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# An Effort to Reveal the Characteristics of the Urban System in Batna, Algeria for the Period (1998-2020)

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Abstract		

Through the identification of the imbalance level in the regional urban city network and the evaluation of the balance extent in the urban network, the study aims to investigate the characteristics of the urban system in Batna Territory from 1998 to 2020. In order to accomplish the objective of the research, several suitable spatial planning techniques have been used.

In this study, the investigation and analysis of urban weight distribution were reviewed; also, the most significant alterations that resulted from it were noted. The volumetric distribution of cities was also studied and diagnosed through the examination of urban centers rank and size with the study and evaluation of the level of urban dominance over the years of study. In addition to studying and measuring the spatial distribution of urban sizes as well as understanding the extent of concentration and dispersion for urban residents in terms of the relationship of cities to their population sizes.

The results of the study showed the presence of the phenomenon of urban polarization, with the dominance of the city of Batna on the urban landscape of the region, and for the study period (1998-2020) the changes in the number and sizes of cities have known a wide growth. Research findings have shown large disparities in the number of cities and their population size. The study concluded with recommendations that we believe are appropriate for reducing urban polarization.

Key words: Characteristics, size, urban system, polarization, rank, inequality, wilaya territory.

## INTRODUCTION

Today's scholars and decision-makers are aware of the urban phenomenon's accelerated dynamics and how it differs from one location to another. The concentration of urban regions and the preference for them over rural ones has a detrimental effect on the geographical field as a whole. Studies confirm that the internal disparity in the urban system network translated in the domination of by Big cities and the decline in the sizes of smaller ones contribute to deepening the development gap between urban centers on the one hand and widening the divide between city and countryside on the other hand. Both receiving facilities and expulsion centers experienced numerous issues because of moving to and residing in urban centers, and as time went on, it became more challenging to find solutions.

Numerous studies have focused on cities, viewing them as complex objects that revolve around a central node of exchanges that gradually alter the local and regional dynamics of geographic environments (Sinard et al. 2011, and the city as a system within the city system (Celine. 2004).

In light of the occurring transformations on the city as well as the increasing interest in studying it for this, several tendencies have emerged trying to study its different aspects. Some of these approaches confirm that the city can be studied from the outside; as in observing the cities in the form of points that constitute the urban system components. The focus in this aspect can be realized through the spatial distribution of cities and its disparity versus the study of the movement patterns side by side the relationships that link cities to each other. Also, observing the spatial interaction between the elements of the network, as well as the relative locations of cities and the general characteristics of the urban system network (Abda,A. 2021).

The outputs of the study concerning the city as a self-contained system, so that the different functions and sizes were integrated into the networks of exchange of regional systems known as urban systems to achieve the exchange of

goods within the systems and according to a hierarchy generally related to the size. The greater the size, the greater the diversity and influence of economic activities. During the last fifty years, direct focus began with the concept of gradation, functional specialization, and spatial divergence (Coffy. 1998).

Spatial studies today strive to tackle the urban system. Urban planning and preparation are in fact linked to development concerns and to the attempt of reversing the city impact on the countryside. In order to reach spatial integration that provokes the cities interaction not competition aiming to avoid spatial imbalances and misuse of areas.

The Batinian urban system knows a rapid growth of the urban population, especially in the period (1998-2020), as the size of the cities and the increase in their number in the wilya region became the most visible scene, especially the wilaya headquarters city, which alone accounts for 38% of the urban population of the state region. The urban population of the region consists of 65.13 % of the total population of the region for the year 2020. The numbers really reflect an unbalanced urban situation between what is urban and rural, also indicate a discrepancy in the cities sizes. This situation necessitated the diagnosis and analysis of the urban system of the Batnian wilaya region to reveal its characteristics during the period (1998-2020), which is the goal that we seek to achieve through:

- Study and analyze the distribution of the wilaya's urban weight and learning the most significant changes associated with the study period (1998-2020)
- Analysis and distribution of the cities size through a bi-sized analysis, addressing the review of urban dominance and identifying its changes during the study period
- Studying and analyzing the spatial distribution of volumetric ranks and identifying the extent of dispersion and concentration in terms of the relationship of cities with their sizes during the study period.

