Urban Characteristics of Qassim Region, An Applied Study with Rank-Size Rule According To 2010 Census

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ABSTRACT

In the context of geographical quantitative revolution around the mid-20th century, George K Zipf's model emerged, which was designed to measure sizes of cities by their population in what is known as the rank-size rule. It is important to apply that scientific base to measure sizes of cities at state level as well as level of administrative regions within the state. This is the scope of this study, which sought to apply the rule to the cities of Qassim region as a geographical unit within Kingdom of Saudi Arabia. The aim of the research is to study the urban system in Qassim and discover the urban hierarchy that runs the governorates within their administrative boundaries. The main question of the study was: What is the balanced geographical rank of the cities of Qassim region? The tools of the geographical statistical method were used to display and analyze data, where most important results were: The urban system in Qassim region is dominated by the city of Buraidah, which contains most of the geographical factors that formed the urban sites and their environmental conditions. The study concluded that the urban system in Qassim enjoys a natural formative background that depends on the fertile lands around its cities, whose characteristics are similar and their main features converge. In spite of this, the consequence of applying Zipf's rank-size rule was that: cities are far from the straight equilibrium line of the vertices of their sizes.

Keywords: geographical rank, cities, Qassim region and rank-size rule.

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**الخصائص الحضرية لمنطقة القصيم،
دراسة تطبيقية لقاعدة الرتبة والحجم وفقاً لتعداد ٢٠١٠م**

المستخلص

في سياق الثورة الكمية في الجغرافيا حوالي منتصف القرن العشرين، ظهر نموذج George K Zipf، والذي تم تصميمه لقياس أحجام المدن من خلال عدد السكان فيها وتحديد رتبها فيما يعرف بقاعدة الحجم والرتبة . وقد صار من المهم تطبيق تلك القاعدة العلمية لقياس أحجام المدن على مستوى الدولة وكذلك مستوى المناطق الإدارية داخل الدولة. وهذا هو مجال هذه الدراسة التي سعت إلى تطبيق القاعدة على مدن منطقة القصيم كوحدة جغرافية داخل المملكة العربية السعودية. والهدف من البحث هو **دراسة النظام العمراني في القصيم واكتشاف التسلسل الهرمي الحضري الذي يدير المحافظات ضمن حدودها الإدارية**. فكان السؤال الأساسي للدراسة: **ما هو الترتيب الجغرافي المتوازن لمدن منطقة القصيم؟** وتم استخدام أدوات المنهج الإحصائي الجغرافي لعرض وتحليل البيانات، حيث كانت أهم النتائج: **أن النظام الحضري في منطقة القصيم تسود فيه مدينة بريدة والتي تحتوي على معظم العوامل الجغرافية التي شكلت المواقع العمرانية وظروفها البيئية**. وخلصت الدراسة إلى أن **النظام العمراني في القصيم يتمتع بخلفية تكوينية طبيعية تعتمد على الأراضي الخصبة حول مدنها والتي تتشابه خصائصها وتتقارب صفاتها**. وعلى الرغم من ذلك، كانت نتيجة تطبيق قاعدة زيف Zipf للرتبة والحجم أن المدن بعيدة عن خط التوازن المستقيم لقمم أحجامها.

الكلمات المفتاحية: الرتبة الجغرافية، المدن، منطقة القصيم، قاعدة الرتبة والحجم.

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INTRODUCTION

Since the forties of the twentieth century, the use of statistics and quantitative method in geography has spread, and interests developed until statistics became an integral part

of almost all geographical studies (Taagepera, et al, 2001). This led to establish theories and models that contributed to treating issues that include urban aspects in human urbanization. Zipf equation, which deals with the issue of hierarchy and volumes in the balance of cities in regions, is one of the important models that have scientifically solved problems of urban weight (Nota, et al, 2012).

Circumstances that led Zifp to develop rank-size rule are still there, as the geographical factors that affect settlements in general and urban reality in particular in each country and each region are emerging, due to the change of the factors expelling the population and the attractive ones. So, some cities lose their positions in favor of other cities, and there is always need for scientific opinion in determining the weight of a city and its preference over another city. In a country like Saudi Arabia with a large area estimated at 2,150,000 km2 (Al-Sharif, 2009) it is important to use Zifp equation to determine the weight of cities based on the population size, whether at the national level of the state or at level of any region. This is one of the reasons why the researcher chose Qassim region (where he resides) in which there are many cities to apply Zipf rule to show the order in which each city is based on its population weight.

This study attempted to address the issue within the urban system using that equation based on demography to answer the main question: What is the balanced rank of Qassim region cities based on geographical factors? The aim was to study the urban pattern of the region and to clear the backgrounds of the population sizes of its cities and resulting rank of each. The assumption was (natural factors attracted population to Qassim region and led to stablish urban system similar in its characteristics and hierarchy).

1. RESEARCH METHODOLOGY AND STUDY CASE

Qassim region is one of the administrative units within the Kingdom of Saudi Arabia, and thus it is a geographical region with its geographical characteristics. This requires the use of regional geographical approach to determine the region and give the spatial characteristics. There is another study technic that deals with the main research question elements, which are the cities in Qassim region. They are viewed as digital elements while their populations and spaces are to be used as digital elements, too. That requires use of the geographical statistical approach in general Then there will be a basic statistical use related to the rule of rank and size in determining the ranks of cities in Qassim region:

1.1. Statistics and Rank-size Rule

The study uses statistics to elucidate Qassim cities data because they are embodied in numbers. Even the two characteristics the study focuses on (provinces areas & rank-size rule) need to be determined numerically. The focus in the first characteristic is sufficient by listing and tabulating the numbers and then highlighting in graph.

