 2018). Additionally, the Simpson's Diversity Index is used to assess the diversity of land use types within a region, offering insights into potential sprawl trends (Nguyen, 2010).

Furthermore, urban concentration is a significant aspect of urban sprawl, and its study benefits from a range of dedicated indices that gauge the density and centrality of urban populations and economic activities (Batty et al., 2003; de Espindola et al., 2017; Tisdale, 1941). Population density, a fundamental metric, calculates the number of people residing in specific areas, with higher density often indicating urban concentration (Tikoudis et al., 2022). The location quotient, conversely, measures the concentration of a particular industry or occupation in an urban area relative to its presence in the surrounding region, aiding in identifying economic concentration (Werner et al., 2022). Complementing these metrics are centrality indices that assess the accessibility and centrality of specific locations within urban areas. The Gini index for population density adapts the concept of income or wealth inequality to population density, enabling the identification of areas with highly concentrated or uneven population distribution (Gadakh & Jaybhaye, 2020; Molero-Simarro, 2017). Finally, accessibility indices gauge the ease of access to various services and amenities, with high accessibility often indicative of urban concentration (Sohn et al., 2012). These indices collectively offer invaluable insights into patterns of urban concentration, providing crucial support for researchers and policymakers in making informed decisions related to urban development and resource allocation.

On the other hand, Mediterranean countries have undergone a rapid urbanisation process driven by demographic growth and economic development (García-Nieto et al., 2018). Algerian cities, in particular, have experienced profound transformations since the end of the colonial period. The rapid urbanisation, catalysed by rural-to-urban migration post-independence, has led to demographic pressure, rural exodus, and significant economic and social changes. The manifestation of this urban explosion has taken the form of urban sprawl, expanding into the surrounding geographical areas of cities (Bounouni, 2014).

Recognising the far-reaching implications of urban sprawl, this study aims to provide a comprehensive understanding of this phenomenon. It focuses on the dynamic urban systems of Bejaia, the central urban hub, and the neighbouring communes of Oued-Ghir and Tala-Hamza, which exemplify substantial urban sprawl on agricultural land. The analysis draws on data collected from diverse sources, encompassing general censuses spanning from 1977 to 2008 and a range of statistical yearbooks from 1987 to the close of 2019.

Methodology and context

Methodological approach

The methodology in this paper consists of two distinct parts, each serving a specific purpose in the analysis. The first part focuses on the compilation of scientific materi-

al, which plays a fundamental role in the introduction, providing a solid basis for the subsequent investigations.

The second part, built upon the theoretical framework established earlier in the article, involves the practical application of these concepts. It commences by clearly defining the study area, setting the stage for the in-depth exploration of various aspects of urban sprawl analysis.

The analysis begins with a thorough examination of demographic development, encompassing factors such as the growth rate and the utilisation of the urban concentration index calculated using the Gini index "Ic." The diachronic study of human densities, relying on reliable statistical data, forms a pivotal part of the analysis, with human density (HD) as a key focal point. This detailed exploration offers crucial insights into the distribution of the population within the study area.

Subsequently, data processing, a critical step performed using Microsoft Excel, serves as the foundational building blocks for the spatial analysis of urban dynamics, facilitated through the potent tools of the Geographic Information System (GIS). Within the GIS framework, the "thematic analysis" function found in ArcMap software enables the creation of impactful visual representations, including colour classification graphs and comparison histograms that enhance data interpretation.

Moving forward, the study seamlessly transitions to an examination of housing developments, coupled with an in-depth analysis of urban density changes spanning from 1977 to 2019. Here, the primary focus shifts to residential density (RD), along with a detailed investigation of employment distribution and its geographical locations. The study also delves into an analysis of the road network and the consumption of agricultural land.

In the final step of the methodology, after conducting the multifaceted analyses as delineated, the study concludes with a rigorous discussion and a set of recommended guidelines. This culminating section synthesises the findings and elucidates the intricate web of factors influencing urban sprawl within Bejaia City, offering valuable insights for informed urban planning and policymaking in the region.

Study area

The Bejaïa region, located in the northeastern part of Algeria, is positioned approximately 250 kilometres to the east of the Algerian capital, stretching along the country's coastline. This region covers an area of 322,348 hectares and is administratively divided into 52 municipalities (Figure 1). According to the 2014 census, the population of this area was around 185,882 inhabitants. It is bordered to the north by the Mediterranean Sea, and to the east by the wilaya of Jijel, to the west by Tizi-Ouzou, and to the south by Setif and Bordj-Bouraridj. In this context, the study focuses on the three specific regions: the commune of Bejaia, covering an area of 120.22 square kilometres; Oued-Ghir, covering 46.32 square kilometres; and Tala-Hamza, which encompasses 38.83 square kilometres. This study site is characterised by a distinctive geographic composition that seamlessly integrates various landscapes, including urban areas, the sea, mountains, plains, valleys, rivers, and foothills (blogger, 2022; Ouahiba et al., 2019).