## METHODOLOGY

The study used a variety of approaches to analyze the urban system, starting with the historical angle that involved observing the phenomenon over time and identifying its tendencies based on the varying densities and sizes of the urban centers in the region. To achieve the study objectives, the analytical descriptive approach was followed, by projecting the models and methods adopted by many researchers in an attempt to measure the reality of the urban system, highlighting urban characteristics and trying to assess the urban reality. Given the specificity and importance of the phenomenon studied, the systems approach was adopted in order to complete the maps, as well as its application to identify the cities distribution nature in the wilaya region, the program is also of use in the process of statistical analysis.

To achieve the research objectives, a set of statistical data was utilized from its official sources, especially the National Bureau of Statistics (ons.2008) as well as the Directorate of Planning, Programming and Budget Follow-up (.DPBF. 2020), the data was gathered along (1998-2008-2020), where we focused on the urban centers of the Batnian wilaya region. On another level, we reviewed some publications, reference books and figures closely linked to the study subject. In order to achieve the research objectives, we measured different aspects of the urban system following different methods.

## Statistical Data Processing and Analysis Methods

According to the methodological approach followed, and in order to achieve the research objectives, statistical methods were employed for data processing and analysis, mainly as follows:

## The Rank-Size Rule

The rule set by researcher George Zeff, states that the size of the city has a direct relationship to its rank. The rule's objective is to determine the extent of balance in the urban system in question, where cities are classified in a graphic relationship according to their size. The rule confirms that the theoretical number of the second city is equal to half the population of the first city and the third city It is equal to a third of the first city, and so on until the entire system of cities is classified. For example, the theoretical size of the second city (Browning,h.Gibbs,J.1961) is calculated according to the following formula:

$$N = \frac{population \, of \, the \, firest \, city}{city \, rank \, N}$$

N: theoretical size of the city

#### **Urban Dominance Index**

This indicator is employed to identify the proportionality degree between the population of the first city and the total population of the following three cities; in this case, the result is one (1) integer (Ketich,R.Kaid,s.2014) The urban dominance indicator is written according to the following formula:

$$pi = \frac{S1}{S2 + S3 + S4}$$

So that: pi: urban dominance index

- S1: Population of the first city

S2, S3, S4 are Population of the three cities following the first city.

#### The Law of the Primate City. Mark Jefferson

Jefferson assumes the existence of a major dominant city within the region, where all powers are that centralized and concentrated,(Jefferson,M.1931) Mark Jefferson confirms that the first city has an estimated population of 100%, the second city population is estimated at 30%, while the population of the third city is at 20% compared to the first city's rate. According to Jefferson, if the distribution of cities approximates to the distribution that has been established, he confirms the existence of a rather balanced hierarchy.

#### Lorenz Curve Aad Gini Coefficient

It is one of the methods to measure the relationship between the distribution of a phenomenon within the framework of spatial space(Ebrahim,A.1999) that is, it tries to identify the degree of a particular distribution of idealism. If there are two phenomena, such as the relationship of the population with the number of city centers, then 40% of the population are distributed on 40% of the city centers, hence the distribution is only ideal.

Gini coefficient:

The Lorenz curve aims to determine the relationship graphically by comparing the reality of the situation between two phenomena, while the Gini coefficient focuses on finding a number through which we can explain either the inequality or the idealism in the distribution of cities with their population weights. Gini coefficient is calculated through the following formula:

$$G = 1 - \frac{1}{10000} \sum_{i=1}^{n} (S + S_{i-1}) N_i$$

G : Gini coefficient

Si: Aggregate ration of the value of i

Ni: Rate of the variable value relative to the category

N : Categories' number

Whenever the result approaches the integer one (1), this indicates a disparity from idealism, while if it approaches (0) this indicates the existence of idealism in the distribution of the population compared to the number of cities.

#### Nearest Neighbor Analysis

It aims to reach evidence that expresses the distribution pattern (clustered pattern - regular pattern and random pattern). The idea of this indicator lies in the analysis of the nearest neighbor (Ebrahim, A.2014) and comparison between the actual arithmetic mean of the distance of the nearest neighbor.