As for the rank-size rule: George Kingsley Zipf is the first to try finding a relationship between the number of cities, their sizes and ranks in a geographical region. His method is (comparing the city's population with its hierarchy in relation to the population and ranks of other cities in a particular region or country) (Zipf, 1949). Sometimes researchers differentiate between natural cities and cities established and planned for special reasons (Asami, 1986).

This rule means that if we take the cities of a region or a country and arrange them in descending order from largest to smallest and put them on a logarithmic graph consisting of a horizontal axis that shows the rank and a vertical axis that shows the

size or population of the city, then the size of the first city is number 1 and the size of the second city is half the size of the first city, i.e. 1/2, and the third, a third, i.e. 1/3, and so on, to equal the size of the last city 1/n, according to the following series: 1, 1/2, 1/3, 1/4, 1/5. 1/n.

formula of the equation is as in Eq (1) below:

Equation (1) $P_x = \dfrac{P_1}{X}$

where:

X is the rank of the city's population i.e., one for the highest population, 2 for the second highest.

P_x is the population size of the city-ranked x

P_1 is the population size of the largest city

If this number is multiplied by the order (n) of a city in its population (size), then the result will be equal to the size of the first city. Thus, Zipf assumed that the sizes of the cities take a gradual smooth curve as close as possible to the straight line (figure1):
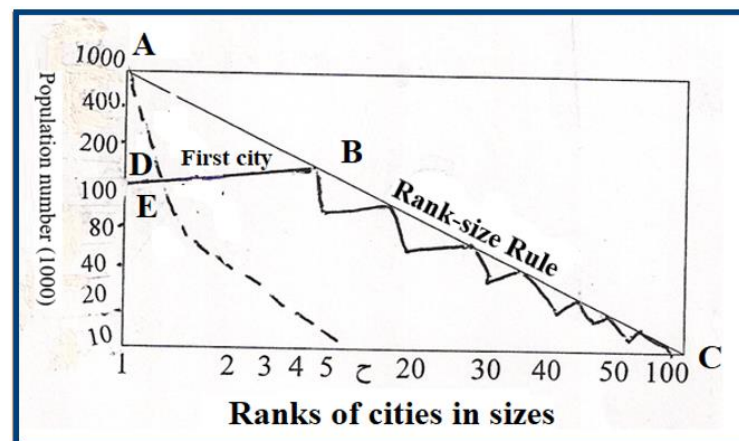

Figure (1): Example of rank-size rule application
Source: Hussein Abdul Razzaq, 1977, p. 2422

If this rule was originally directed to find a gradient line for the tops of cities in a specific region to be straight or whatever it is, then it aims at one of two things (Al-Jarallah, 1996).

1. Verify whether the measured relationship between the cities concerned is completely identical to the rule or not according to the sequence 1, 1/2, 1/3, 1/4, 1/5...... 1/n, noting that the value of the first city doesn't change.
2. If the relationship does not match the sequence, the actual demographic sizes of the cities are compared with the results of the proposed sequence and deviation will be measured to calculate it formally and graphically, noting that the rule is completely applicable only in a few countries.

In general, the region to which rank-size rule applies is the one closer to the following specifications (Al Hamidi, 1991):

1. Must be independent unit, not part of a larger region that overlaps with.
2. Can achieve self-sufficiency easily.
3. Should be regular in shape and moderate in area.
4. Diverse and numerous in its natural and human elements.
5. Does not belong to another region, so that functions of its cities turn into the cities of the larger region

These characteristics, if available in the country as a geographical region, make it include geographical factors that support independence more, and if available in an administrative region within the state, make it an integrated geographical unit. Together, cities with their provinces and populations make the full picture. That is like the sizes of communities as a measure of social organization in the considerations of Zipf (1941). That is while some scientist like Eric Sheppard (1982) see that; city size relationship should not be treated as a norm for national settlement policies unless it is agreed upon with other social factors.

What Eric Sheppard stated is noticed in Saudi Arabia. That is why the criteria of determining towns among settlements is unified in one factor. For this reason, the government consider many factors to estimate the weight of the city: like history, location, economic production and size of population (Al-Jarallah, 2000).

The rule is valid for application in many regions of the world. The geographer Wright, J. K. confirmed the validity of this theory after applying it to 25 cities in the United States of America and a cumulative drawing that proved that the distribution agrees with the symmetrical curve that follows the rule sequence: 1, ½, 1/ 3, ¼, 1/5 ... ... 1/n (Al-Zawka, 1991). The rule has been criticized on the grounds that there is no specific relationship between volumetric and functional categories, so it is not required that parallel functional levels be linked to one population sizes, as each region has its own arrangement for its city categories, so the relationship between the number of cities and their sizes cannot be considered an interdependent relationship at the global level. The main advantages specially in regional aspects are: interpretation of relationships, assessing ranks, viewing population size of settlements, helping in distribution of wealth, organizing regional economic, contributing in resource development and analyzing settlements networks. However, some researchers argue with some points considered as negatives when implementing rank-size rule from which are:

- not all areas can get equal access to certain economic activities,
- flow of information is decreased,
- not all cities are equally represented in global trade.
- smaller markets for goods and services

1.2. Study Case

Naturally, Qassim region is dominated by Wadi al-rummah which is the main feature (Al-Sharif, 2009) for most of the surface of the region. The western parts are of igneous rocks in general, but the middle and eastern parts are sedimentary, where the valley flows and contain underground water. And there is no difference between Qassim and other regions of Saudi Arabia in general climate which is the kind of dry regions climate.

