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An Analysis of Rank-Size Distribution Pattern in District Bundi, Rajasthan, India

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ABSTRACT: The study of urban areas is one of the core concepts of urban geography. A lot of research and study have been undertaken in the various fields of urban geography. Theory of rank-size rule is an important concept to explain the special hierarchical pattern in the reference of population and rank of urban settlements. The theory of Rank-size rule was given by G.K. Zipf. This rule is related to an urban hierarchical system in a region. Zipf explains that there is a specific relationship between the population of settlements, their ranks and the relative abundance of settlements. The settlements having the smallest size of population should always be most abundant in number. The higher rank settlements will be larger in population and less in number. A detailed and comparative study is undertaken to explain and understand the hierarchical pattern of urban settlements of district Bundi. The research paper is based on the study of relation between the population and rank of tehsil headquarters in district Bundi.

KEYWORDS: Urban Geography, Settlements, Hierarchical System, Rank-Size Rule.

I. INTRODUCTION

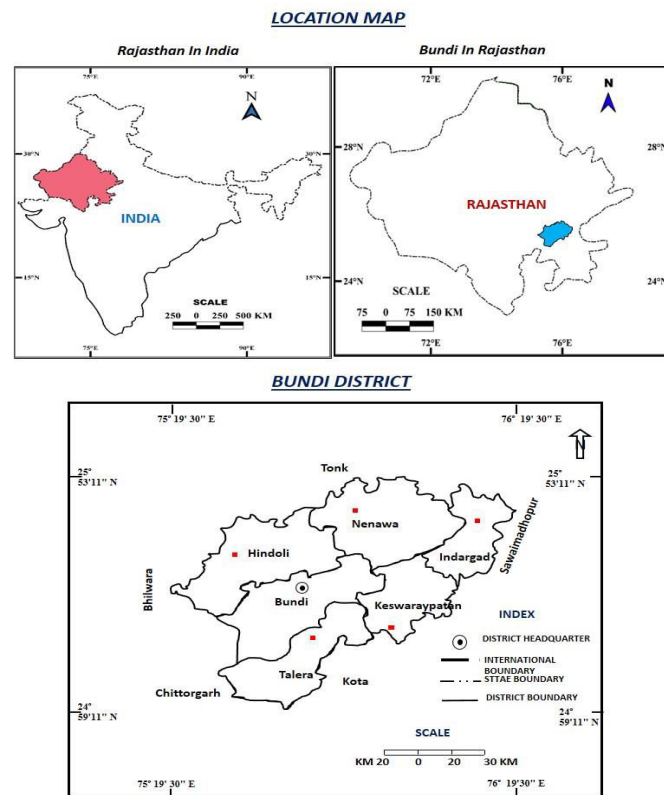
The district is situated in the south – east of Rajasthan, Between latitudes 24° 59'11" and 25° 53'11" North and Longitudes 75° 19'30" & 76° 19'30" East. The length of the district from east to west is about 110 km. and it is about 104 kms from north to south. Bundi is bounded on the north by Tonk District, on the west by Bhilwara and on the south – west by Chittorgarh district. The river Chambal forms the eastern Boundaries, separating the Bundi and Kota territories. The southern tehsil of Bundi forms a wedge between Bhilwara and Kota and also touches Chittorgarh district. The total geographical area of the district is 581938 hectares. The Bundi district ranks Twenty second among the existing 33 Districts of Rajasthan from the point of view of the area.