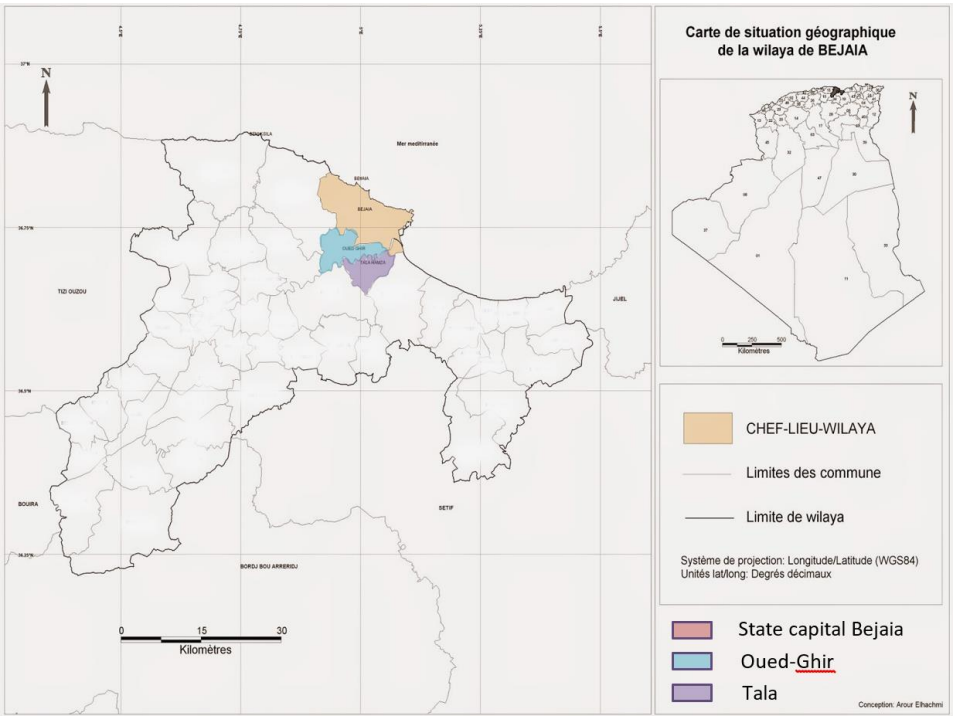

Fig. 1. Geographical location of the study area (blogger, 2022)

Results

Demographic development

Evolution of population

The population of the study area, which was 101,463 residents according to the 1977 census, witnessed a substantial increase of 123,926 individuals between that year and the conclusion of 2019. This population growth occurred at varying rates and displayed an uneven distribution across the selected analysis zones. These observations highlight the sustained demographic expansion that Bejaia experienced during the later decades of its independence. This demographic surge was the result of a combination of factors, including a high natural growth rate and significant migration from the surrounding rural areas. As depicted in figure 2, the population dynamics of Bejaia's main town and the adjacent communes of Oued-Ghir and Tala-Hamza have evolved diachronically since 1977.

