

Methodology For Measuring Centrality And Hierarchy Of Central Places:A Case Study Of Mirzapur City Block U.P.**Dr.Shyam Lata Devi****Associate Professor****Department Of Geography****K.B.P.G College****Mirzapur****Uttar Pradesh****(Received:29January2020/Revised:18 February2020/Accepted:26February2020/Published:29February2020)****Abstract**

In this paper several methods has been discussed for measuring centrality and hierarchy of central places of a geographical area which can be used as pivot point to implement the new policy and its devolution to root level for development

Introduction

The strategy of integrated area development is based on the concept of growth of central places is a new way to plan centres in every aspect of development and services required for improving the general standard of living ill rural areas. Human behaviour is affected and constrained greatly by the spatial environment, a set of relative locations in which man live. Integrated rural development is primarily concerned with the appropriate allocation and decentralization of socio - economic infrastructures over a physical space. However, each and every settlement cannot be provided with all types of infrastructure within its own limits because of the limited existing resources which cannot be provided to every settlement, hence the service function should be distributed according to needs at appropriate locations. These appropriate and selected location of social and economic activities in the physical space will also help in the balanced development of the region. As such, there is a need to identify and select growth centres which can provide required functions or services that can be used by the people.

Growth Centre Concept

The central place theory, as formulated by chris taller and modified by others, forms the basic background of this work. Although the central place theory is instrumental in understanding the functional attribution of settlements and types and patterns of their interactions, yet neither christallers," nor loeshs" concepts are comprehensive enough to fulfil this role. However, it is concluded, from their critical analysis, that the central place hierarchy is the result of balancing a

number of goods, locating as many activities in few places as possible and realizing the greatest economics of agglomeration, while at the same time keeping the number of trips and total distance travelled to a minimum." On the other hand, growth centre concept assumes that economic development never occurs uniformly over a region, rather it tends to be concentrated in few selected parts, which thereby develop as 'growth poles' expanding much more rapidly than their surrounding areas. The growth poles are almost invariably seen as urban industrial in character. Perroux originally formulated this concept and he postulated that a growth pole owes its existence to location, within it, of one main 'growth industry' and the growth of this industry attracts other allied industries by virtue of external economics created in the locality, and as these industries grow under stimulus of the 'industries matrices' the growth pole as a whole expands still further. This is considered as the internal expansion mechanism of a growth pole.' The growth centre concept has also been extended, with the centre's internal mechanism of growth, to its relationship with the surrounding regions, i.e., the geographical area. The general acceptance shows the 'belief that concentration of investment and industrial activity within a growth pole will stimulate the industrial and economic development through its centrifugal forces. It also reflects the idea that 'prosperity will spread outwards from the chosen points in concentric ripples. Therefore, Martin describes the growth pole model as a model of dynamic industrializing society, in which economic development occurs primarily in the urban type of 'location matrix'. This development in time produces an expansion of prosperity to surrounding areas (a) by tapping them for industrial and urban raw materials and consumers, (b) by stimulating food production for urban markets and introducing to the countryside the industrial type of farming techniques, (c) by encouraging migration of surplus rural population to the town and (d) by deconcentration of population, industry and other institutions. These two models can be integrated and the integrated outcome may form an effective basis for integrated area development.

Growth Center Concept As Planning Strategy

Several governments and agencies, in recent years, have come to regard this concept as basis for the practical planning of regional development. There are also strong economic arguments for adopting this concept. As Hirschman points out, 'there can be little doubt that an economy to lift to higher income levels, must and will first develop within itself one or several regions of economic strength'. Where such centres do not exist, it is argued that their creation is likely to produce benefits both to the national economy as a whole and also to its individual regional

components. The organisation of area development policy, in the terms of system of growth centres, offers a number of potential advantages. The growth foci in the system cannot be of the same level and they may be classified into national, regional and local in decreasing order of functional complexity. Mishra has designated them as development poles, development centres and development points in decreasing order of hierarchy. Originally, the growth centre concept was formulated for urban areas but it can also be applicable in its modified form to non-urban areas to induce growth through a hierarchical system of settlements, such as development points, service centres, central villages and dependent villages.