For a number of distribution points, the nearest neighbor correlation index is extracted according to the following formula:

$$RN = 2D\sqrt{\frac{B}{A}}$$

**RN** : closet Neighbors Relationship

d : distance rate

- b : the number of urban center
- A : territory area

The number of points in the subject of the research; the cities of the urban system represent the value of the closest neighbor relationship and is limited between (0 and 2.15). When neighbor relationship is the closest, it means that all points are confined to one point in the wilaya territory. The nearest neighbor technique confirms the existence of a significant number of points, and accordingly we will apply this technique on the urban system of the Batnian wilaya territory for the years of study (1998-2008-2020) and the total points for each year in a row (17-21-35)

## Field of Study Localization

The wilaya of Batna is located in the north-east of Algeria within the range of its eastern high plains. Astronomically, it is located between coordinates (4) and (5) of the eastern longitude, and coordinates (53) and (36) of the northern latitude, as it is shown in Figure N° (1). The wilaya's territory occupies a surface of 12,038.76 square kilometers, occuping a strategic location, bordered on the north by the Wilayas of Oum El Bouaghi, Mila and Sétif, on the east it is bordered by the Wilaya of Khenchela, and the Wilaya of Biskra from the south. From the west, we find the Wilaya of M'sila. The wilaya territory consists of (61) municipality, which is one of the largest states in Algeria, the wilaya surface contains multiple urban centers, whereas the centers that exceed (5000) people (.ons.2008), which form the basis of the urban system, are estimated at (35) cities in the year 2020 with the total urban population of (910937) people.

The wilaya of Batna is one of the oldest wilayas in Algeria, its history merges with the history of the Berbers. It witnessed the succession of many civilizations and nations, from the Phoenicians to the French. Batna was named as a governorate at the end of the French period. It maintained the level of promotion as a wilaya in all the divisions known to the independent Algeria (1963 -1974-1984). The terrain of the Batna territory presents a heterogeneous structure with three terrain zones, the high plains zone in the north, the mountain zone in the middle and south, and the steppe zone within the western zone. The diverse topography resulted in a variety of bioclimatic zones, with the dominance of the semi-arid continental climate and the semi-humid zone in the top of mountains, mainly the Aures Mountains. Fig N° (1) is more illustrative of the locational importance of the region.



Figure 1. Localisation of study area. Source: Nacer Fethi based on data (dptb) for the a year (2020)

# **RESULTS AND DISCUSSION**

The Batinian urban system consists of a significant group of cities. The urban region has witnessed rapid urban growth. The 1998 census indicates that the number of cities reached (54,0943), with an estimated rate of 56.19% of the total urban territory population of the wilaya region distributed over (17) cities. Further clarification of this distribution is illustrated on Fig (2). The city of Batna has the largest share of the urban population in the wilaya territory with an estimated rate of (45,62) %. The urban situation in the wilaya of Batna continued to develop and expand; the territory, urban population reached (684,999) in 2008, The urban population is estimated at (61.18) percent, with an increase of 144056 persons compared to 1998.

The urban population is distributed for the year 2008 by (21) urban cities. Batna city has maintained its leadership of the urban population in the terretory with an estimated rate of (42.26)%, and map N° 3 is more illustrative of the cities distribution and their population sizes, the figures indicate a significant increase in the number of urban residents in In the year 2020, compared to previous statistics, the population reached (910937) people, with an estimated rate of (62.27) percent, distributed over (35) urban centers, as illustrated in Fig No (2)



Figure 2. Wilya batna: distribution of urban centre and sizes for years (1998-2008-2020). Source: Nacer Fethi based on data (ons, dptb)for the years(1998-2008-2020)

The first observation concerning this development is the decrease in the share of Batna City by (38,85%), compared to the previous census, there is a population increase estimated at (225938), which can be considered as a significant increase, the urban population is distributed over (35) cities fig N(2) details about this development furthermore alongside with the increase in the city's number by (14) one compared to 2008. Most of these cities are new that, before this census, were counted among rural centers.