That nature formed the relation between population and land. So, the region is really taking the characteristic of the country being underpopulated while it is classified as an agricultural region in human activities. And because the location is in the middle of the state people are getting the benefit Qassim as a transit area between east and west as well as between north and south.

Qassim is a region in the Kingdom of Saudi Arabia, according to the government decree dated 27/8/1403 (8/6/1983) modified 30/3/1414 (16/9/1993). It is in the northern center of the Kingdom, located between º23:30 and º28:00 N latitudes and º40:00 and º45:00 E longitudes east (Al-Daghiri, 2019), and it is bordered to the south by Riyadh region, to the east by Eastern region and part of Riyadh, to the north by Hail region, and to the west by Medina region (Department of Statistics & Information, 2004). the total area of Qassim is about 69840.1 km2, which is equal to 3.7% of total area of the Kingdom (Saudi Geological Survey, 2012) figure (2).

Thus, Qassim is considered one of the medium-sized regions in the Kingdom, where there is much smaller than it, being centered to the north. That gives it great importance as a transit area for three regions north of it. The area south of it to the southern international borders is greater than the north one. And the same is from it's east to its west in terms of importance. the astronomical position gives it the general nature that characterizes the kingdom within the tropical ranges in the lower latitudes in terms of temperature, dryness of its environment and other geographical characteristics.
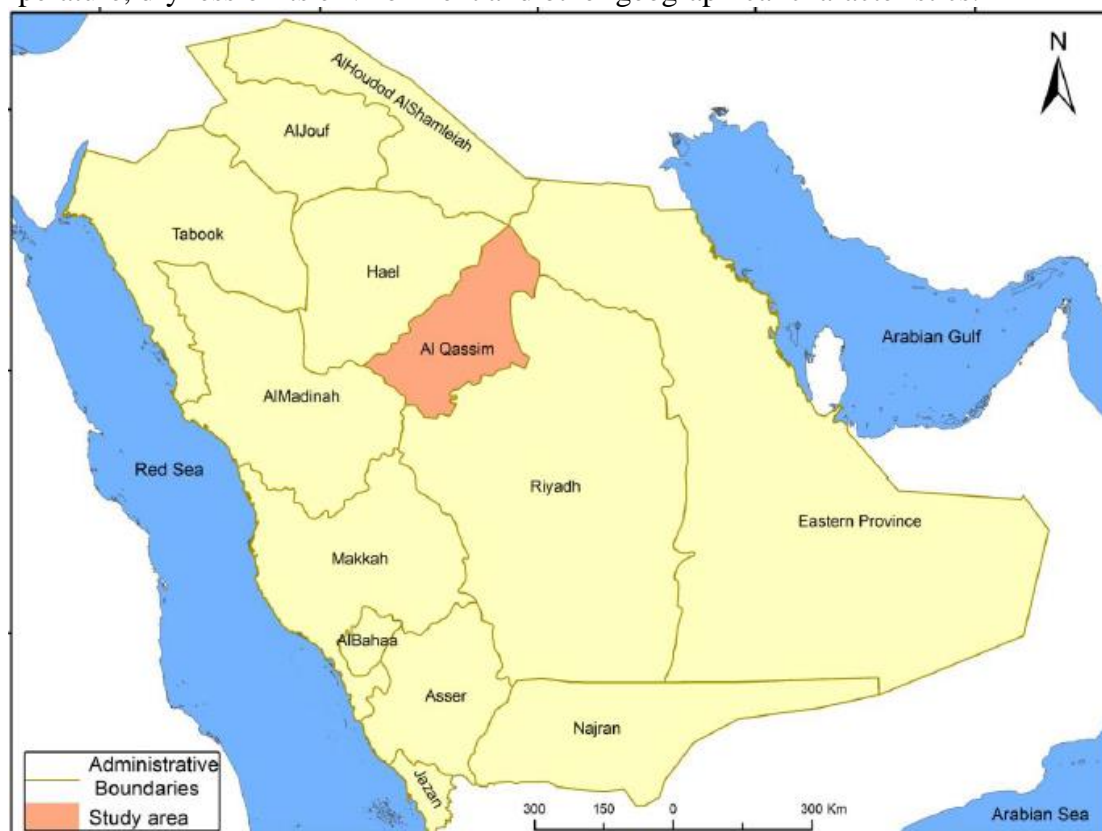

Figure (2): Qassim Region in Saudi Arabia
Source: Atlas of The Kingdom of Saudi Arabia 1999

Accordingly, Qassim region consists of 13 governorates with about 154 administrative centers (Saudi Geological Survey, 2017). Article 3 of the Regions System issued in 1992 stated: "Each region consists administratively of a number of governorates category A, and governorates category B, centers category (A), and centers category (B), taking into account demographic, geographic, security considerations, environmental conditions and transportation means." (Saudi Geological Survey, 2017). This means that there is an administrative rating that makes settlements classified as demographics, spatial, environmental relations and transportation conditions, as in table (1). These considerations have made each province of demographic and

administrative status that shows its weight in Qassim's region that consists of six provinces category A and seven category B.

