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APPLICATION OF THE CENTRAL PLACE THEORY TO DETERMINE
CURRENT CENTRALITY PATTERNS: A CASE STUDY OF PARBATSAR
TEHSIL, NAGAUR DISTRICT, RAJASTHAN.



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Short Profile

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ABSTRACT:

This study find the order of Central Places and new emerging central places in future prospective in Parbatsar tehsil, Nagaur District, Rajasthan. The only theory which partially or fully determine the centrality of the region by applying the principles of Christaller's Central Place theory within a contemporary sub-urban area. To create balance Regional Development to knowing the area of influence, functions and services of the region to reduce isolation and social exclusion. Thus there is a need to provide access to infrastructure and services and functions to the rural mass so that they can build their assets, reduce vulnerability and develop sustainable livelihood.

KEYWORDS

Centrality, Regional, Influence, Functions, Sustainable, Livelihood.

1.1. INTRODUCTION

In present scenario, there is a growing need to adopt an approach to balance regional development and local planning for spatial arrangement, size, and no. of settlement for study urban and rural area. Central place theory is a geographical theory that explain the number, size and location of human settlements in an urban and rural system. The theory was created by the German geographer Walter Christaller in 1939. Who asserted that settlements simply functioned as 'central places' providing services to surrounding region. Central place theory attempts to explain the spatial and functional distribution of settlements in a region and their interlink ages. The theory recognizes the importance of demand for central functions (services) as the driving force behind the emergence of central places (service centers), as well as the importance of access (transport) to these central places and the functions they provide. And also explain the hierarchy of central places (service centers). There are different orders of service centers, with higher order centers providing all those services found at lower order centers as well as more sophisticated services.

Central place relied on two concepts: threshold and range. Threshold population: - is the minimum number of people needed for a service to be worthwhile or necessary before a particular good or service can be provided in an area. Range: - The willingness of consumers to travel maximum distance to purchase particular goods or services.

It also help to trickle-down effect by generating a Growth pole to provide serves and functions to the surrounding area of Parbatsar and itself, which in turn will benefit the rural community to a great extent. And as result Balance Regional development took place in Both Town as well as in villages of Parbatsar tehsil.

1.2. STUDY AREA

Parbatsar is sub-urban area and a municipality in Nagaur district of Rajasthan. Parbatsar got its name from Parbatshah Zawar who built this township in 1536. Parbatsar panchayatsamiti include 117 villages and one town named as Parbatsar. Parbatsar is 108 km far from its District Main City Nagaur and 53 km from Ajmer. The Parbatsar Municipality has population of 15,172 of which 7,741 are males while 7,431 are females as per report released by Census India 2011. Literacy rate of Parbatsar city is 75.59 % higher than state average of 66.11 %. In Parbatsar, Male literacy is around 86.86 % while female literacy rate is 63.96 %. In Parbatsar, 16% of the population is under 6 years of age. (Census of India, 2011). Near By Villages of this Village with distance are Kinsariya (5.8 km) , Peeplad (6.8 km) , Khokhar (6.9 km) , Rohindi (9.4 km) , Bidiyad (10. km) , Gangwa (10. km) , Biloo (12. km) , Parbatsar , Bagoth , Bajwas , Barev , Bhadsiya , Bhadwa , Bhakri , Bithwaliya , Chitai , Gular , Jawla are the villages along with this village in the same Parbatsar Mandal.

1.3. METHODOLOGY AND DATABASE

The analysis is based on secondary data. The secondary data has been tapped from census and village directory of Parbatsar Tehsil of Nagaur district, Rajasthan. (Census of India, 2011). To find the order of settlement the composite index is calculated. The composite index is the resultant of the Mean is divided by the sum of weightages of such facilities (1. Education (Sum of primary school, secondary school, college etc.). 2. Health (Sum of primary health center, hospitals etc.). 3. Banking (co-operative bank, commercial banks etc.). 4. Accessibility (Rail lines, roads etc.). 5. Communication (telephones,

post offices etc.).

$$\text{SCARCITY INDEX} = \frac{\sum (\text{Functions})}{\sum (\text{Settlements})}$$

The Calculated value of the weightages by using the formula of Scarcity Index. Resultant value are weightages and this weightages is multiplied by each function such as primary school, secondary school etc. Then Classify the weighted data in five categories and make values scale free and then Take sum of all the five Free Scale values .The resultant value is composite index..