Table-1.1
Administrative Setup: District Bundi

S.N.	SUB DIVISION	TEHSILS	AREA (Sq. Kms)	VILLAGE NUMBERS	TOWN
1	Bundi	Bundi	1929	166	Bundi
2	Talera	Talera	N.A.	106	Budhpura
3	Keshavrai Patan	Keshavrai Patan	754	122	K.Patan Kapren
4	Indergarh	Indergarh	668	121	Indergarh, Lakheri
5	Nainwa	Nainwa	1158	190	Nainwa
6	Hindoli	Hindoli	1341	186	Hindoli
Total			5850	891	7

Source: District Statistical Year Book 2018

The population of district Bundi is 1110906 (2011). The rank of district Bundi is 30th in Rajasthan according to population of 2011. There are six tehsil headquarters in district Bundi. The rank-size rule presents the relation between population and rank of the urban settlement. According to the rank-size rule the district headquarter of tehsil Bundi has the largest population among all the tehsil headquarters of district Bundi. According to this the tehsil headquarter of Bundi tehsil is the primate city of district Bundi. The detailed analysis of Zipf's rule in the reference of district Bundi reveals the actual hierarchical pattern of urban settlements. Table 1.2 shows the actual relationship between the population and rank of tehsil headquarters of district Bundi. While table 1.3 shows the ideal pattern and relationship between the population and rank of tehsil headquarters of district Bundi according to the Zipf's rank-size rule. The comparison between table 1.2 and 1.3 shows that in district Bundi the rank-size rule does not actually work. The population of the remaining five tehsils does not follow the ideal rank-size pattern of G.K. Zipf.



II. RELATED WORK

Several scholars have tried to analyze the pattern of urban settlement before the postulation of rank-size rule by G.K. Zipf. The most important theory in this field was Christaller's Central Place Theory given in 1933, which was later modified by Losch. N. Rashevsky in 1947 who presented a generalized theory for the spatial distribution of settlement and level of economic opportunities. This theory is known as 'Mathematical Theory of Human Relations'. Walter Isard (1956) stated an analysis of rank-size relations of cities in the U.S.A. He called New York a primate city which is the largest city. In 1957, A.K. Philbrick gave his model of nested hierarchy of central places. In 1958 Charles T. Stewart found that the rank-size rule fits well with the distribution of cities in the larger heterogeneous areas. The basic concept of rank-size rule was originally put forward before urban geographers by German Scholar Felix Auerbach in 1913. He tried to analyze the relationship between the size of cities and their ranks.

In 2014 Dr. Kiran Kumari presented the detailed study of rank-size distribution of urban centers of Eastern Uttar Pradesh. Tushar Waghmare, Prashant Patil, Sambhaji Shinde and Pravin Shembade analyzed the rank-size rule in the reference of world population in 2019. In 2020 Subham Pramanick and A K M Anwaruzzaman assessed the rank-size rule in the reference of West Bengal. They also observed the shifting pattern of primate cities in West Bengal. In 1949 G. K. Zipf proposed his rank-size rule to clarify the hierarchical distribution of settlements. He presented that in every region there is a city with the largest population. He called it a primate city. He said that "if all the urban settlements in an area ranked in descending order of population, the population of nth town will be 1/nth of the largest town."

III. METHODOLOGY

Primary and secondary data are collected for analytical study and finding conclusions. Intense survey and field visits are undertaken to bring out the empirical results for study. Secondary data are collected from various published and unpublished administrative publications. For the analysis of hierarchical arrangement of urban settlements in district Bundi the rank-size rule of G.K Zipf is used. The formula used for it is-

$$Pr = P1/r$$

Where

Pr = Population of a town of the rank in question



P_1 = Population of the largest city

r = rank of town in question.

The six tehsil headquarters (Bundi, Keshoraipatan, Nainwa, Hindoli, Indergarh, Talera) of district Bundi are considered as city centers or urban settlements to explain the actual distribution according to the rank-size rule. The census data of 2011 are used to analyze the relationship between population and rank of urban settlements.