Figure (2) show the distribution discrepancy in the urban population during the years of study. According to research, there are three cities in 2020, with a combined population of 64.72 percent of the total combined 32 cities; the preliminary results show the dysfunctional image of the Batnian system. In order to identify and further apprehend the Batnian urban system, we analyzed and studied the Rank-size rule in an attempt to confirm the existence of a dominant city through the changes study during the period (1998, 2008, and 2020). Pursuant to the Ziv Rule and in accordance with the objectives of the study, aiming to identify the urban system situation within the volumetric orders in the urban territory, consequently to determine the changes resulting from the volumetric orders in them, hence the applications of Zipf's law showed this by arranging the cities' sizes in a descending order.

The results confirm that the urban system is poorly balanced; Figure (3) shows a significant difference in the statement of the rank according to the Zipf's law and the rank of city sizes in all years of the study. The observation shows the dominance of the major cities in terms of size while maintaining their ranks during the years of study with a relative change in the ranks of the smaller cities, due to a change in each census concerning the city numbers. The Zipf's law highlights the clear differences between the actual and theoretical sizes. All cities suffer from a deficit in their actual sizes, i.e. a shrinkage in size compared to the theoretical size values, this situation is redundant in all the study period; Tables N° (1,2, 3) in the appendix reflects these discrepancies. This situation is mainly related to the significant impact that the first city (Batna) has on the urban system throughout the years.

In order to identify properly the phenomenon of urban domination of the wilaya of Batna in a quantitative manner, we have applied some laws, including the (Mark Jefferson's) law.





Ranking of Urban Centers	The Cities	Actual Population	Rank by Size	Rank by Ziv	Theoretical Population	The Difference
batna	1	246800	0.322	1	246800	0
barika	2	79508	0.181	0.5	123400	-43892
Ain touta	3	44904	0.104	0.33	81444	-36540
ngaous	4	25723	0.079	0.25	61700	-35977
merouna	5	19503	0.076	0.20	49360	-29857
tazoult	6	18997	0.072	0.167	41216	-22219
arisse	7	18003	0.060	0.143	35292	-17289
El madher	8	14375	0.047	0.125	30850	-15875
chemoera	9	11629	0.039	0.111	27395	-15766
Oued el ma	10	9677	0.039	0.10	24680	-15003
Ras eaoun	11	9627	0.038	0.091	22459	-12832
Ain djasser	12	7841	0.031	0.083	20484	-12643
seriana	13	7309	0.029	0.077	19004	-11695
timgad	14	7126	0.028	0.071	17523	-10397
mdoukal	15	6908	0.027	0.067	16536	-9628
tkout	16	6602	0.026	0.063	15548	-8946
Ain yagout	17	5811	0.025	0.059	14561	-8750
The total		540943	-	-	-	-

<b>Iddle 1.</b> Wilva Datila., Illelaitilv uldali telltels attoluille to tile zil i ule tile veals 1990	Table 1	. Wilva batna::	Hierarchy urban	centers according to	the zif rule the vears 1998
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Source: Nacer fethi based on data ( ons, dpsd )for a year, (1998)

Table 2	Wilva	hatna	Hierarchy	urhan	centers	according	to the	7if rule	the	vears	2008
Table 2.	vviiya	Datild	meratchy	ui Dall	centers	according	to the	ZII I UIE	une.	years	2000

Rank of Urban Centers	The Cities	Actual Population	Rank By Size	Rank by Ziv	Theoretical Population	The Difference	
1	batna	289504					
2	barika	98141	0.338	0.5	144752	-46611	
3	Ain touta	55736	0.192	0.33	96501	-40765	
4	Ngaouz	29453	0.101	0.25	72376	-42923	
5	merouna	24120	0.023	0.20	57901	-33781	
6	Tazoult	22918	0.079	0.167	48251	-25332	
7	rase eaoun	20827	0.071	0.143	41358	-20531	
8	arris	120668	0.071	0.125	36188	-15520	
9	El madher	17989	0.062	0.111	32167	-14178	
10	ichemora	13715	0.047	0.1	28950	-15235	
11	Oued el ma	11219	0.038	0.091	26318	-15099	
12	serian	10890	0.037	0.083	24125	-13235	
13	Ain djasser	10264	0.035	0.077	22269	-12005	
14	timgade	8765	0.03	0.071	20679	-11914	
15	mdoukal	8188	0.028	0.067	19300	-11112	
16	tkout	7645	0.026	0.063	18094	-10449	
17	Ain yagout	7602	0.025	0.056	17030	-17030	
18	Cite 1er n	7366	0.025	0.056	16083	-8717	
19	bouhmar	6953	0.024	0.053	15237	-7577	