Then The Konig number and Beta Index is calculated such as Konig Number is (or associated number) is the number of edges from any node in a network to the furthest node from it. This is a topological measure of distance, in edges rather than in kilometers. A low associated number indicates a high degree of connectivity; the lower the Konig number, the greater the Centrality of that node. The beta index (β) measures the connectivity relating the number of edges to the number of nodes. The greater the value of β index, the greater the connectivity. As transport networks develop and become more efficient, the value of β should rise.

where e = number of edges (links), v = number of vertices (nodes)

The Gravity Model is also used gravity model, as social scientists refer to the modified law of gravitation, takes into account the population size of two places and their distance. Since larger places attract people, ideas, and commodities more than smaller places and places closer together have a greater attraction, the gravity model incorporates these two features.

The relative strength of a bond between two places is determined by multiplying the population of city A by the population of city B and then dividing the product by the distance between the two cities squared.

$$\text{GRAVITY MODEL} = \frac{P(1) \times P(2)}{D^2}$$

Where,

P:- population of region,

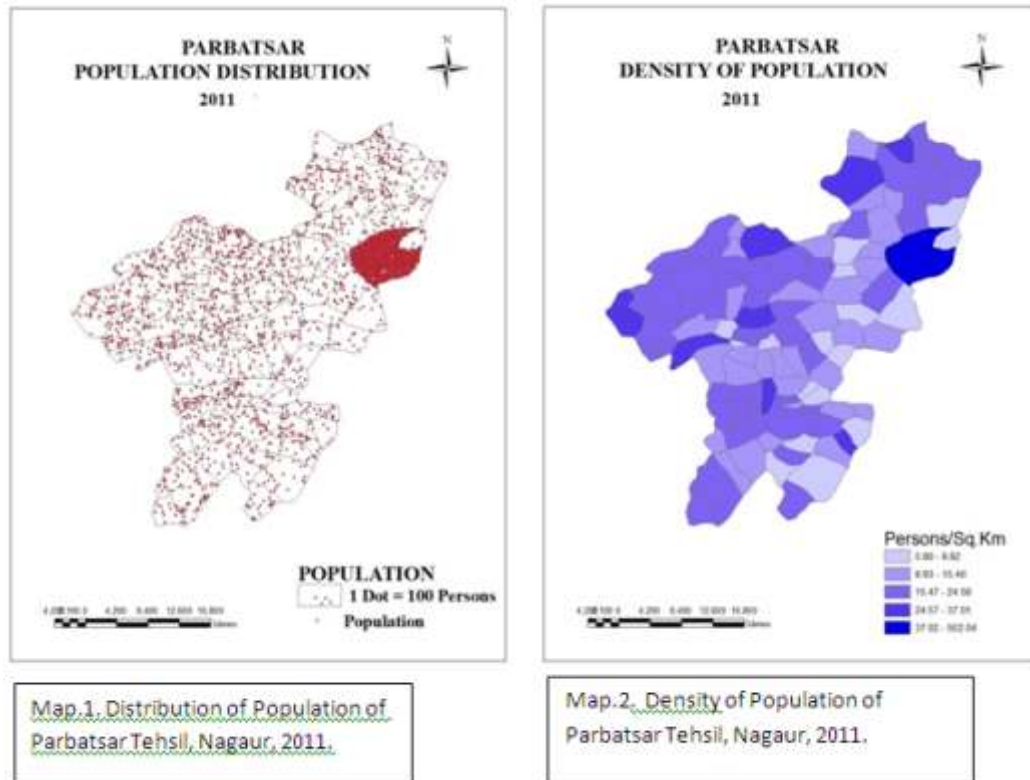
D:- Distance between two regions.