Table (1) Qassim provinces and their areas and centers

No	Province	Category	Area k^2	No of centers
1	Buraidah	A	17085.0	41
2	Unaizah	A	1901.3	4
3	Ar-Rass	A	2523.3	6
4	Al-Mithnab	A	2058.3	7
5	Al_Bakiryah	A	3696.0	10
6	Albadayea	A	1234.5	4
7	Al-Asyah	B	12937.6	11
8	Al_Nabhanya	B	10125.0	32
9	UyunAl-Jiwa	B	3158.2	7
10	Riyadh Al-Khabra	B	1466.1	4
11	Al-Shammasiya	B	1947.1	2
12	Oklat_AlSkoor	B	5552.5	13
13	Daria	B	6155.3	13
	Total		69840.1	154

Source: Saudi Geological Survey 2017,
Qassim Municipality correspondence, February 2022

Total area of Qassim, which is 69840.1 square kilometers and 3.7% of the total area of Saudi Arabia (Saudi Geological Survey, 2017) is shared by its provinces as shown in table (1) above, the governorates vary in their possession of the area according to the administrative division. So, Buraidah (bigger city) appears as the first administrative city in the region with a governorate area that is the largest, followed by the governorate of Al-Asyah, then Al_Nabhanya, and even the least populated Dariah governorate in the region has become the fourth in terms of area, where the rest of the governorates are ranked in reducing the area. We find that Albadayea is the last of the governorates in terms of area, and it almost only has about 5% of region area.

Note that the area is an important factor in determining the city's rank because it provides other sub-factors that attract or repel population, and since rank-size rule was based only on population size, the area is one of the factors determining population conditions. Even the neighborhood is a factor as Clark, P. J., & Evans, F. C. (1954) see, especially in natural elements but the area is the basic factor where all other elements found. In figure (3) below cities are shown ranking according to their governorate areas.
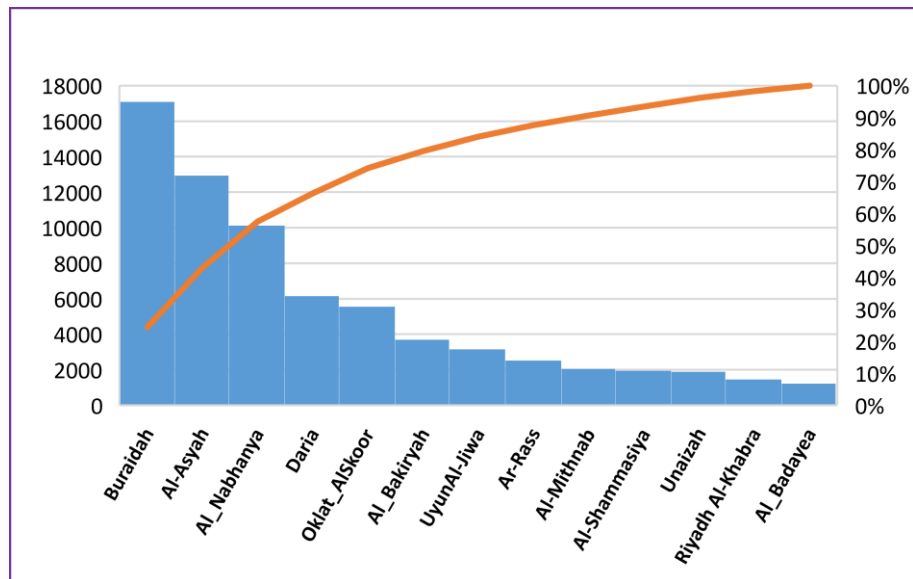
Figure (3) Qassim provinces and their areas
Source: Designed by the researcher based on Table (1).

As for the demographic aspects, we find that the last actual census of the Kingdom's population was carried out in 2010, and the result was 27,136,977 people, while the population of Qassim were 1,219,184 people (General Authority for Statistics 2010), i.e. 4.4% of the kingdom population. According to the reports of the Saudi General Authority for Statistics, we find that the population of the main cities of Qassim in 2010 census was as in the following table (2) noting the absence of two governorates, Oklat al-Soqoor and Dariah, which were distributed within the governorates existed in 2010.

Table (2): Qassim provinces populations, 2010 census

No	Province	Pop. size
1	Buraidah	619739
2	Unaizah	163441
3	Ar-Rass	133837
4	Al-Mithnab	42890
5	Al_Bakiryah	56922
6	Albadayea	56466
7	Al-Asyah	26368
8	Al_Nabhanya	47241
9	Uyun Al-Jiwa	26476
10	Riyadh Al-Khabra	35209
11	Al-Shammasiya	10595
	Total	1219184

Source: Saudi General Authority for Statistics, 2010, Book No. 46

All that shows the case of the study, the region, and the most important elements related to. The focus of the study will be on cities, not the governorates with their total areas.

A quick comparison between the case of Qassim and other three cases is essential. Qassim is an internal region, as well as the three cases, which are the Kashmir Valley region in India, the Babylon province as a region in Iraq, and the Asir region in Saudi Arabia. The comparison includes four elements: the aim of the research, number of cities, total population of the case and the conclusion of the research:

The comparison with its four elements in the following table (3) shows some important aspects. In terms of objectives, we find that the four regions have some differences, because rank-size rule is a neutral tool that can be used to achieve different goals. My research in Qassim focused on two areas of objectives: the study of the urban system and the detection of the hierarchy of Qassim cities.