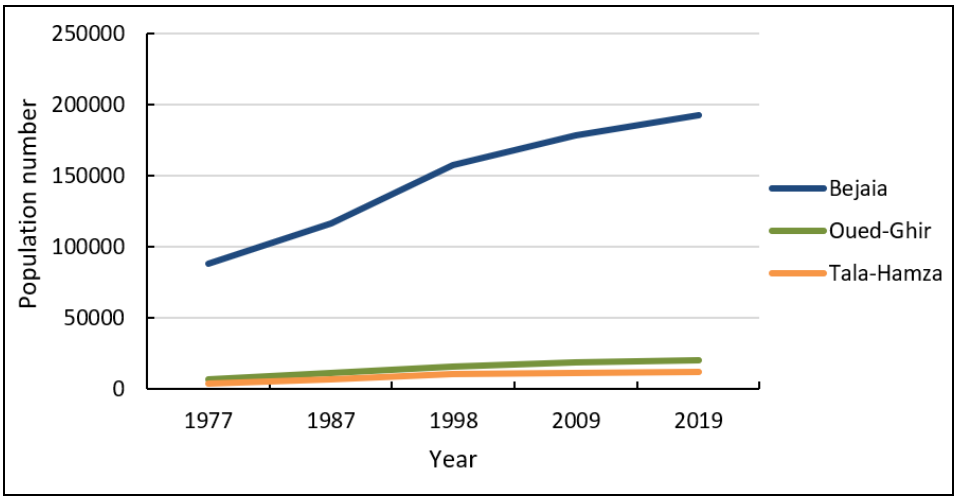

Fig. 2. Communes's population evolution of Bejaïa, Oued-Ghir, and Tala-Hamza

Growth rate

The three different regions, Oued-Ghir, Bejaia, and Tala-Hamza, each exhibited distinct population dynamics over the period from 1998 to 2008 (table 1). Oued-Ghir, characterised by its unique demographic pattern, experienced a substantial population surge, growing from 15,728 residents in 1998 to 19,346 residents in 2008. This growth represented a notable 2.09% increase, signifying a significant shift in the commune's demographic landscape. The driving forces behind this growth might include factors such as economic opportunities, infrastructure development, or changes in regional attractiveness. Conversely, Bejaia commune, the main urban centre in the study, demonstrated its significance as a magnet for population growth. Its population swelled from 150,195 residents in 1998 to 177,988 residents in 2008, marking a growth rate of 1.74%. This growth reflects Bejaia's role as a hub for economic activities, services, and educational institutions, drawing in residents from the surrounding areas and contributing to the urbanisation of the region. In contrast, Tala-Hamza, while experiencing a more modest growth rate of 1.31%, also underwent demographic changes over the same decade. The commune's population increased, albeit at a slower pace, from 1,423 inhabitants to a larger population, possibly due to local factors such as lifestyle, infrastructure development, or community dynamics.

Tab. 1. Population evolution in GPHC and the rate of growth of Bejaia, Oued- Ghir, and Tala-Hamza (DPBM, 2008).

Commune	GPHC 1998	GPHC 2008	Population evolution 1998 – 2008	Growth rate 1998–2008 (%)
Bejaia	150 195	177 988	27 793	1.71
Oued Ghir	15 728	19 346	3 618	2.09
Tala Hamza	10 252	11 675	1 423	1.31
Total Wilaya	856 844	912 579	55 735	0.63

The urban concentration index (Gini index « Ic »)

The Urban Concentration Index, denoted as Ic, serves as a metric for gauging the extent to which populations are clustered or scattered within a specific area. The concept and methodology behind this index were developed by GINI, employing a mathematical framework that takes into account key variables, including population and surface area (GUECHI, 2011). The calculation of the Ic index follows this formula:

$$Ic = \frac{Commune's\ population}{Wilaya's\ population} - \frac{Surface\ area\ of\ commune}{Surface\ area\ of\ wilaya} \quad (1)$$

There are three cases depending on the different values of Ic:

Ic > 0 : the population is concentrated.

-1 < Ic > 0 : the population is sparse.

Ic < - 1 : the population is very sparse.

In Bejaïa, the Ic stands at 0.18, indicating a relatively higher population concentration within the communal area. Meanwhile, Oued-Ghir and Tala-Hamza both show lower Ic values of 0.008 and 0.001, respectively. These values, closer to 0, suggest a more dispersed population within these communal regions, reflecting a lower degree of concentration (table 2). This data highlights the varying population distribution patterns among these areas, with Béjaïa demonstrating a higher level of concentration in comparison to Oued-Ghir and Tala-Hamza.

Tab. 2. GINI index « Ic » for the communes of Bejaia, Oued-Ghir and Tala-Hamza

	Bejaia's commune	Oued-Ghir's commune	Tala-Hamza's commune	Bejaia's wilaya
Population	191 936	20 866	12 587	912 577
Surface area (km²)	120.22	46.32	38.83	3 223.49
Ic index	0.18	0.008	0.001	/

Population distribution in the study area

Table 3 and Figure 3 provide an overview of the population distribution in the study area over the period from 1998 to 2019. The distribution for 2019 is categorised as follows:

- Agglomeration Main Town (AMT): 92.18%
- Secondary Urban Area (SUA): 4.30%
- Sparse Areas (SA): 3.50%

The Commune of Bejaia stands out as the commune with the highest concentration of AMT, where 85.15% of the total population resides in the main town. Similarly, the commune of Tala-Hamza also exhibits a significant concentration of AMT, with the majority of its population residing in the main town. In contrast, the Commune of Oued-Ghir represents a more balanced distribution of population across AMT, SUA, and SA.

Tab. 3. Distribution of 1998 and 2019 population by geographical dispersion (DPBM, 2008)

	AMT 1998		SUA 1998		SA 1998		Total 1988
	Number	%	Number	%	Number	%	
Bejaia	149 510	95.41	3 431	2.18	3 747	2.39	156 688
Oued-Ghir	3 447	21.67	6 823	42.91	5 630	35.40	15 900
Tala-Hamza	2 053	19.98	1 780	17.33	6 438	62,68	10 271
Total study area	155 010	84.77	12 034	6.58	15 815	8.64	182 859
Total wilaya	382 935	42.29	279 204	30.83	243 286	26.86	905 425
	AMT 2019		SUA 2019		SA 2019		Total 2019
	Number	%	Number	%	Number	%	
Bejaia	189 938	98.95	505	0.26	1 494	0.75	191 936
Oued-Ghir	7 800	37.38	7 387	35.40	5 679	27.21	20 866
Tala-Hamza	10 043	79.78	1 815	14.41	729	5.79	12 587
Total study area	207 781	92.18	9 707	4.30	7 902	3.50	225 389
Total wilaya	602 966	61.27	258 979	26.23	122 105	12.40	984 050