But here in Central Place, we consider Functions instead of population.

1.4. DISCUSSION AND ANALYSIS

Parameter Analysis Parbatsar had a population of 15,172 of which 7,741 are males while 7,431 are females as per report released by Census India 2011. In Parbatsar Municipality, Female Sex Ratio is of 960 against state average of 928. Moreover Child Sex Ratio in Parbatsar is around 905 compared to Rajasthan state average of 888. Literacy rate of Parbatsar city is 75.59 % higher than state average of 66.11 %. In Parbatsar, Male literacy is around 86.86 % while female literacy rate is 63.96 %. Schedule Caste (SC) constitutes 12.46 % while Schedule Tribe (ST) was 0.32 % of total population in Parbatsar. Manglana (2895), Bidiyad (9502), Badoo (8880), Bagot (4154), Gular (5472), Rid (3064), Peelwa (4268), Peeh (6620), Jawla (4781). (Census of India, 2011). In the distribution of population Parbatsar is at top and other have mentioned population. Parbatsar has very high density .followed by Manglana ,Badu, Bagoth, Bidiyad , Gular, Jawla, Peeh, Peelwa, rid. and the medium density are in , Bajwas

,BarevBhakri,Bithwaliya,Chitai,Dhadhota,Harnawa,Janjeela,Jhalara,Kaletara,Khokhar,Kinsariya,Kundari,Kurada,Mayapur,Neniya,Netiyas,Peeplad,Rabdiyad,Rohindi,Runija,Taparwara are having low density .The demographic characteristics are depend upon the Functions and Services provided by the central places and the accessibility to the central place.



Education facilities is one of the basic facility in settlement .these facility are according to the hierarchy of education facility like primary school , secondary school , H.S school ,colleges etc.in respect to the order of central places .In ParbatsarPanchayatsamiti Parbatsar Town has high facility of education followed by Manglana ,Badoo , Bagoth, Bidiyad , Gular, Jawla, Peeh, Peelwa, rid.The concept of range and threshold are work here in terms of opening of a school with minimum number of population so a school can run. And the concept of Range i-e the maximum distance students are prepared to travel to acquire education facility - at some point the cost or inconvenience will outweigh the need for the facility. Here transport cost is proportional to distance traveled in example, the longer the distance traveled, the higher the transport cost. So the concept of range and threshold are changes according to the hierarchy of education.

Health facilities are one of the essential facilities in settlement.Thesefacilities are dependent on the socio-economic condition of settlement. Better the condition better the facility like primary health center are generally found in villages whereas hospitals and dispensaries are found in towns.so this also depend upon the hierarchy of functions and order of settlements.In ParbatsarPanchayatsamiti Parbatsar Town has high facility of health followed by Manglana ,Badoo , Bagoth, Bidiyad , Gular, Jawla, Peeh, Peelwa, rid.This is the basic facility so at initial level it not considered threshold and range but little higher order the concept of range and threshold are work here in terms of opening of a hospital with minimum number of population. And the concept of Range i-e the maximum distance patient are prepared to travel to acquire health facility - at some point the cost or inconvenience will outweigh the need for the facility. Example for small diseases health center at village level is sufficient but for major