In terms of the number of cities, it varied around 46, 17, 14 and 13 in Qassim, but the high population size appears in the Indian Kashmir Valley region, with 46 cities, noting the different factors of population conditions that are often based on the natural reality of the region and the abundance of surface resources, but it is noticeable in the three Arab regions of Babylon, Asir and Al-Qassim the convergence in the number of cities and the size of the population as well due to the convergence of demographic conditions.

The conclusions of the comparative studies varied, where we find in Kashmir region the incompatibility of city relations in some characteristics and the clear influence of political and economic factors (Naqshbandi et al. 2016), while in the province of Babylon we find that the lack of basic services made three cities dominate the urban situation in the region with a large gap between the actual and theoretical sizes of cities Which led to the concentration in three cities (Al-Anbari, et al 2014), but the conclusion of Asir study was revealing the impact of rapid urbanization on the conditions of cities and the dominance of the first and second cities on the urban system with the large gap between the actual and theoretical sizes, which resulted in the loss of the balance of sizes and the absence of million cities due to the general population imbalance of the country (Abdullah, et al, 2015), the case of Asir is similar to the case of Qassim in these characteristics.

Table (3): Comparison of researches applied with rank-size rule

Region	Aim of study	Number of cities	Total population	Conclusion
Kashmir Valley	-to analyze the spatial distribution pattern -to estimate the distances	46	2,050,065	- relationship of cities is not in conformity - political and economic factors affect city gathering
Babylon	-to analyze the hierarchical arrangement of cities	14	993,047	- basic services lack makes three cities the dominant. - the gap between actual and assumed sizes means irregularity in sizes and ranks of cities caused by concentration in big cities.
Asir	-to identify characteristics of urban system -to show hierarchical urban pattern and its nature	17	1,022,307	- impact of rapid urbanization - dominance of the first and second cities - large gap between actual and assumed sizes - imbalance in city sizes and absence of million cities
Qassim	-to study the urban system -to discover the urban hierarchy	13	1, 219,184	In conclusion.

Sources: Naqshbandi, et al. 2016 / Al-Anbari, et al 2014 / Abdullah, et al, 2015.

2. RESULTS AND DISCUSSION

The previous determinants of Qassim were the regional aspect with its elements that formed it in terms of the territorial unit that the study deals with analyzing and applying

the methodology. Here the researcher gives some background about the urban and urbanization in Qassim before rank-size rule application:

2.1. The Urban Context of Qassim

Urbanization in Arabian Peninsula, including Najd, where Qassim is located, is due to historical, economic and social factors, as seen by Dr. Ishaq Qutb (Qutb, 1986), and this includes the caravan trade between Najd and other areas such as Levant. It started since the traditional stage, which extends to the beginning of Islam until oil was explored after which a rapid process of urbanization took place. Results of quick urbanization were of environmental, social and ethical problems due to its speed and lack of gradualness.

Nuzha Al-Jabri (Al-Jabri, 2008) believes that urbanization was not clear until the establishment of modern Saudi states except in Makkah and Madinah due to their religious status. Other than these two cities, human gatherings were group Markets in local exchange of production to achieve just local consumption of the population, and the situation did not change until oil was explored.

Al- Jabri distinguished between three stages of urbanization in Saudi society that went through: The pre-oil stage: in which the Saudi government encouraged the Bedouins (Nomad) to settle and urbanize, and the cities were surrounded by walls until then, and then the pre-planning stage, which began with the production of oil, where the population migrated from desert areas to cities where slums appeared around and walls were removed. Then came the third stage, which is the planning stage: Nozha Al-Jabri says that this stage coincided with the implementation of the comprehensive development plans. The aim was to raise urbanization rates for all categories of Saudi society table (4) Next:

Table (4): Saudi development plans

Plan	Period	Achievements
First Development Plan	1970 - 1975	Construction of basic equipment and facilities in major cities
Second Development Plan	1975 - 1980	Equal distribution of financial resources between regions
Third Development Plan	1980 - 1985	Providing basic equipment, facilities and services
Forth Development Plan	1985 - 1990	Providing basic equipment, facilities and services
Fifth Development Plan	1990 - 1995	Providing basic equipment, facilities and services
Sixth Development Plan	1995 - 2000	Regional comprehensive urban and rural development and encouragement to work
The seventh Development Plan	2000 - 2005	Activating the role of growth centers to identify appropriate investments
The eighth Development Plan	2005 - 2009	Raising the standard of living, improving the quality of life and providing job opportunities for citizens
The ninth Development Plan	2009 - 2014	Intensifying the role of growth sources and internal driving forces in achieving economic growth and developing the structure of the national economy
The tenth Development Plan	2015 - 2019	Pushing development, the economy and society in general to broader horizons commensurate with the Kingdom's position at all levels

Source: (Al-Jabri, 2008) (ESCWA, 2015). (Saudi Ministry of Finance, nd a) (Saudi Ministry of Finance, nd b)

It is noted that development plans were five-year in period each and were built on each other.