Methodology For Measuring Centrality And Hierarchy Of Central Places

The foremost task is to establish the hierarchy of the settlements of the study area under the constraints of the above concept. In fact, the hierarchy of a settlement in a region and the centrality itself depends on quality and quantity of central functions performed by a settlement. The central functions are those which are non-ubiquitous in the nature and are available in few settlements but are available by a number of settlements. Thus the centrality of a settlement is the outcome of its level of functional hierarchy and that the same can be determined by analysing the relevant elements of different qualitative and quantitative functional structures. The various methods for measurement of centrality of functions and central places and their hierarchy, have been tested by various authors with reference to various parts of India. In the present, efforts have been made to test the feasibility of some of these methods and out of the whole lot, the following two methods have been found suitable for study area

Method-I

In this method, the centrality of a settlement is assured on the basis of five components, i.e., functional presence, functional dependency, functional status, functional interdependency and service potentiality of the settlements. Effort has been made in the study to determine the centrality of settlement in Kerakat tahsil of Jaunpur district of this state." This area is not far away from the area under study and, hence, it is felt essential to test the validity of the method for the study area. The author considered 39 functions for determining the above five components of each settlement of the study area. On the assumption that scarcity increases the importance of functions in terms of centrality, the following formula has been used for calculating weightage to the functions and result is tabulated in table 1

$$W_i = N / F_i$$

Where W_i = the weightage of i th function.

N = total number of settlements.

F_i = Number of settlements having i th function.

The above five components have been calculated on the basis of the above weightages in the following manner:

(A) Functional Presence (Fp)

The functional presence of a settlement is considered to be the summation of the weightages of the functions present in the settlement and has been expressed as :

$$FP_j = \sum_{i=1}^N F_{wi}$$

Where, FP_j = Functional presence of the j th settlement

F_{wi} = Weightage score of the J th function

(B) Functional Dependency (Fd)

If a settlement does not have a particular function, then it depends on other settlements having the same function for the fulfillment of its needs. The magnitude of this functional dependency is, thus, the summation of the functional weightages, for which the settlement is dependent on other settlements. Statistically it can be expressed as under:

$$Fd_j = \sum_{i=1}^N d_{wi}$$

Where, Fd_j = Functional dependency of j th settlement.

d_{wi} = The weightage of functions for which i th settlement depends.

(C) Functional Status (Fs)

The functional status of a settlement is the difference between its functional presence and functional dependency. The functional status may be positive or negative.

(D) Functional Inter-Dependency

This component plays quite important role in identifying different levels of settlements. For the computation of inter-dependency, the number of served settlements in the context of a function have to be found out. The multiplication of total number of served settlement with the weightages of considered functions will be its inter-dependency .statistically it can be expressed as under:

WHERE

$$FD_j = (F_{p1} q_1) + (F_{p2} q_2) + \dots + (F_{pD} q_D)$$

FD_j = Functional interdependency of jth settlement

F_p = weightage of functions serving other settlement

q = total No. of settlements served by the f^h settlement.

(E) Service Potentialities (Sp)

It is the summation of functional status and functional interdependency (fs + fi). Functional interdependency is sufficient to define a service centre but it reveals only external servicing of the centre, whereas, internal servicing can be used for evaluating the service potential.

The Hierarchy Of Settlement

The hierarchy of settlements is the product of the centrality of settlements in a region. The centrality, in its turn, is the outcome of the quality and quantity of central functions performed by a settlement" thus the composite existence of functions may be influenced by accessibility, availability of socioeconomic infrastructure and nature of neighbouring areas. The hierarchy of settlements has been ascribed through functional gravity, i.e, scalogram technique" and spatial pattern. On the basis of the above five components, the functional hierarchy of settlements is established and a five tier hierarchy is obtained with the following main characteristics:

Hierarchical level characteristics

V	centres having positive functional status.	
Iv	centres having positive service potentialities	
Iii	centres having 250 or more inter dependency score and negative service potentiality	
Ii	centres having less than 250 inter dependency score	
I	centres with nil functional presence	

The number of settlement on the hierarchical classification was found to be in the order 1: 1: 4: 16: 85 from v to i level respectively in the area under study. Some of the examples of each tier have been tabulated in table 2. In this hierarchic classification, the settlements at v level and iv level are considered to be service centres, at iii level central villages, at ii level semi dependent villages and at i level dependent villages. The main drawback of this method is that it is purely based on functional complexities and it does not take into account the population size of the settlements and the area and population served by it in ascertaining the hierarchic level and thus the hierarchic level of settlement is not much correlated with the population size and the population served, devari, which serves an area of 7.12 sq. Km. And a population of 5,702 is

placed in the iv level, whereas massari which is serving an area of 8.78 sq. Km. And population of 5,911 is placed into iii level (table 2). Such is the case with samogara and lakhanpur as the farmer with a service area of 8.42 sq. Km. And a population of 4,781 is in iii level, whereas the latter with a service area of 9.19 sq. Km. And a population of 4,780 persons falls in ii level. Numerous such anomalies were noticed and it is concluded that this method is not suitable, where planning of growth centres for an integrated area development is involved.