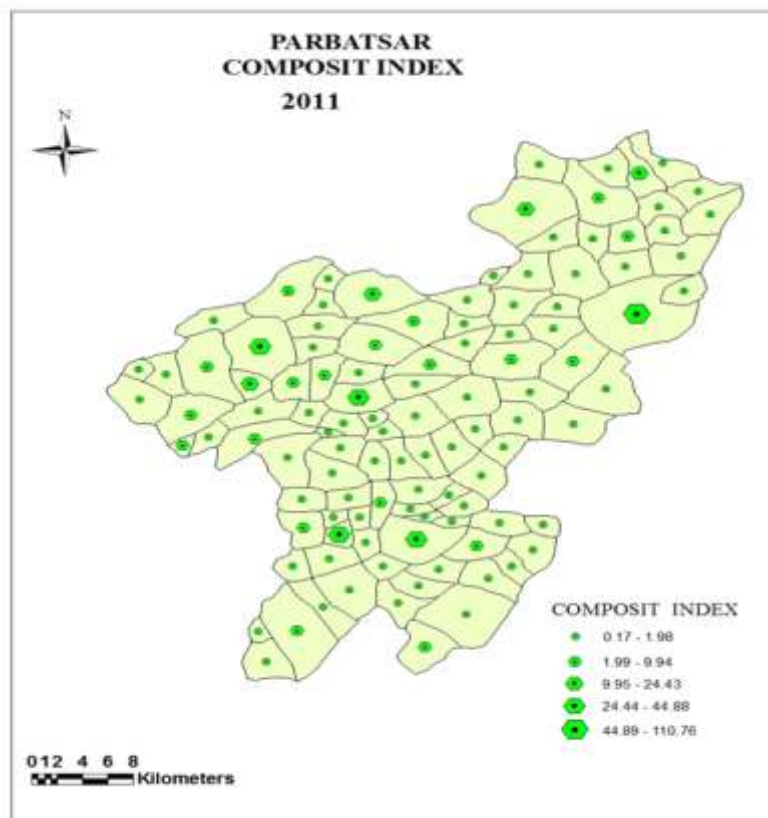
diseases one can need a good hospital facility that is in town or in city.

Banking: - Without a sound and effective banking system in any region, it cannot have a healthy economy. The banking system of Parbatsar panchayat samiti should not only be hassle free but it should be able to meet new challenges posed by the technology and any other external and internal factors. A spread of co-operative banks in villages such as Manglana, Badoo, Bagoth, Bidiyad, Gular, Jawla, Peeh, Peelwa, and these are villages in which the bank facilities are available. And well established banking facility (commercial banks like SBI, BOB, PNB etc.) in Parbatsar town. It avails the banking services to the surrounding areas.

Communication facilities include telephone and post offices services. In telephone services are available in all the villages but post offices services in Parbatsar, peelwa, bidiyad, bodoo.

Recreation: - This facility includes the means of entertainment like cinema halls etc and sports grounds, community halls for the social interaction in society. In Parbatsar panchayat samiti these facilities are only available in Parbatsar town.

Composite index includes above five parameters such as education, health, communication, banking and recreation facilities. In Parbatsar panchayat samiti Second order settlement is only one i.e Parbatsar and fourth order settlement is eight (Manglana, Badoo, Bagoth, Bidiyad, Gular, Jawla, Peeh, Peelwa), fifth order settlement is 4, Sixth order settlement is 45 and Seventh order settlement is 51.



Map.3. Composite Index of Functions (population, Education, Health, Banking, Recreational Activities etc.) of Parbatsar Tehsil, Nagaur,

4.1.2. Centrality Analysis

Threshold of population:- is the minimum number of people needed for a service to be worthwhile or necessary before a particular good or service can be provided in an area. To explain the concept of threshold we use the population potential model and a relationship of hierarchy of orders and population.

Table.1. Population Potential of Parbatsar.

S.no.	Settlement	Population (2011)	Distance from Parbatsar(km)	Population Potential
1	Manglana	2895	14	207
2	Bidiyad	9502	13	731
3	Badoo	8880	18	493
4	Bagot	4154	21	198
5	Gular	5472	27	203
6	Rid	3064	32	96
7	Peelwa	4268	27	158
8	Peeh	6620	40	166
9	Jawla	4781	33	145
	Population Potential			2396

Population Potential is a measure of the nearness or accessibility of a given mass of people to a point. The general formula of population potential essentially calculate the degree of interaction .In Parbatsarpanchayatsamiti, 2396 population from nine surrounding settlements are availing services from Parbatsar town. 2396 population has availing the services and functions or in other wards 2396 population is interacting main central place i-e Parbatsar town.

Table .2. Relationship between Hierarchy of orders and Population, Parbatsar, 2011.