As a result of the increasing government interest by encouraging the Bedouins and the rurals to change their living lifestyles and comprehensive development plans for all Saudi state, the number of settlements that gained city considerations has increased significantly. In a period of 30 years (1974–2004), urbanization became one of the most important features of the society. In the year 1974 there were only 58 cities, and after the intensification of efforts, in 1992, they became 177 cities, to be in 2004 about 212 cities.

That increased the rate of urbanization in Saudi society, which was in 1932 about 20%, in 1966 to 24%, in 1974 46%, in 1992 74%, and in 2004 81% (Al-kheraif, 2007).

According to the Ministry of Municipal and Rural Affairs, about 82.1% of the total population of the Kingdom live in urban areas, while the rest (17.9%) are in rural areas.

One of the most important human influences in an urban context, which includes Qassim region, is the internal migration, which is caused by factors of expulsion and attraction (AI- Zayady, 2011). That appears in every census conducted in the Kingdom, including 2004 census, in which Qassim ranked sixth, with a rate of 8.4% of the total in the Kingdom. that reflects the extent of impact of population movement in cases of urbanization, and 8.4% reflects the number of attraction factors that characterize Qassim region.

Therefore, the pace of urbanization in Saudi Arabia is considered one of the fastest ways of urbanizing societies. The availability of huge economic components has led to unprecedented growth measures that included various areas of urbanization. Even extensive human development occurred for population and moved them from Bedouin conditions (about 85%) to state rapid urbanization. Statistics show that the pace of urbanization was 15% in 1950, then it became 29.7%, 48.7%, 66.8%, 77.3%, and 80.8%, respectively, for the years 1960, 1970, 1980, 1990, and 2004 (Al-Jabri, 2008).

In urban studies conducted during the past decades, Qassim region is considered one of the medium-ranked regions in urbanization, accompanied by Najran region during the period 1974 to 2004. Qassim took position among highly urbanized areas such as Riyadh region and the low ones like Northern Borders region. The following table (5) shows the most important rates of urbanization in Qassim compared to Riyadh, the highest in it, and the whole Kingdom:

Table (5) Comparison of urbanization rates between Qassim, Riyadh and whole country

Region	Urbanization percentage			average rate of change
	1974	1992	2004	
Riyadh	58.9	87.6	90.5	15.8%
Qassim	37.9	62.1	71.7	33.8%
Whole country	46.9	73.8	80.8	33.9%

Source: Al-kheraif, 2007.

The most noticed factors responsible for an urbanizing population include the geographical distribution of cities in different regions of Saudi Arabia. Among the natural factors, we find the importance of the site, the availability of water and other surface characteristics, while among the human factors, we see the importance of settlement history, economic activities, and then economic development in its various forms. In Qassim, there are two types of factors: The fertile lands and their large percentage compared to other Saudi regions as well as the groundwater in the eastern sedimentary parts. The balance of cities number in Qassim is due to historical factors

of settlement, importance of sites and economic development that was through the comprehensive governmental plans, all of which led to increase cities.

In 1974, the number of cities, according to government considerations, was 5 in Qassim, and that number increased to 8, in 1992, then in 2004 it became 14 cities (Al-kheraif, 2007). The urbanization of the region's population in those years was 37.9%, 62.1% and 71.7%, respectively. That was the background of the Saudi urban context, which includes Qassim. Rank-size rule will be applied on the following Qassim cities as in figure (4): namely: Buraidah and Unaizah Ar-Rass, Al-Mithnab, Al-Bakairiyah, Al-Badayea, Ain Bin Fahaid (Al-Asyah), Al-Nabhanyah, Uyun Al-Jiwa, Riyadh Al-Khabra, Al-Shammasiya, Oklat Al-Skoor, and Daria.

Figure (4): Qassim Region Main Cities
Source: map of Al-Daghiri, 2019 modified by the researcher.

2.2. Application of Rank-size Rule
2.2.1. Factors determining sizes and ranks of Qassim cities

The settlements of Qassim region (cities and villages) are of old establishment factor. And it is clear that the availability some agricultural soils in the sedimentary parts played a good role and attracted people to choose the locations of the villages some of which developed to cities historically. In addition to the valleys like Wadi al-rummah which is the main feature (Al-Sharif, 2009), there is an abundance of underground water in the sedimentary part of Qassim, which strengthened agricultural activity and enabled people to settle.

Ten tribal role is very clear, historically and at present. According to the culture of the society the tribe is the traditional human strong unit since the ancient history. Most of the lands were known in the past as settlements of tribes. That is very clear in Qassim. And till now most of the small towns and villages are restricted in a way or another to be dominated by tribes. But since the fifties of twentieth century Saudi government

made so much efforts to settle nomads beside towns and big villages (Al-Sharif, 2009). And that was one of the reasons of reducing the tribal role in the cities.

There are influential factors which determine ranks and sizes of cities subject to the equation of this study to reveal their position in Qassim region. They include areas of the provinces, number of centers (in each province), population size, percentage of foreigners, and population density as in the following table (6) (noting that Daria and Oklat Al-Skoor were not independent governorates when conducting 2010 census, but affiliated with the neighboring governorates). Zipf rule concentrate only on population factors but the other factors must be shown to demonstrate their influence on the subjected cities. According to that table, there is no single city that contains all mentioned factors, and there is a clear non-gradual disparity in all factors. So, there is no homogeneity in factor distribution. It can be said that it is the spatial reality that controls the conditions of these five factors among the governorates of Qassim, and its influence extends to repel and attract a population with a changing value from a locality to another.