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20	El djzzar	6898	0.023	0.048	14475	-7577
21	sefiane2	6138	0.021	0.048	137886	-7647
The total		684999				

Source: Nacer fethi based on data ( ons, dpsd ) for a year, (2008)

**Table 3**. Wilya batna : Hirarchy urban centres according to the zif rule the yers 202

Ranking of Urban Centers	The Cities	Actual Population	Rank by Size	Rank by Ziv	Theoretical Population	The Difference
1	Batna	353904	1	-		
2	Barika	119342	0.337	0.5	176952	-57610
3	Ain touta	67091	0.189	0.330	117968	-50877
4	Ngaous	33456	0.094	0.25	88476	-55020
5	Merouna	29467	0.083	0.2	70781	-41320
6	Tazoult	29377	0.083	0.167	58984	-29607
7	Arris	25989	0.073	0.143	50558	-24569
8	El madher	22467	0.063	0.125	44238	-21771
9	Ras eaoun	17704	0.05	0.111	39323	-21619
10	Ichmora	16390	0.018	0.1	35390	-19000
11	Oud el ma	14042	0.039	0.091	32173	-18131
12	Seriane	13605	0.038	0.083	29492	-15887
13	Ain djasser	13289	0.037	0.077	27223	-13934
14	Timgad	10160	0.028	0.071	25279	-15119
15	tkout	9741	0.027	0.067	23594	-13853
16	Ain yacout	9458	0.026	0.063	22119	-12661
17	bouhmar	9393	0.026	0.059	20818	-11425
18	Cite 1er n	9262	0.026	0.056	18626	-9364
19	mdoukal	9230	0.026	0.053	17695	-8465
20	djezzar	9085	0.025	0.05	16852	-7767
21	Ouyoun el assafir	8839	0.024	0.048	16086	-7247
22	Oed chaaba	7862	0.022	0.045	15926	-8064
23	Sefiane	7766	0.021	0.043	15387	-7621
24	Rahbat	7749	0.21	0.042	14746	-6997
25	Boulhilet	7098	0.020	0.04	14156	-7058
26	Ali nemeur	6244	0.017	0.038	13612	-7368
27	bouzina	6229	0.017	0.037	13107	-6878
28	El kasbat	6085	0.017	0.036	12639	-6554
29	Hamla 3	6073	0.017	0.036	12203	-6130
30	bitame	5997	0.016	0.033	11797	-5800
31	fesdis	5887	0.016	0.032	11416	-5529
32	Menaa	5709	0.016	0.031	11059	-5350
33	Ichmoul	5671	0.016	0.03	10724	-5053
34	Talkhemet	5510	0.015	0.029	10409	-4899
35	Ouled fadhel	5024	0.014	0.028	10111	-5087
The total		910937				

Source. Nacer fethi based on data (ons, dpsd) for a year (2020)

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Where as Table NO (4) shows a convergence between the ratios set by Jefferson and those recorded during the study, the observation of the results according to (Mark Jefferson's law) demonstrates the clarity in the arrangement of the Batnian urban system. The fact that concurs with the estimations of Jefferson, who considers that in the event that the second city represents 30% of the first city, it does not represent a hegemony according to Jefferson's law.

Accordingly, the law application results indicate that the hierarchical system is arranged in a pyramid hierarchy. Given the results of the application of Jefferson's law, we wanted to ensure the application of the urban dominance guide for the cities that follow the first city, which are, respectively, the city of Barika, Ain-Touta and the city of N'Gaous according to the years of study.

 Table 4. Wilaya of Batna: Results of Mark Jefferson's Law application for the years (1998-2008-2020)

Application of the Primate City law on urban centers of 1998			Application of City law on un of 20	f the Primate rban centers )08	Applicatio Primate Cit urban cente	Application of the Primate City law on urban centers of 2020		
City	Population	city size ratio %	Population	city size ratio %	Population	city size ratio %		
Batna	246800	100	289504	100	353904	100	100	
Barika	79508	32	98141	34	119342	34	30	
Ain-Touta	44904	18	55736	19	67091	19	20	

Source: Nacer Fathi, based on data from (NSO-dptb) for the years 1998-2008-2020.