CENTRILITY	Settlements(no.)	very high	High	Medium	low	very low
FIRST ORDER	0	0	0	0	0	0
SECOND ORDER	2	1	1	0	0	0
THIRD ORDER	0	0	0	0	0	0
FORTH ORDER	8	2	4	0	1	1
FIFTH ORDER	4	1	2	1	0	0
SIXTH ORDER	45	1	5	12	21	6
SEVENTH ORDER	51	0	0	0	18	33
TOTAL	110	5	12	13	40	40

Class size of settlement: Very high-5000+ ,High-3000-5000, Medium-2000-3000, Low-1000-2000, Very low-< 1000.

Composite Index Value: Frist Order- 1000+, Second Order- 100-1000, Third Order- 50-100, Forth Order-

10-50, Fifth Order- 5-10, Sixth Order- 1-5, Seventh Order-Less than 1.

Center places (Parbatsar) will supply particular types of goods forming levels of hierarchy. In the functional hierarchies, generalizations can be made regarding the spacing, size and function of settlements. The result of these consumer preferences is that a system of centers of various sizes will emerge. Each center will supply particular types of goods forming levels of hierarchy. In the functional hierarchies, generalizations can be made regarding the spacing, size and function of settlements.

1. The larger the settlements are in size (population), the fewer in number they will be, i.e. there are many small villages, but few large cities.
2. The larger the settlements grow in size, the greater the distance between them, i.e. villages are usually found close together, while cities are spaced much further apart.
3. As a settlement increases in size, the range and number of its functions will increase.
4. As a settlement increases in size, the number of higher-order services will also increase, i.e. a greater degree of specialization occurs in the services.

The higher the order of the goods and services (more durable, valuable and variable), the larger the range of the goods and services, the longer the distance people are willing to travel to acquire them.

At the base of the hierarchy pyramid are shopping centers, newsagents etc. which sell low order goods. These centers are small. At the top of the pyramid are centers selling high order goods. These centers are large. Examples for low order goods and services are: newspaper stalls, groceries, bakeries and post offices. Examples for high order goods and services are: jewelry, large shopping arcades and malls. They are supported by a much larger threshold population and demand.

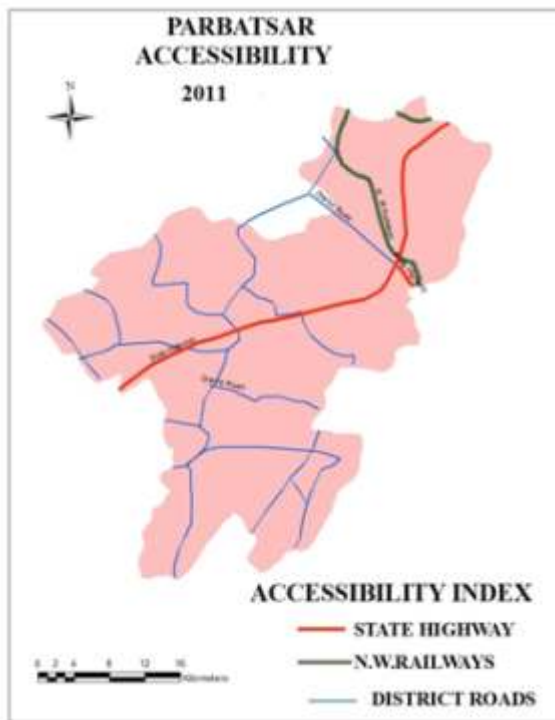
RANGE :- The willingness of consumers to travel maximum distance to purchase particular goods or services. Range of the good and services are not constant it is changing according to the commodity. Example Range of vegetable shop is less for electronic item it may be more. In the concept of range longest the distance from the center and the distance decay are in proportionate, means as the distance from the center increases, distance decay will also increase.

Table.4. Distance Decay from Parbatsar to other Settlements.