Buraidah city possesses the characteristics of the first city in three factors, namely, the area of which is 23.4% and the number of 41 centers accounts for 26.6% of the total centers of the region, then its percentage of the total population of the region amounting to 50.8%. As for the ratio of foreigners to its population, which is 24.6%, it is considered the fifth city after Uyun Al-Jiwa with a percentage of 30.6%, then Unaizah by 27.2%, then Al-Bakiriya by 27%, and then Al-Badayea by 25.5%, and this has its demographic impact on the population.

As for the population density, Buraidah has a density of 38/km^2, which is not the largest number in this factor, as the figures refer directly to the province of Unaizah, which has the highest density in Qassim, i.e., 85.3/km^2, despite the fact that the size of its population is less than that of Buraidah, but its area is less than that of Buraidah as well. The advantage of Uyun Al-Jiwa is being the first in the factor of foreigners with 30.6% of its population, which is the highest percentage in the entire region. With the exception of two factors (the percentage of foreigners and density) Buraidah is the first in the other three factors. The other ten major cities do not excel in any of the five factors that reveal the rank and weight of the city in Qassim region.

Table (6): Determining factors for ranks and sizes of Qassim cities

No	City	Province Area (km^2)	Number of Centers	Province Population	Percentage from Region's Population	Percentage of Foreigners from its Population	Pop. Density Persons/k) (m^2
1	**Buraidah**	17085.0	41	619739	50.8	24.6	38
2	**Unaizah**	1901.3	4	163441	13.4	27.2	85.3
3	**Ar-Rass**	2523.3	6	133837	11	21	57.8
4	**Al-Mithnab**	2058.3	7	42890	3.5	19.7	20.7
5	**Al_Bakiryah**	3696.0	10	56922	4.6	27	15.9
6	**Albadayea**	1234.5	4	56466	4.7	25.5	44
7	**Ain Bin Fahaid**	12937.6	11	26368	2	17.1	2
8	**Al_Nabhanya**	10125.0	32	47241	4	8.9	4.9
9	**UyunAl-Jiwa**	3158.2	7	26476	2	30.6	8.9
10	**Riyadh Al-Khabra**	1466.1	4	35209	3	16.11	18
11	**Al-Shammasiya**	1947.1	2	10595	1	12.9	4
12	**Oklat_AlSkoor**	5552.5	13	--	--	--	--
13	**Daria**	6155.3	13	--	--	--	--
Total		69840.1	154	1219184	100	Qassim 23.6	Qassim 17.5

Source: The areas from Qassim Municipality 2022 and the population data from the General Authority for Statistics 2011

2.2.2 Application of rank-size rule on Qassim region cities

It is clear from the figures shown in the following table (7) that the ordinal position of Qassim cities is not what is actually believed in public. It appeared from the actual size of population that the real order differentiates between cities of more population sized and cities with other characteristics. Unaizah and Ar-Rass cities remained the second and the third respectively, but Al-Mithnab declined from the fourth rank and became the sixth, while Al-Badayea rose and became the fourth, and even the Al-Bakiriyah took the fifth rank.

Theoretically, according to Zipf's rule, all cities arranged on the actual size. The rule, starting from the second city to city 13, was by dividing the actual size of the first city on the ranks of cities based on the actual size as well. It is noted that dividing by rank of the city 13, which is the last major city, resulted in 35,955 inhabitants, which is much greater than the actual size of the city, which is 4,695.

There is another matter, that, the difference between the equation number and actual size for all cities is positive (+), indicating that the first city has a great deal of numerical superiority over all cities. And one of the most important matters is that: the order of the theoretical size is the same as the order of the actual size.

Table (7) Qassim cities according to 2010 census and rank-size rule

City	Rank	Actual size	Theoretical size	Difference between actual and theoretical	Rule's rank
Buraidah	1	467410	467410	0	1
Unaizah	2	152895	233705	+80810	2
Ar-Rass	3	92501	155803	+63302	3
Albadayea	4	46620	116852	+70232	4
Al_Bakiryah	5	29547	93482	+63935	5
Al-Mithnab	6	29210	77901	+48691	6
Riyadh Al-Khabra	7	17236	66772	+49536	7
UyunAl-Jiwa	8	8338	58426	+50088	8
Ain Bin Fahaid	9	6649	51934	+45285	9
Oklat_AlSkoor	10	6659	46741	+40082	10
Al-Shammasiya	11	5871	42492	+36621	11
Al_Nabhanya	12	4834	38951	+34117	12
Daria	13	4695	35955	+31260	13

Source of actual size: Saudi General Authority for Statistics, 2010 census data
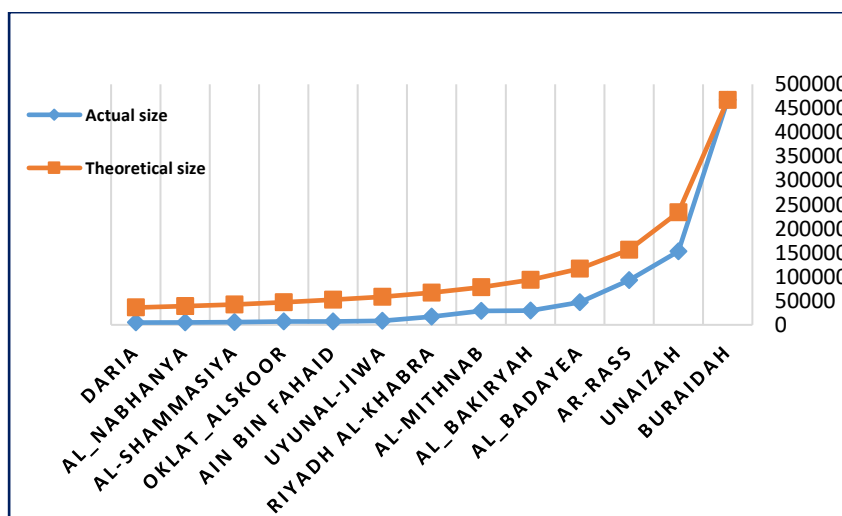