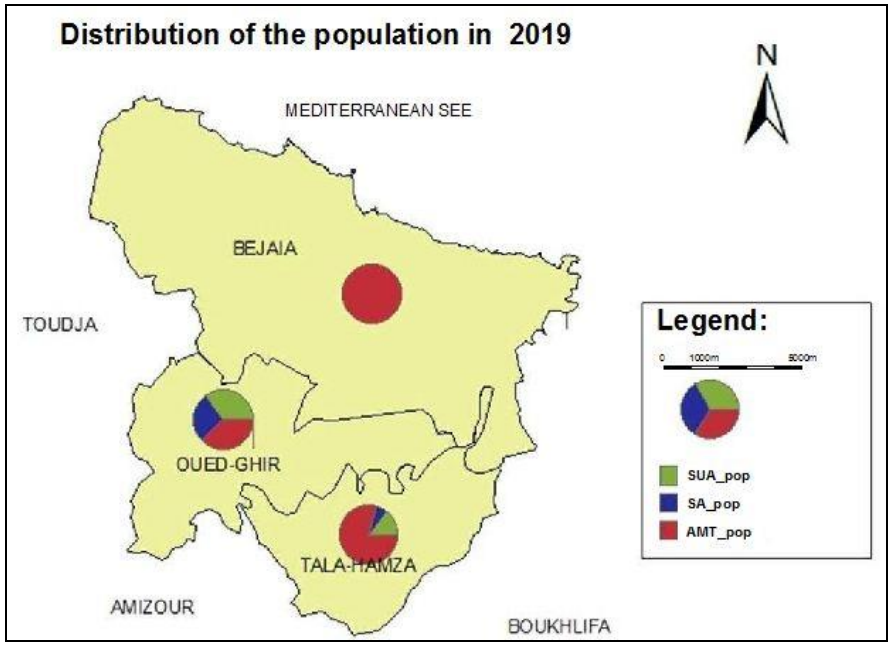

Fig. 3. Distribution of the population according to geographical dispersion

One notable demographic trend in the study area is the growing prominence of AMT, which increased from 84.77% in 1998 to 92.18% in 2019. Conversely, the proportions of SA and SUA experienced a decline during this period, indicating a shift towards increasing urbanisation within the region. It's worth mentioning that by the end of 1998, rural outmigration had ceased, while city residents had started residing in rural communities while maintaining frequent connections with urban areas. These dynamics underscore the evolving urban-rural demographic landscape within the study area.

Diachronic study of human densities over the period 1977-2019

In this spatial analysis, the objective is to highlight recent urban dynamics, showcasing current trends in spatial growth through a comparative perspective between the periphery and central city. This analysis takes into account the development of the first urban density previously considered, which is human density (HD). Human density is defined as the ratio of an area's population to its administrative area.

$$HD = \frac{Population}{Surface\ area\ (km^2)} \quad (2)$$

Figure 4 provides a visual representation of population density in the three communes. The data highlights the substantial population density in Bejaia City, reaching 1597 inhabitants/km². Following Bejaia, Oued-Ghir exhibits a population density of 450 inhabitants/km², while Tala-Hamza shows a slightly lower density at 324 inhabitants/km².

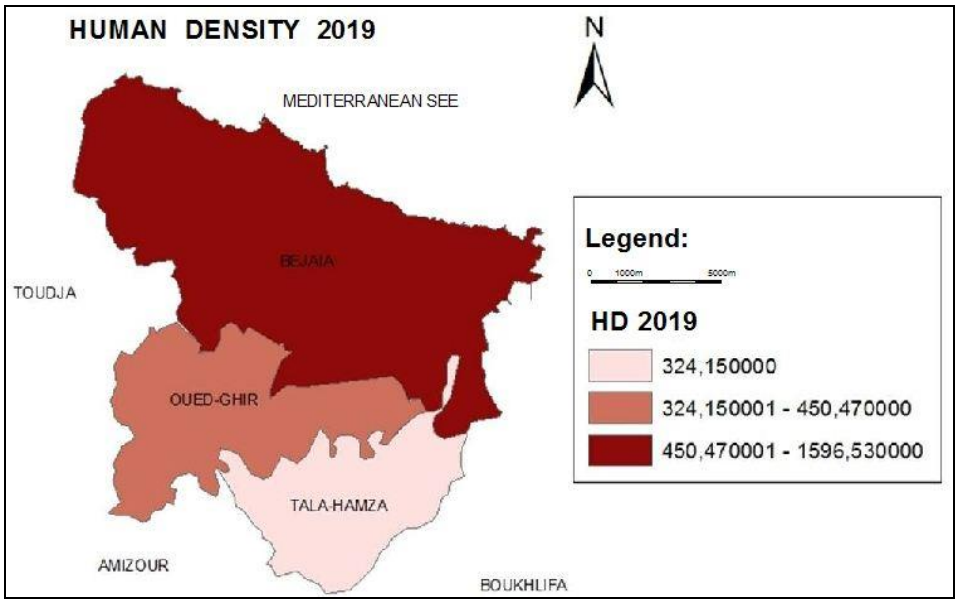

Fig. 4. Human density (HD) for 2019

Spatial analysis of habitat

Evolution of residential stock

Taking into account residential stock as a crucial indicator of urban sprawl, this section delves into a comprehensive analysis of the housing situation in our study area. Through

an examination of statistical data pertaining to urban dynamics and the commune's population changes from 1998 to 2008 (table 4), a notable increase in the number of households becomes evident. Specifically, there was a significant rise from 29,232 households in 1998 to 42,580 households in 2008.