S.No.	Main Settlement	Settlements	Distance Decay
1	Parbatsar	Manglana	4.24
2	Parbatsar	Bidiyad	5.37
3	Parbatsar	Badoo	7.41
4	Parbatsar	Bagot	6.45
5	Parbatsar	Gular	9.34
6	Parbatsar	Rid	9.59
7	Parbatsar	Peelwa	8.63
8	Parbatsar	Peeh	14.33
9	Parbatsar	Jawla	11.05

The above diagram shows that the nearer settlement has less distance decay like Manglana ,Bidiyad ,Bodoo and Bagot whereas Gular , Rid and Peelwa has large distance decay.

Accessibility or transportation is the movement of people or goods from one place to another by the modes of transport such as roads and railways. In Parbatsar two rail lines are there. and one railway station is in Parbatsar town. which provide services to nearby areas. there are two state highway (SH-27 and SH-7). A good networking of districts roads which connecting almost all the villages in the Parbatsar tehsil. IN accessibility Parbatsar is at the top having railway, state highways and districts roads.

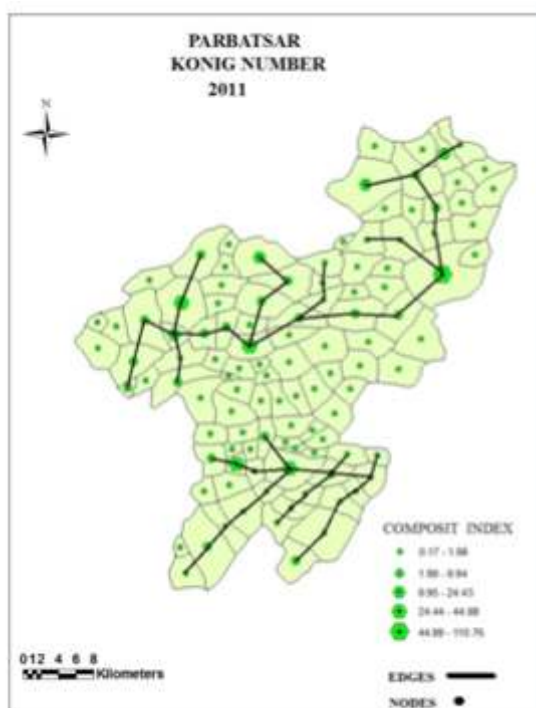


Map.4. Accessibility Index of Transport network of Parbatsar Tehsil, Nagaur.

The Konig number (or associated number) is the number of edges from any node in a network to the furthest node from it. This is a topological measure of distance, in edges rather than in kilometres. A low associated number indicates a high degree of connectivity; the lower the König number, the greater the Centrality of that node. In Parbatsar panchayat samiti the konig number of Bidiyad ,Manglana , Jawla , gular is 14 i-e high means that its centrality is low in the particular tehsil. Whereas Badoo , Rid and Peelwa has less konig number means that high centrality. above pattern of konig number shows that the graph theory of konig number is applicable in the region but in case of Parbatsar the konig number is 10 i-e little large means low centrality but according to the composite index values it is a central place . so due to the locational factor its konig number is high.

Table.5. Measurement of Accessibility By konig Number and Beta Index.

S.No.	Villages	konig Number	Beta Index
1	Bidiyad	14	0.88
2	Manglana	14	0.88
3	Parbatsar	10	1.00
4	Badoo	11	0.92
5	Jawla	14	0.88
6	Gular	14	0.88
7	Bagot	8	0.89
8	Rid	9	0.90
9	Peeh	10	0.83
10	Peelwa	6	0.86



Map.5. Relationship between konig Number and Composite Index of Parbatsar Tehsil, Nagaur.

The beta index (β) measures the connectivity relating the number of edges to the number of nodes. The greater the value of β , the greater the connectivity. As transport networks develop and become more efficient, the value of β should rise. In Parbatsar panchayat samiti Badoo and Parbatsar has high beta index means high level of connectivity in the region and rest has low beta index means low connectivity. so the beta index results are positively applicable to the region.

Centrality has always been a concept that has fascinated urban geographers. The power of most cities has tended to emerge due to locational advantage of some sort. From the simplest forms of exchange, when peasant farmers literally brought their produce from the fields into the densest point of

interaction – giving us market towns – the significance of central places to surrounding territories began to be asserted. Large central squares or open spaces reflected the importance of collective gatherings in city life. These manifestations of bustling centrality appeared to obey a gravitational pull.