Figure (5) Qassim cities IN RANK-SIZE RULE
Source: Designed by the researcher based on Table (6).

In Figure (5), in which the curve was used instead of the logarithmic form because the curve is clearer and indicative for the results of the rule, capital Buraidah; retained its leading characteristics as the first city in Qassim. Then, Unaizah and Ar-Rass retained their positions in the second and third, respectively. But there are shifts to other cities in Qassim urban system. Al-Mithnab was delayed, as indicated, and others rose, with confirmation of rank for the last city Daria. Badayea was the fourth, then Al-Bakiriya, Al-Mithnb, Riyadh Al-Khabra, Uyun Al-Jiwa', Ain Bin Fahaid, then 'Oklat Al-Skoor, Al-Shammasiya, Al-Nabhanya, and then Daria, respectively. And if it's assumed that the larger is city's population the fewer is the number of cities, that is not found in Qassim region. Because Buraidah is the big city with 467410 populations while the fewer population city is Daria with only 4695. The rest of the organizational assumptions are verified in the case of Qassim, as it has an urban system that includes all the cities/capitals of the thirteen governorates, which are organized in a large agricultural area.

There are three features in Zipf's rule graph: the first is that Buraidah the first city is far from all cities in its population size, which is very large compared to them. The second is that the theoretical line is above and parallel to the actual size line of cities. And the third is the theoretical graph has great curvature: it goes over the close tops of cities, starting from toward to rise clearly toward the top of Ar-Rass and then upwards toward Unaizah to jump high toward Buraidah the great city. All that means if we consider the factors in Table (6) that there is a clear irregularity between the cities of Qassim in most of the factors affecting and determining rank and size, the difference in areas, population sizes and density affects the rest of the factors so that irregularity prevails in the geographical reality, but there is convergence and similarity in some features as it is shown in Figure (5) in terms of parallelism of the actual and theoretical sizes of most cities.

The results shown were based according to population size factor only since the factors determining the weight of the city in the region are not agglomerated into one factor. Locations of the cities to which the rule was applied stand as the most important characteristic (figure 4). And most of the cities conglomerate in a united geographical space in the center of Qassim region, slightly southeast. According to Zipf's rule, the equation confirmed the logical hierarchy of the ranks of the main cities in the region, noting the population weight of Qassim within the Saudi state, which is 4.4% of the state's total.

On the other hand, figure (5) shows that all cities are close in rank according to the curve, except for Buraidah, the capital of the region, where it is far from all to be of an abnormal rank according to Zipf's rule. This graphic image is similar to images of studies conducted in some parts of Saudi Arabia, as if the regions of Saudi Arabia are similar in the ranks of the regional cities in relation to the capitals of the regions. The curve line of the actual size follows the line of the Zipf base curve. So, the general picture is very far from the straight line, which is the ideal line between the first city and others in the event that the urban reality prevails in balance in everything.

3. CONCLUSSION

We conclude from all of the following:
- Qassim region, as an administrative district in Saudi state, is considered a natural spatial unit with a geographical history having factors that attract population as much as their characteristics allow.

- Most of the cities of Qassim are lumped together due to natural factors, and they have created an urban pattern that is largely similar in its population characteristics.
- The similarity of the cities of Qassim in their natural and human influences made them similar in terms of urban characteristics in general.
- Buraidah is the city that dominates the urban condition in Qassim as a province, with most of the urban influences by its natural and human factors.

These deduced points are reinforced by the application of Zipf's rule in rank and size, which was applied to the provincial capitals in Qassim, and means the strengthening of spatial unity in its united urban context, which made Buraidah the first city, then Unaizah, Al-Rass, Al-Badayea, Al-Bakiriya, Al-Mithnab, Riyadh Al-Khabra, Uyun Al-Jiwa, Ain Bin Fahaid and Oklat AlSkoor, Al- Shammasiya, Al_Nabhanya, and Daria, respectively, ranked in population size.

Figure (5) means that the ranks of the cities are the ranks of the governorates because the cities are the capitals of the governorates, just as the governorates are the geographical grounds of the cities. The figure also shows that the curve is very similar to the large Najd plateau cities curve. So, the main conclusion according to it is that it is far from the straight line, which means balance in everything. That is due to the urban dominance of Buraidah city, which is in the middle of the natural vital area of Qassim region.

4. SUGGESTIONS

In order to enhance the population position of the lower population cities in Qassim region and secure the demographic aspects, the researcher suggests the following:
1. Improving health aspects related to demography.
2. Supporting women and promoting reproductive health.
3. Encouraging investment in the development fields that attract population.
4. Supporting job opportunities to reduce negative immigration.
5. Support positive immigration.

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