Table N(5) displays the outcomes of using the dominance index (5). The findings show that the dominance index consistently outweighs the integer one for the years (1998-2008-2020), respectively (1.64-1.57-1.60), and this supports the occurrence of the hegemony phenomenon in the urban territory in the wilaya of Batna. The first city (Batna) dominates the urban scenery of the territory. Several factors contribute to Batna's dominance, including:

- 1. The city's superiority was a result of its administrative, economic, and geographic importance, and it grew to be a key source of attraction for the wilaya's territory.
- 2. The historical and contemporary immigration movements: the historical, which occurred during the colonial rule, and the contemporary, which occurred during the period of independence, in addition to the substantial natural increase that occurred during the first phases of independence
- 3. Along with the expulsion-related manifestations experienced by the Algerian countryside residents in general and the location of the study in particular, a significant portion of the population desires to live in comfortable urban territories.

	Population 1998	Population 2008	Population 2020
First city (Batna)	246800	289504	353904
Second city (Barika)	79508	98141	119342
Third city (Ain-Touta)	44905	55736	67091
Fourth city (N'Gaous)	25723	29453	33456
Dominance Index	1.64	1.57	1.60

**Table 5.** Wilya batna: Urban domination guide, for a year (1998-2008-2020)

Source: Nacer Fethi based on data (ons,dptb) for a year(1998-2008-2020)

To achieve the objectives associated with the research endeavor and to reveal the characteristics of the urban system by identifying the relationship of the urban population distribution to the urban centers of the concerned territory, and to achieve this purpose, we have applied the Gini coefficient and the Lorenz curve. Figure N° (4) and Table (6) show the most important outcomes in general. The results are based on the tables in Appendix N° (7.8.9)

Table N° (6) reflects the results of the Gini coefficient for the years (1998.2008.2020) respectively (0.628-0.612-0.622), hence the results are close to the integer one, which, as we mentioned earlier, expresses the gap in distribution therefore indicates the clear disparity in population numbers compared to the cities' sizes.



Figure 4. Wilya Batna :Lorenz curve for urban centers for years(1998-2008-2020). Source. Nacer fethi based on data (ons dptb) for a year (1998-2020)

**Table 6**. Wilaya batna: Gini coefficient, for the period(1998-2020)

The Years	1998	2008	2020		
Gini Coefficient	0.628	0.612	0.618		

Source: Nacer Fethi based on data (ons dptb) for a year (1998-2008-2020)

Table 7.	Wilva batna:	data for the application	on the Lorenz and je	enny curves for	the vear (	1998).
	J	The second				

Size Classes	The Number Urban	Population	Perce Population	entage of n and Centers	Aggreg Percent Populatio Cente	ate age n and rs	Ni . (1)	Si (4)	Si-1 (5)	(5+4)	(5+4)× I(6)
	Centers		Centers %	Population %	population	centers					
5000-10000	8	55090	47.05	10.18	47.05	10.18	47.05	10.10	0	10.18	478.96
10001-20000	5	83107	29.41	15.36	76.46	25.54	47.05	10.10	0	35.72	1050.5
20001-50000	2	70627	11.76	13.05	88.22	38.59	29.41	25.54	10.18	64.13	754.16
50001-100000	1	79508	5.88	14.69	94.1	53.28	11.76	5 38.59 25.54	25.54 38 59	91.87	540.19
100001-300000	1	246800	5.88	45.62	99.98	98.9	5.00	00.0	98.9 53.28	152.18	894.81
+3000001	0	0	0	0	100	100	5.88	98.9		98.9	0
	17	540943	100	100			100	100			3718.64

Source : Nacer fethi based on data (ons, dpsd) for a year, (1998)

Table 8. Wilya Batna: data for the application on the Lorenz and jenny curves for the year (2008)

Size Classes	The Number Urban Centers	population	Percentage of population and centers		Aggregate Percentage Population and Centers		Ni	Si	Si-1	(5+4)	(5+4)×
			Centers %	Population %	Population	Centers	(1) (4)				.(0)