IV. EXPERIMENTAL RESULTS

Table - 1.2

Actual Relationship Between the Population and Rank of Tehsil Headquarters of District Bundi, (2011)

S.N.	Tehsils	Tehsil Head Quarter	Population of Tehsil Head Quarter (2011)	Actual Rank According to the Population
1.	Bundi	Bundi	103286	1
2.	Keshoraipatan	Keshoraipatan	24627	2
3.	Nainwa	Nainwa	19485	3
4.	Hindoli	Hindoli	9601	4
5.	Indergarh	Indergarh	7444	5
6.	Talera	Talera	7203	6

Source: District Statistical Abstract, 2018

Table 1.2 shows that there are six tehsils and six tehsil headquarters in district Bundi. Bundi, Keshoraipatan, Nainwa, Hindoli, Indergarh and Talera are six tehsils of district Bundi. The headquarters of these six tehsils are considered as city centers or urban centers of district Bundi. According to the Zipf's rule headquarter of Bundi tehsil is the primate city of district Bundi. Tehsil headquarter of Bundi district has the largest population (103286) among the all six city headquarters of district Bundi. The actual population data shows that tehsil headquarter of Bundi tehsil is the primate city. Primate city is the city with the largest population in a region according to Zipf's rule. The second largest tehsil headquarter according to population is Keshoraipatan. The population of Keshoraipatan is 24627(2011), which is about $\frac{1}{4}$ of the population of the primate city. It should be just half of the population of the primate city according to Zipf's rule. Further the actual population of tehsil headquarters of Nainwa is about $\frac{1}{5}$, and Hindoli is about $\frac{1}{10}$ of the population of primate city. While the population of tehsil headquarters of Indergarh and Talera tehsils is about $\frac{1}{14}$ of the population of primate city.

Table - 1.3
Ideal Relationship Between the Population and Rank of Tehsil Headquarters in District Bundi
According to Rank-Size Rule

S.N.	Tehsils	Tehsil Head Quarter	Population of Tehsil Head Quarter (2011)	Ideal Population and Rank According to Zipf's Rule
1.	Bundi	Bundi	103286	103286(1)
2.	Keshoraipatan	Keshoraipatan	24627	51643(2)
3.	Nainwa	Nainwa	19485	34429(3)
4.	Hindoli	Hindoli	9601	25821(4)
5.	Indergarh	Indergarh	7444	20657(5)
6.	Talera	Talera	7203	17214(6)

Source: District Statistical Abstract, 2018

Table 1.3 shows the ideal relationship between population and rank of tehsil headquarters of district Bundi. According to table 1.3 the actual population of Keshoraipatan and Nainwa tehsil headquarters is just about half of their ideal population according to Zipf's rule. While the population of Hindoli and Indergarh tehsil headquarters is just about 1/3 of their ideal population according to Zipf's rule. The population of Talera tehsil headquarter is just between half and 1/3 of their ideal population. The entire analysis shows that the population and rank relation pattern does not follow the Zipf's rule in district Bundi.

V. CONCLUSION

Rank-size rule is required to study the settlement pattern of urban centers according to their population. This is an ideal situation. But this situation does not work in every region or conditions. The study shows that the rank-size rule is not applicable in district Bundi. The comparison of table 1.2 and 1.3 shows the actual population and ideal population of tehsil headquarters of district Bundi does not follow the Zipf's rank-size rule. Tehsil headquarter of Bundi tehsil is the primate city of district Bundi, because it has the largest population among all tehsil headquarters. Remaining all five tehsil headquarters does not justify the relation between their population and rank. Various geographical aspects affect the population of a region. In district Bundi, Bundi and Keshoraipatan tehsils have first and second rank according to their actual population. These two tehsils are also well socio-economically developed. Diverse natural resources, agriculture production, industrial development, transportation facilities, opportunities for employment and other socio-economic facilities are responsible for the disparities in population distribution in district Bundi. The lagging of Nainwa, Indergarh and Hindoli tehsils in the reference of these facilities is responsible for their less population according to the ideal pattern of rank-size rule. The conclusion is that the rank-size rule can help us to find out the disparities of population distribution and various other aspects related to the urban centers, and settlements in district Bundi. This may help in the policy making for the sustainable development of urban areas of district Bundi.



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