Tab. 4. Comparative table of the last two GPHC (1998 and 2008) for Bejaia commune (DPBM, 2008).

RGPH	Population	Number of occupied homes	Number of households	Housing Occupancy Rate (HOR)	Average household size
1998	150 195	23 385	29 232	6.42	6.11
2008	177 988	31 441	42 580	5.7	5.3

Additionally, there has been an increase in the number of occupied homes, rising from 23,385 in 1998 to 31,441 in 2008, representing a difference of 8,056 homes. These findings underscore the magnitude of urban expansion within the city. Two mechanisms have contributed to this growth dynamic:

- A high rate of natural population growth occurs within urban areas, resulting from improved living conditions brought about by the development of urban centres.
- An influx of individuals from rural areas, primarily from peripheral communes, has been driven by the city's appeal and improved security conditions over the last decade.

The data provided in the figure below (Figure 5), summarising the evolution of residential stock between 1998 and 2019 in the study area, paints a compelling picture of positive changes in living conditions and housing occupancy rates.

Notably, the study area has witnessed a remarkable increase in residential stock in a relatively short span of time.

In 1998, the number of occupied homes in Bejaia was 24,322, which then grew to 34,543 in 2008 and substantially further to 54,416 by 2019. Similarly, Oued-Ghir and Tala-Hamza have also experienced notable growth in their residential stock over the same period. This upward trend reflects the significant efforts and developments undertaken to enhance living conditions within the study area.

A key indicator of the improved quality of life is the net housing occupancy rate. In 1998, there were approximately 6.5 persons per housing unit, a figure that saw a positive transformation to around 5.65 persons per housing unit in 2019. This reduction in housing occupancy can be attributed to the focus on providing better housing infrastructure and promoting a higher standard of living.

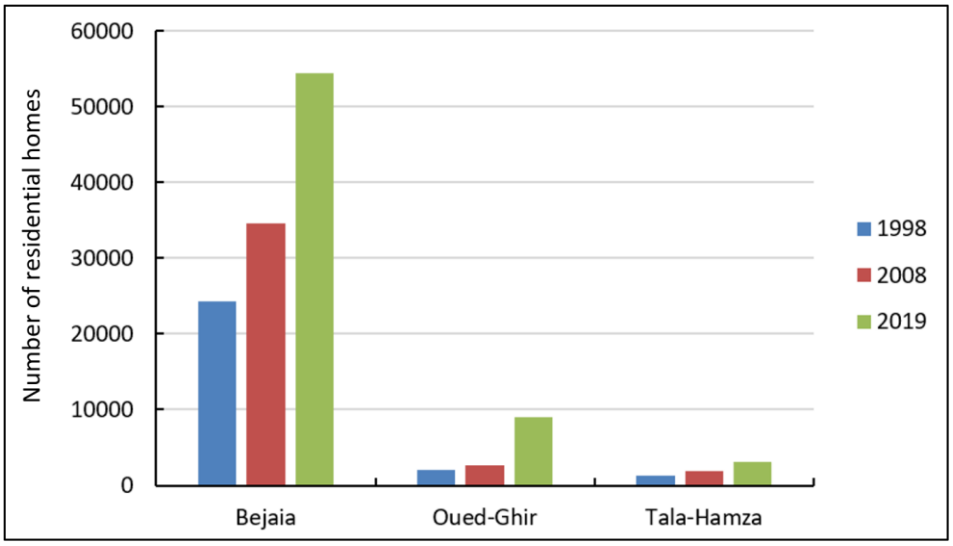

Fig. 5. Evolution of residential stock over period 1998 – 2019.

Diachronic study of residential densities from 1998 to 2019

Considering the evolution indicators related to the second urban density metric, specifically residential density, it's essential to highlight that this metric is calculated with respect to administrative surface areas. Residential density, often denoted as RD, is determined by establishing the ratio of the number of households in a given zone to its surface area. This calculation allows us to assess the concentration of residential units within a defined area.

$$RD = \frac{Homes\ number}{Surface\ area\ (km^2)} \tag{3}$$

The evolution of residential density (RD) provides a valuable insight into the recent trends in residential growth characterising the development of Bejaia City. As depicted in Figure 6, the data spanning from 1998 to 2019 highlights distinct patterns in residential density. Notably, the highest residential density is consistently concentrated in Béjaïa, where RD has seen a substantial increase. In 1998, it stood at 200.51 homes/km², and by 2019, this figure had risen to 425.10 homes/km².