Weightages of Functions on Five Component Basis

S.N.	Functions	Weightage	S.N.	Functions	Weightage
1.	Carpenter/Blacksmith	1.45	18.	Junior High School	9.98
2.	Barber	1.52	19.	Maternity and Child Welfare Centre	9.99
3.	Rice Haulers	1.67	20.	Request Bus Stop	10.20
4.	Atta Chakkies	1.71	21.	Medical Store	11.89
5.	Washerman	1.73	22.	Agricultural Implement Distribution Centre	12.31
6.	Primary School	1.75	23.	Dispensary	13.98
7.	Tailors	1.98	24.	Wooden Frame and Fixture	14.19
8.	Cycle Repair	1.99	25.	Seed Distribution Centre	15.97
9.	Retail Kirana Shop	2.13	26.	Stationary Store	19.17
10.	Ration Shop	2.19	27.	Veterinary Hospital	30.12
11.	Public Health Care Centre	4.91	28.	Co-operative Bank	31.10
12.	Fertilizer Distribution Centre	5.13	29.	Foot-ware Store	33.91
13.	Farmer Service Centre	5.98	30.	Inter College	41.71
14.	Sweet and Tea Shop	6.12	31.	Railway Station	42.72
15.	Branch Post-office	6.98	32.	Scheduled Bank	49.67
16.	Co-operative Society	7.71	33.	Auto Repair	49.71
17.	Oil Ghannies	7.99			

TABLE-1

Method-II

According to Christaller, the centrality of a central place mainly depends on

- (I) The type and volume of functions offered by these places

- (II) The degree of dependency of other settlements on. The central place for these functions. The population size of the settlements is, of course, strongly associated with its centrality.

Thus the measure of centrality in this method includes the following factors :

1. Population of the settlement
2. Degree of functional complexity
3. Population served by the settlement

Population Size

It is the internal population of a settlement which avails functions and services available in it.

Degree Of Functional Complexity

Unlike the first method, all functions for this method are considered to have equal importance, as it is observed that functions tend to cluster around certain levels of hierarchy and hence, a place having a primary school tends to be the likely place to have a branch post office, a co-operative society, a request bus stop, etc. Firstly, the levels of functional hierarchy were established on the basis of the medium population threshold of 39 functions, which were considered for this study. A three tier functional hierarchy emerged and it was found that the first, i.e., the lowest group of functions tended to cluster between population size of 324 - 1600, the second group between 2000 - 2800 and the third and the highest level group at a population size of 5000 and above. This clearly show that these functions occur in the regional settlement system within definite population size group which were distinguished from each other by a clear break between the clusters in terms of population size.²⁴ the above three levels of functional hierarchy have their definite entry points of functions in the regional settlement system in terms of population size. These entry points were considered as basis for awarding appropriate weightage for each level. Thus, the first level, taking it as the base awarded a value of 1, the second level a value of $2000/324 = 6.17$ or 6 and the third level is awarded a value of $3160/324 = 9.75$ of 10. All the functions of a particular level have equal importance, a junior high school and footwear store, in spite of their individual entry points of 2000 and 2548 respectively, being in second level, are awarded a value of 6 each. If there are 2 junior high school in the settlement, then weightage is $6 \times 2 = 12$ and so on. Thus the centrality scores of all settlements on this basis of functional complexity were ascertained as it is the summation of weightages of all functions present in the settlement.

Hierarchy And Centrality Of Settlements

Method, ii depicted a three - tire hierarchy of settlements and on the basis of nomenclature, as discussed earlier, the centres of the **iii** level have been named as 'development point' at ii level as 'service centres' and those at the i level 'central villages' for the purpose of this study. The rest of the settlements are dependent villages. The numbers are 1: 3: 18 iii iii, ii and i levels respectively and 85 settlements are dependents. For centrality, the scores obtained by centres on the three dimensions, i.e., population size, complexity of functions and population served were combined to obtain a single integrated score. For this purpose, the maximum scores, on each dimension was considered as unity. All scores were divided by maximum score and then multiplied by 100. The following formula was used:

$$\text{CENTRALITY SCORE} = \frac{S \times 100}{MS}$$

WHERE, S = ACTUAL SCORE ON A DIMENSION.

MS = MAXIMUM SCORE ON THE SAME DIMENSION.

Thus, all scores were converted into proportions of the maximum score on each dimension. These were added across these dimensions and an average was calculated. The relative rank of each centre in terms of its centrality has been tabulated in table 2. It is evident from this table that development points identified on the basis of peoples preference for them for obtaining high order services, also scores very high (100) on the centrality scale based on above dimensions. The service centres score lower (32-27) than the development point. The lowest order centres, i.e., the central and self-sufficient villages score the minimum (25 -5).some of the self-sufficient centres, in spite of having quite high centrality index, are not central villages, because they are not serving any other settlement. These are perspective central village of the area.