5000-10000	8	59555	38.09	8.69	38.09	8.69	38.09	8.69	0	8.26.73	331
10001-20000	5	64077	23.80	9.35	61.89	18.04	23.8	18.04	8.69	26.73	636.17
20001-50000	5	117986	23.8	17.22	85.69	35.26	23.8	35.26	18.04	53.3	1268.54
50001-100000	2	153877	9.52	22.46	95.21	57.72	9.52	57.72	35.26	92.98	885.16
100001-300000	1	289504	4.76	42.26	99.97	98.97	4.76	99.98	57.72	157.7	750.65
+3000001	0	0	0	0	100	100	0	100	99.98	199.98	0
	21	684999	100	100							3871.52

Source : Nacer fethi based on data ( ons, dpsd )for a year ,(1998)

Table 9. Wilaya Batna : data f	or the application on the L	lorenz and jenny curv	ves for the year (2020)
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Size classes	The number urban	population	Percentage of Population and Centers		Aggregate Percentage Population and Centers		Ni	Si (4)	Si-1	(5+4)	(5+4)×
	centers		Centers %	Population %	population	centers	(-)				1(0)
5000-10000	21	154814	60	17	17	60	60	17	0	17	1020
10001-20000	6	75030	17.14	8.23	25.33	77.14	17.14	25.33	17	42.33	725.36
20001-50000	5	140756	14.28	15.45	40.88	91.42	14.28	40.88	25.33	66.21	945.47
50001-100000	1	67091	2.85	7.36	53.78	94.27	2.85	53.78	40.88	94.66	269.78
100001-300000	1	119342	2.85	13.10	66.88	97.12	2.85	66.88	53.78	120.66	343.88
+3000001	1	35304	2.85	38.35	100	100	2.85	100	66.88	166.88	475.60
	35	910937	100	100							3780.09

Source : Nacer fethi based on data ( ons, dpsd ) for a year, (2020)

The results express the disparity in the distribution of the urban population over the urban centers. This imbalance is mainly due to the rural migration movement that started early in the territory and continued more intensely after the independence stage, in addition to economic factors represented in the state's industrialization policy that instigated the population movement towards industrialization areas located adjacently to the major cities.

To inspect Gini's results, we have completed the Lorenz curve for the years of study (1998-2008-2020); Figure (4) graphically shows the discrepancy between the optimal line of Lorenz and the cumulative ratios of urban residents and city sizes. The disparity is present in all the statistics. In 1998, 60.31% of the population is concentrated in two cities (Batna and Barika), and the rest of the population, estimated at 39.69%, is located in (15) urban cities, which constitutes a significant disparity between the population and urban centers. The situation is indeed constant during the rest of the years (2008-2020), as the figure graphically shows the line deviation from the cumulative ratios of the population and urban centers. Moreover, to further elucidate: in the year 2020, we find (51.95%) of the population is concentrated in (33) urban cities in the year 2020. The numbers reflect a significant degree of disparity and inequality. Nevertheless, the congruence between the results of the Gini coefficient and the Lorenz curve is undeniable.

In an attempt to gain familiarity with all the detailed characteristics of the urban system of the wilaya of Batna, we attempted to reveal the nature of the distribution of urban centers in the wilaya territory. Hence, to achieve this purpose, we have applied the Nearest Neighbor Index called the "closest neighbor connection" through the (q gis) program. The obtained results for the years of study (1998-2008-2020) respectively scattered random are shown in table No 10

Inspecting the study outcomes, the urban centers follow, in their spatial distribution, the (quasi-arbitrary) pattern, however some details are present in this context: according to the years of study . In 1998, the distribution pattern of cities approved by the program was determined to be quasi-arbitrary, according to the result obtained, (1.431) which is close to the integer one. As indicate the results, The results also confirm that the confidence level is high, reaching 95%, and that the incoming error rate is estimated at 5%: to be aggregated or dispersed.

 $The application of the Nearest Neighbor Index for the year 2008 \, displayed similar results to those of 1998, the distribution and the second statement of the second statem$ 

pattern is close to the arbitrary according to the obtained result (1.306), the obtained results exhibited a High level of confidence up to 95% with a weak error of 5%. The distribution pattern should be clustered or random.