In contrast, the other two communes, Tala-Hamza and Oued-Ghir, exhibit lower residential densities compared to Béjaïa. Nevertheless, Tala-Hamza experienced an upward trajectory, with RD increasing from 37.78 homes/km² in 1998 to 51.55 homes/km² in 2008, culminating in 81.45 homes/km² in 2019.

Furthermore, the commune of Oued-Ghir stands out for its significant surge in residential density between 2008 and 2019, elevating it from 57.46 homes/km² to 192.85 homes/km². This transformation highlights the robust residential dynamic characterising this peripheral area. The comparative graph also underscores two key densification trends: the first within the peripheral zone of Oued-Ghir and the second within the central city of Bejaia, which boasts the highest residential density.

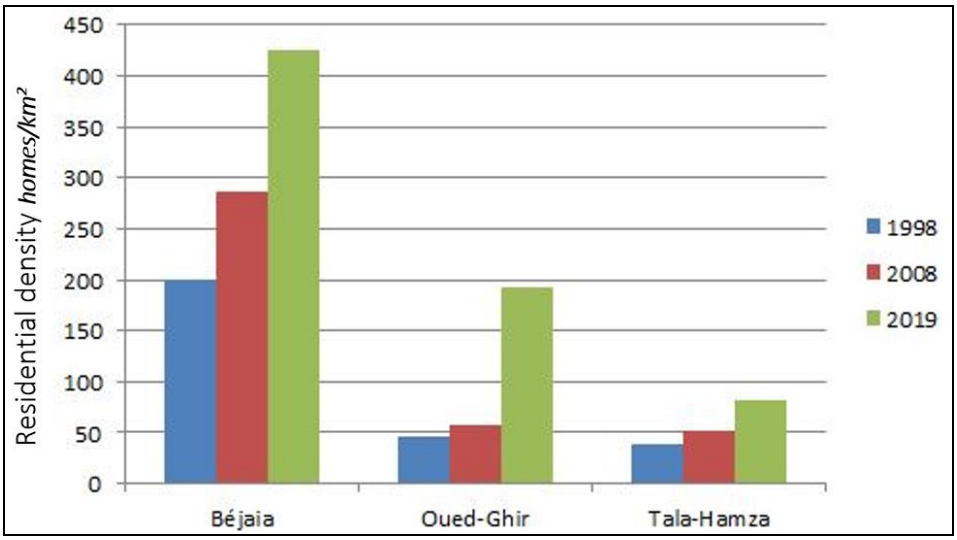

Fig. 6. Evolution of residential density over the period 1998 – 2019

Continuing the discussion on the evolution of residential density, the thematic analysis, as depicted in the figure below (Figure 7), further reinforces the trends observed in the Bejaia region for 2019. This analysis clearly indicates that the highest rates of residential growth are concentrated in Bejaia, aligning with the preceding findings regarding the significant increase in residential density within this central city. This congruence underscores the continued expansion and densification of the urban area.