Table.6. Gravitational Pull from Main town Parbatsar to other Settlements.

S.No.	Main Settlements	Settlements	Gravitational Pull
1	Parbatsar	Manglana	13.35
2	Parbatsar	Bidiyad	10.99
3	Parbatsar	Badoo	7.79
4	Parbatsar	Bagot	10.90
5	Parbatsar	Gular	4.34
6	Parbatsar	Rid	3.66
7	Parbatsar	Peelwa	5.31

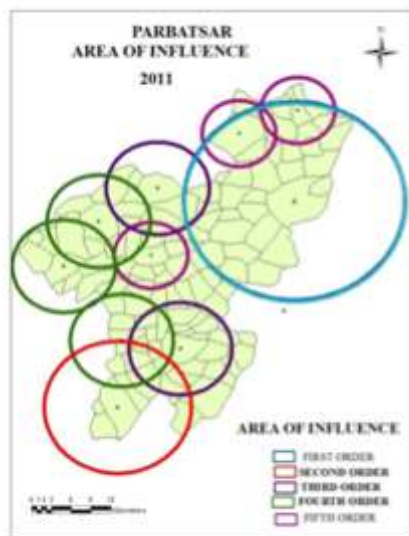
In Parbatsar panchayatsamiti, the applicability of gravity model is quite satisfactory shorter the distance from the center more gravitational force works. Like Manglana, Bidiyad and Bagot are nearer to Parbatsar town the gravity or the same where as for gular, Rid and Peelwa are away force has more from Parbatsar town has less gravity force.

The concept of centrality and central place is very complex in Parbatsar tehsil. The location of biggest settlement (in terms of size of population, services, functions, accessibility, threshold of population, range, connectivity etc.) is extreme away from the center.

Table.7. Final Index of Centrality of parbatsar Tehsil, Nagaur District.

Settlements	Population	Distance Decay	Gravity Model	Konig Number	Beta Index	Composite Index	Final Index
Parbatsar	2.62	0.00	0.00	0.93	1.11	2.70	7.36
Bidiyad	1.30	0.84	1.56	1.30	0.97	0.44	6.41
Badoo	1.29	1.16	1.11	1.02	1.02	0.59	6.19
Manglana	0.49	0.66	1.90	1.30	0.97	0.61	5.95
Bagot	0.51	1.01	1.55	0.74	0.99	1.13	5.94
Gular	0.73	1.46	0.62	1.30	0.97	0.74	5.83
Rid	0.48	1.50	0.52	0.84	1.00	0.88	5.22
Peelwa	0.58	1.35	0.75	0.56	0.95	0.91	5.11

The above shows that final composite index (include population, distance decay, gravity model, konig number, beta index, composite index) of settlements in Parbatsar tehsil. In which the overall centrality comes out in a very positive manner. More the value of the final index is more area of influence in the region. Parbatsar is among the First, Bidiyad is on second whereas as peelwa is on last in regard to centrality and area of Influence which is shown in the following map.



Map.6. Area of Influence according to hierarchy of settlements in Parbatsar Tehsil, Nagaur.

1.5.CONCLUSION

This paper has been attempt to find out the order of central places in the considering central functions and services, the centrality has been calculated by scarcity index, values are computed by giving weight ages according to their importance. The hierarchical structure of rural service centers in the Parbatsar has classifies them into five orders of hierarchy(education, health , banking , communication and recreation facilities).then the relationship has been developed with certain model and theories like distance decay , gravity model , konig number , beta index, accessibility etc. and then finally a final index has been formed which give a better picture of central place and centrality in Parbatsar tehsil .hence it has been identified that Parbatsar is the central place in Parbatsar tehsil but its lacuna is that it has not a locational advantage. So Parbatsar is the high order central place in the Parbatsar tehsil followed by Bidiyad ,Badoo , Manglana etc.

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