With a view to complete the nature of the distribution in all years and facilitate the comparison process and extract some of the reasons that we consider appropriate to the state of change in order to explain as much as possible of the results obtained, which is the essence of the serious scientific endeavor that we intend to obtain. The application of the Nearest Neighbor Index for the year 2020 indicate that the territory in this year was quasi-arbitrary, since the result obtained was at (1.15), The results obtained showed a confidence level estimated at 95% with an estimated error rate of 5%. The results reflect the state of cumulativeness, as the distribution pattern tends towards aggregation, especially in the suburbs of the main city (Batna).

**Table 10**. Wilaya batna: The results of the application the relationship of the nearest neighbor the period (1998-2008-2020)

The Results of Application for the Relationship of the Nearest Neighbor								
The Year	Sample Size	Actual Distance	Expected Distance	Average Nearest Neighbor Index				
1998	17	18053.337	12610.84	1.431				
2008	21	14820.041	11346.42	1.306				
2020	35	10194.96	8853.107	1.15				

## CONCLUSION

The analysis and study of the Batnian wilayal urban system for years (1998-2008-2020) explain the characteristic clarity of the urban system, so recommendations were formulated based on the reached results. The study highlighted the presence of significant changes, whether in the increase in the number of centers or in the increase in the size of the centers during the study period (1998-2020), Batna counted about (17) cities in the year 1998 to reach (35) cities in 2020, in a transverse expansion while the territory witnessed a vertical expansion in the cities' sizes, yet with varying increases, the largest share was in favor of the city of Batna.

The results of the study, in accordance with the application of the Zepf's rule (rank - size) showed the absence of balance in the urban network during the study period (1998-2020).When we compare the actual number with the theoretical number in all years of study, it becomes flagrant the deficit in all the cities that follow the first city, compared to the vast Batna city. The results showed Batna great dominance over the wilaya territory, and this is by applying the index of dominance alongside with Mark Jefferson law. The process of polarization is unequivocal in the wilaya territory, with the dominance of Batna city over the rest of the urban centers. This situation persisted in all the years of study, the pyramid hierarchy in the Batna territory has become missing.

To complement the identification of the Batnian urban system characteristics and to reveal the nature of centers distribution over the territory by applying the Nearest Neighbor index for the period (1998-2020)it is shown that the centers are distributed arbitrarily, relatively close, nevertheless the territory tends towards more gathering of urban centers. Moreover the study results indicated after applying Gini coefficient and Lorenz curve on the size of the disparities that exist between the population and urban centers, the distribution is far from ideal rather inequitable in all years of study.

In line with the study results and due to the undesirable situation patent in the urban system characteristics of the study territory, both in the centers distribution and the variation in the sizes of cities alongside with the absolute dominance of Batna City over all elements of the urban system. In addition to the absence of pyramid hierarchy in all years of the study, this situation framework requires us to intervene with some recommendations judged to be as important to achieve urban integration and bring about a sort of balance in the urban network. Since maintaining this situation has negative consequences on the urban system. Therefore, the most important recommendations possible to restore urban balance to a territory - by examining the urban pattern, which illustrates the dominance of Batna City, characterized with large population loads, the fact that reflects the size of the urban accumulation and concentration of the city- so we must:

1- To restore balance to the wilaya territory by creating a balanced and efficient urban system capable of resolving the network imbalance requires issuing a strategy to develop the urban system in order to

- 2- To diminish urban concentration and dominance through the implementation of growth poles far from the main city is one way to redistribute development.
- 3- To adopt development policies that reduce migration to urban centers through the establishment of urban facilities and services that prevent movement to big cities.
- 4- To reexamine the guiding principles applied to regional divisions. The formerly held belief that the region's chances of development are increased by division. This procedure has outlived its usefulness, as practice has shown. To achieve this, underdeveloped areas must be the focus of development policies in order for them to regain their vitality.
- 5- To implement an equitable (urban) local development that prevents polarization and affects all cities
- 6- To redistribute the population surplus towards the satellite cities, and making these cities to be considered as subcities alternative to Batna city
- 7- To reconsider the operations of financing local groups and the modalities of dividing programs and projects in order to prevent the wilaya headquarters (Batna) from taking possession and monopolizing projects
- 8- In order to overcome polarization and implement balanced development policies, the causes of the problem must be identified.

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