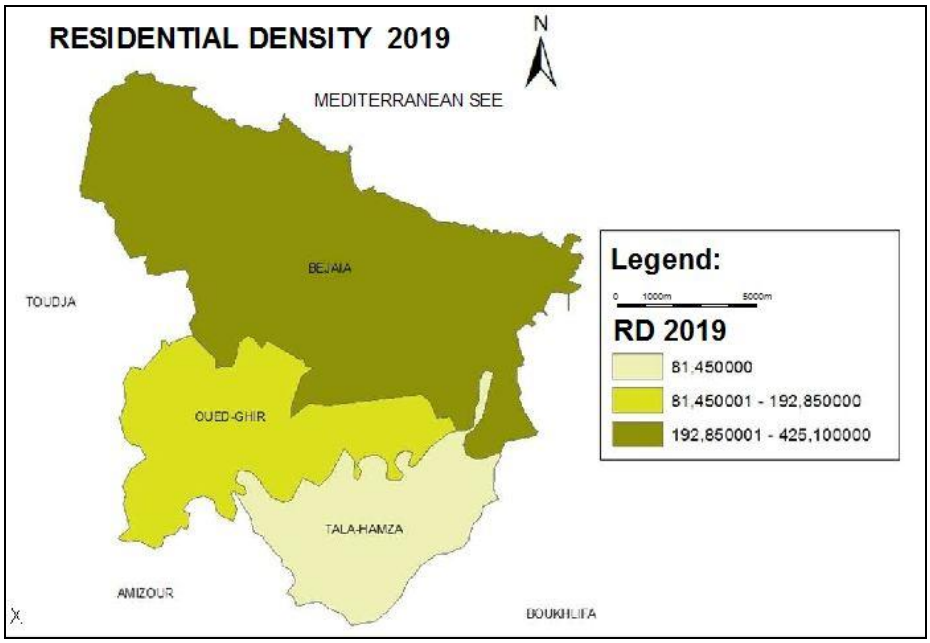

Fig. 7. Residential density (RD) for 2019

Analysis of employment distribution and location

In recent years, the study area has experienced noteworthy growth across various sectors, with a particular emphasis on the tertiary sector. As depicted in figure 8, the distribution of employment by sector of economic activity in the year 2019 reveals important insights into the composition of the working population. It is evident that the commerce and services sector boasts the largest workforce, employing 124,653 individuals, representing 36.09% of the total workforce. Following closely is the administration sector, employing 97,481 individuals, and the construction and civil engineering sector, with 59,310 workers. The industry sector is also a significant contributor, providing employment to 56,470 individuals, accounting for 28.22%, 17.17%, and 16.35% of the total workforce, respectively. In contrast, the agricultural sector exhibits the lowest percentage, employing just 2.15% of the workforce. This observation sheds light on the transformation of the region, where there has been a shift away from agricultural activities, leading to land conversion in favour of industrial and construction sectors as Bejaia continues its development.

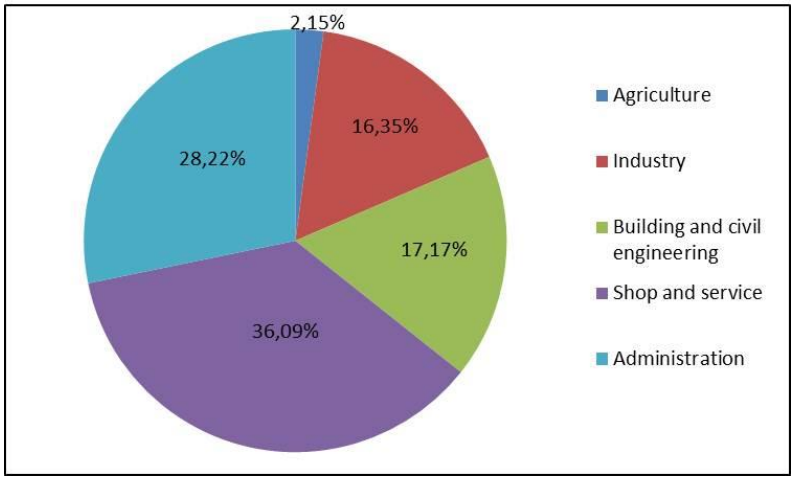

Fig. 8. Distribution of employment by major sector

The road networks

This section enables a comparison between the transportation infrastructure and the demands resulting from urban sprawl in the Bejaia study area. The study area is intersected by three major roads, with the Soummam Valley (NR12 and NR75) on one side and the West Coast (NR24) on the other. Additional regional and communal roads branch out from these two main axes. However, as illustrated in figure 9, there is a noticeable absence of transverse roads connecting the peripheries, which essentially means that to travel from one periphery to another, one must navigate through the city centre. According to Bounouni (2014), this absence of transverse roads complicates transit and hampers efficient connectivity between the various localities of Bejaia, especially with significant economic centres such as the port and industrial zone. This situation does not adequately respond to the increasing transport demands brought about by urban sprawl and urban development, underscoring a misalignment between transportation supply and burgeoning urbanisation.

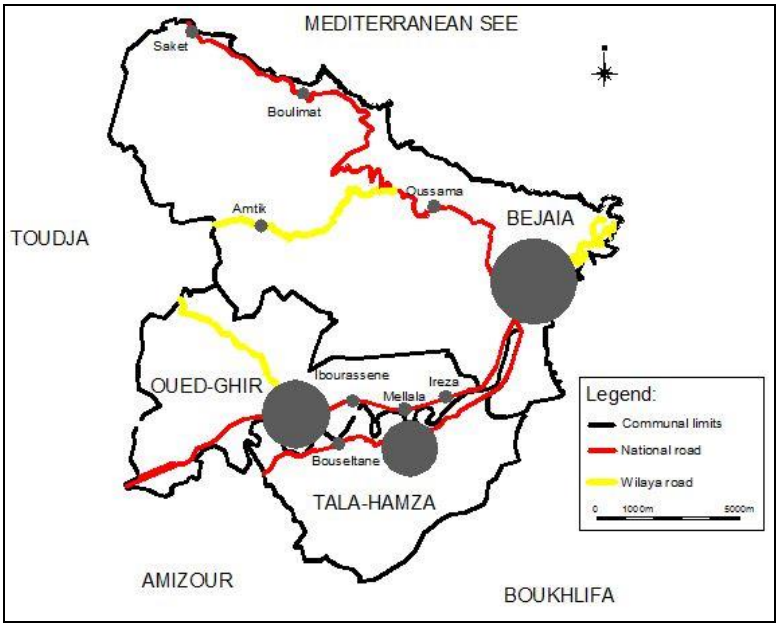

Fig. 9. Main roads in the Bejaia area

Consumption of agricultural land

Bejaia's urban development has witnessed uncontrolled urbanisation in spatial terms, as reported by Bounouni (Bounouni, 2014). This uncontrolled urbanisation has resulted in the consumption of agricultural and forested lands, further contributing to the overall land consumption in the region. Bounouni's research highlights that the area available for urban development in Bejaia expanded significantly, growing from 1300 hectares in 1987 to 1769 hectares in 1997 and further to over 2917 hectares in 2009. This marked a 40% increase in urbanised land within a span of 22 years (Figure 10).