Hierarchy of Settlements : Some Examples of Five Component Basis

Code No.	Settlements	Functional				Service potentiality	Hierarchic order
		Presence	Dependency	Status	Interdependency		
170	Devari	280.10	687.18	(-) 407.08	1275.11	(+) 878.03	IV
76	Massari	158.22	831.11	(-) 672.99	360.23	(-) 312.76	III
15	Samogera	87.34	903.53	(-) 816.19	336.74	(-) 479.45	III
127	Bharuhana	21.82	969.05	(-) 947.23	308.58	(-) 638.65	III
161	Barakacha kalan	17.56	973.31	(-) 955.75	16.89	(-) 938.86	II
45	Neveriya ghat	20.28	970.59	(-) 950.31	21.82	(-) 928.49	II
108	Laccha patti	34.25	956.22	(-) 921.97	38.19	(-) 883.78	II
105	Birshahpur	24.06	966.81	(-) 942.75	37.25	(-) 905.50	II
120	Lohadi kaian	30.25	960.62	(-) 930.37	60.15	(-) 870.22	II
79	Naoha	15.95	974.62	(-) 959.67	84.25	(-) 875.42	II
87	Bhattoli	14.85	975.92	(-) 961.07	90.21	(-) 970.86	II
75	Ghurasnadi	34.24	956.62	(-) 922.38	87.19	(-) 835.19	II
17	Karanpur	13.25	977.13	(-) 953.88	95.71	(-) 858.17	II
53	Lakhanpur	14.14	976.89	(-) 962.75	252.72	(-) 710.03	II
136	Bhorasar	24.98	966.61	(-) 941.63	251.24	(-) 790.39	II

TABLE 2

Conclusion

It is clear from the above discussion that the ii method is more suitable for the purpose of this study. This method help to measure the hierarchy of functions as well as settlements. The space preference helps in identification of the central places and demarcation of their service areas. The area and population, served by a central place, become instrumental in finding the 'areal functional gaps', on which the planning for integrated area development depends.

References

1. Sen, I.k. and mishra g. K. (197) regional planning and rural electrification, nicu, hyderabad, p. 26.
2. Johnston, r.j. (1973) : spatial structures, methuen & co. Ltd., london, p.
3. Mishra, s.p. (1985) : integrated rural area development and planning : a geographical study of kirakat tahsil, district jaunpur, u.p., p.73.
4. Christler, w. (1933) : "the central place in southern germany" translated by c.w. baskin, new jersey (1966).
5. Loesh, a. (1954) "the economics of location", new haven.
6. Moril, r.l. (1970) : "the spatial organisation of society", duxburg press, belmont, california, p. 177.
7. Chorley, r.l. and hagget, p. (1'176) "socio-economic models geography" methuenn, london, p. 282.
8. Wright, m. (1965) : "regional development: problem and line of advance in europe" town planning review. Vol. 36 (3). P. 150.
9. Mordin, w. (1957) : "ecological changes in stalite rural areas", american sociological review, vol 22 (2) p.p. 173-174.
10. Harmansen, t. (1972) : "development poles and development centres national and regional development : elements of theoretical framework" a kuklinski (ed.) "growth poles and growth centres in regional planning" monton, paris.
11. Lausen, j.r. (1970) : "on urban hierarchy stability and spatial polarisation", urban studies, vol. 7, p.88.
12. FRIEDMAN, J. (1972) : "A GENERAL THEORY OF POLARISED DEVELOPMENT" N.M. HANSEN (ED.), REGIONAL ECONOMIC DEVELOPMENT", THE FREE PRESS, NEWYORK, P.P. 86-90.

13. THOMS, M.D. (1977) : "GROWTH POLE THEORY AN EXAMINATION OF SOME ITS BASIC CONCEPTS", IN A. KUKLINSIKI, P. 83.
14. MISHRA, R.P. ET. AL. (1976) : REGIONAL DEYELOPMENT PLANNING IN INDIA", P. 189.
15. HIRCHMAN, A.O. (1958) : "THE STRATEGY OF ECONOMIC DEVELOPMENT", NEW HAVEN, CUNNECTICUT, P.183.
16. DR. SHYAM LATA DEVI (2001): PLANNING RURAL GROWTH CENTRE FOR INTEGRATED AREA DEVELOPMENT: A CASE STUDY OF CITY BLOCK , DISTRICT MIRZAPUR U.P.(DEPARTMENT OF GEOGRAPHY ,FACULTY OF ARTS ,U.P. AUTONOMOUS COLLEGE,VARANASI ,U.P. (UNPUBLISHED THESIS)