Furthermore, Bounouni's findings indicate that this expansion in urbanised areas in the main town of the wilaya has been paralleled by similar growth rates in neighbouring communes. Notably, Oued-Ghir commune saw a 45% increase between 1996 and 2009, and Tala-Hamza recorded at least a 42% increase during the same period.

Fig. 10. Residential development at the expense of farmland on Bejaia periphery

Discussion

The demographic evolution within the study area offers invaluable insights into urban dynamics at both inter-urban and intra-urban levels, mirroring global trends of urbanization. The comparative analysis of statistical data reveals a remarkable growth extending into peripheral communes, driven by migration and peripheral urbanization. This trend signifies a strong wave of urbanisation in the hinterland of Bejaia, contributing to the broader discourse on urbanisation patterns observed globally (Dijkstra et al., 2021).

Recognising the housing situation underscores the impact of substantial economic changes in the study area on social needs, particularly in housing. This shift in the socio-economic landscape aligns with urban regions worldwide undergoing economic transitions, emphasising the universal nature of challenges and opportunities associated with urban development.

The analysis of net urban densities across different communes reveals the urban sprawl phenomenon characterized by the expansion of peripheral communes despite the city centre. The consistent increase in human density, coupled with densification in newly urbanized peripheral areas, reflects a manifestation of low-density urban sprawl. This trend aligns with challenges encountered by urban areas globally, emphasizing the importance of sustainable urban planning and development.

The examination of residential densities underscores significant residential dynamics in the peripheries, a trend observed in many urban areas globally responding to saturation and land constraints. Bejaia City's sustained densification over the past three decades, leading to spatial expansion, mirrors the global challenge of accommodating growing populations within urban confines. This aligns with international efforts to address urbanisation pressures while maintaining environmental sustainability (Cobbinah et al., 2015). Moreover, it is imperative to address the uneven distribution of employment within the region and its far-reaching implications for daily commuting patterns. This disparity stems predominantly from the concentration of employment opportunities in Bejaia commune. The presence of diverse sectors and key economic activities in this commune has established it as a pivotal employment centre and a magnet for workers. This centralization of economic activities in the city centre engenders a noticeable gap between residential areas and workplaces, a phenomenon not unique to Bejaia but resonant with urban challenges experienced worldwide.

The magnetic appeal of Bejaia city and the centralization of economic activities in its core have also given rise to pendular movements, particularly for commuting purposes (Bounouni, 2014). These daily movements underscore the global challenges associated with urban sprawl, including heightened pressure on transportation infrastructure. This phenomenon aligns with international discussions on the sustainability of urban mobility and the need for decentralised economic hubs to alleviate strain on transportation networks.

Conclusion

The findings of this study underscore the profound social, economic, and urban transformations experienced by Bejaia City in recent years. The saturation of urban growth lead-

ing to low-density expansion in neighbouring communes reflects a global challenge synonymous with urban sprawl, resonating with international urbanisation trends.

The spatial disconnect between concentrated employment opportunities in the city centre and shifting residential habitats to neighbouring communes echoes patterns observed in various international urban contexts. This phenomenon exacerbates the demand for mobility, posing additional strain on transport infrastructure—a challenge ubiquitous in rapidly urbanising areas worldwide.

The consequences of Bejaia's expansion beyond its urban limits—manifesting urban unrest, environmental pollution, and the threat to urban forests—mirror concerns faced by urban areas on a global scale. The surge in housing stock and urbanisation, fuelled by the consumption of valuable space and non-renewable natural resources, aligns with the broader discourse on sustainable urban development practices.

Attributed to a complex interplay of factors, including demographics, population distribution, housing trends, transportation, topographical conditions, administrative policies, economic and social development, and access to employment, Bejaia City's sprawl reflects challenges encountered by urban areas globally.

To address these challenges and ensure the sustainable development of Bejaia and its surrounding areas, strategic urban planning and management emerge as imperative solutions. This aligns with international discussions emphasising the need for sustainable urban development practices, including the preservation of agricultural land, the promotion of sustainable transportation solutions, and the protection of urban green spaces.

Moreover, the call for community engagement and stakeholder collaboration in guiding Bejaia's future urban development echoes principles recognised internationally as integral to successful urban planning. These principles underscore the shared responsibility for shaping resilient, sustainable, and inclusive cities for the future.

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