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# IDENTIFICATION OF RURAL GROWTH CENTRES AND HIERARCHICAL ORDER OF RURAL SETTLEMENTS IN SINGRAULI DISTRICT OF MADHYA PRADESH, INDIA

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**Abstract**

*In developing countries like India, even after having a prolonged history of rural development planning, villages are still struggling to access most basic amenities and services. This study aims to establish the existing hierarchy of rural settlements in the Singrauli district of Madhya Pradesh by identifying the existing Rural Growth Centres (RGCs). The study is based on secondary data obtained from the District Census Handbook, 2011. In order to find out the four-tier hierarchical arrangement of all the 727 villages in the study area, the Centrality Score (CS) has been calculated by considering 31 services at the village level. Five settlements recording CS value of more than 10.00 have been designated as RGCs which constitutes only 0.68 per cent of the total inhabited villages. The base of the hierarchical pyramid of rural settlements is significantly wider which shows the largest concentration of settlements under the lowest category, which constitutes more than 75 per cent villages of the study area. This study provides a base for village level planning and can help to ensure that rural development is both sustainable and equitable.*

**Keywords:** Hierarchical arrangement, Service score, Rural growth centres, Centrality score, Rural development.

## Introduction

The settlements that provide services to their own, as well as the neighbouring rural areas are known as RGCs. The RGCs oriented development approach is mainly based on rural settlement linkages and interdependencies. This strategy for RGCs is based on decentralisation of social amenities on the one hand and selectivity on the other. It helps to find out what kinds of services ought to be located at various levels of the settlement's hierarchy. Studies of service-based centrality of rural settlements are of immense significance in regional planning, particularly in allocating services in an appropriate order (Banik et al., 2023). Through this approach, overall development of all villages within a region can be assured at a minimum cost.

RGCs are an important component of rural development planning, which provides a focus for investment and development efforts aimed at improving economic opportunities and quality of life in rural areas (Mondal and Das, 2010). The RGCs have been usually developed on the basis of their existing services and infrastructural assets like, transport links, availability of higher order of services or the presence of strong local commercial activities (Agustina et al., 2021).

In a micro-regional setting, growth centres are the instruments for eradicating regional inequalities and fostering rural development (Sharma, 2019). The RGCs are dynamic and efficient centres for development, which provide goods and services to its own population as well as to its surroundings population creating balanced socio-economic development in an area (Sridhar, 2006). This strategy can be useful for promoting agriculture and gainful exploitation of natural resources which constitute the mainstay of the rural sector (Saleh, 2016). The level of the services that it provides to its surrounding area determines the range of the area of influence for a particular RGC. In terms of economic, cultural, commercial, administrative and other requirements, these centres shall serve their surrounding areas (Khan, 1995). RGCs offer a great potential for rural economic growth, therefore the government should promote and support this potential until the process of development becomes sustainable and equitable (Manyanhaire, 2011).

Christaller (1933) and Losch (1940) propounded the Central Place concept, which is associated with the functional specialisation, quantity, size and distribution of human settlements. The original concept has been later expanded by regional scholars such as Hirschman (1958), Boudeville (1968) and Friedman (1970) to include the dimension of geographic space. In both developed and developing nations around the world, the growth centre strategy has become a key component for the formulation and implementation of regional strategies. Based on the pattern of the central place theory, Mishra (1978) has identified a five-tier hierarchy of growth foci, including Growth Pole, Growth Centre, Growth Point, Service Centre, and Central Village in the Indian context. The central place is the hub of a region that serves a greater area than itself with one or more services. Although, services offered may be numerous or few, all central locations perform the same functions. Rondinelli (2021) has pointed out that creation of an integrated system of services, trade and production centres has benefits both for governments attempting to promote regional development and for the people living in the region. Numerous geographers in India, including Kothari (2001), Mishra (2002), Mishra and Sharma (2007) have identified growth centres and their hierarchies. The realization of growth centres came in India at the beginning of the Sixth Five-Year Plan period (1980-85), when the national planners decided to load-off the population of big cities through the planned development of the small towns and village centres (Chand and Puri, 2013). The concept of a growth centre indicates toward the facilities that need to be located at different levels of the hierarchy of settlements so that the overall development of all villages and urban centres within the region could be insured (Sharma, 2021). The settlements can be graded successively according to functional magnitude, resulting in a hierarchical arrangement (Khan and Ahmad, 2013). Hence, studies have been conducted to understand settlement-hierarchy (Gualberto, 2008; Khan and Ahmad, 2013; Sarkar, 2018).

India is quickly emerging as a significant world economy, but due to the restricted spatial and social dissemination of economic progress, a sizable portion of the population continues to lack access to adequate means of subsistence (Sinha, 2022). Nearly 69 per cent of India's population lives in rural areas, which have poor access to food, potable water,

shelter, education, health care, sanitization and financial resources (SHI, 2013). In recent years, more emphasis has been given on local level planning to transform rural India by offering livelihood opportunities and services in chosen RGCs to enhance the quality of life of the local people (Kalkoti, 2014). In this context, an effort has been made in this study, to identify the functional hierarchy of rural settlements in Singrauli district of Madhya Pradesh.

**Objectives of the Study**

Major objectives of the study are:

- to analyse the spatial hierarchical arrangement of rural settlements and
- to identify the existing RGCs in the Singrauli district of Madhya Pradesh.

**Study Area**

The Singrauli district of Madhya Pradesh is located between latitudes of 23° 49' 26" to 24° 42' 11" north and longitudes of 81° 18' 45" to 82° 48' 23" east (Fig.1). It covers an area of 5675 $km^2$, comprising 1.84 per cent of the total area and occupies the $28^{th}$ position in the state. The district has three Community Development (CD) blocks known as Chitrangi, Deosar, and Singrauli. There are 2 towns and 744 villages in the district. Out of the total villages, 727 villages are inhabited, while 17 villages are uninhabited. The total population of the study area has been 11,78,132 persons in 2011. It accounts for only 1.62 per cent of the total population of the state. About 80.75 per cent of the total population resides in 727 villages. The average population density of the district is 208 persons/$km^2$. The decadal growth rate (2001-2011) of the population in the study area has been 28.05 per cent, as compared to the state average of 38.60 per cent. The general literacy rate in the study area is 60.41 per cent, while the urban-rural literacy rates are 75.50 per cent and 56.60 per cent, respectively. The study region is predominantly an agriculture region. However, due to its uneven surface and the high percentage of forest area (42.22 per cent); it has only 2406.70 $km^2$ (42.41 per cent) area under the category of net area sown (CGWB, 2013).

**Database and Methodology**

The study is based on secondary data collected from the District Census Handbook, Census of India for the year 2011. The Centrality Score (CS) has been calculated to classify all the settlements of Singrauli district into a four-tier of hierarchy to identify RGCs.

To calculate CS, a distinct weightage has been assigned to each service. To find out the weightage, following formula proposed by Bhat (1972) has been used:

$$W = N/F$$

where W is the weightage of each service, N is the total number of settlements in the study area, and F is the number of settlements having that particular service.

A service which is accessible in fewer settlements will have more weightage and if available in more or in all settlements will have less weightage. The primary school has a weightage score of 1.08 which indicates that primary school has been available in almost all the settlements.

Further, to determine the service score, the weightage of a specific service has been multiplied by the quantity of that service available in a settlement. For example, if a settlement has five primary schools and the weightage for primary school is 1.08, the service score for primary school would be $5 \times 1.08 = 5.40$. Similarly, the service score

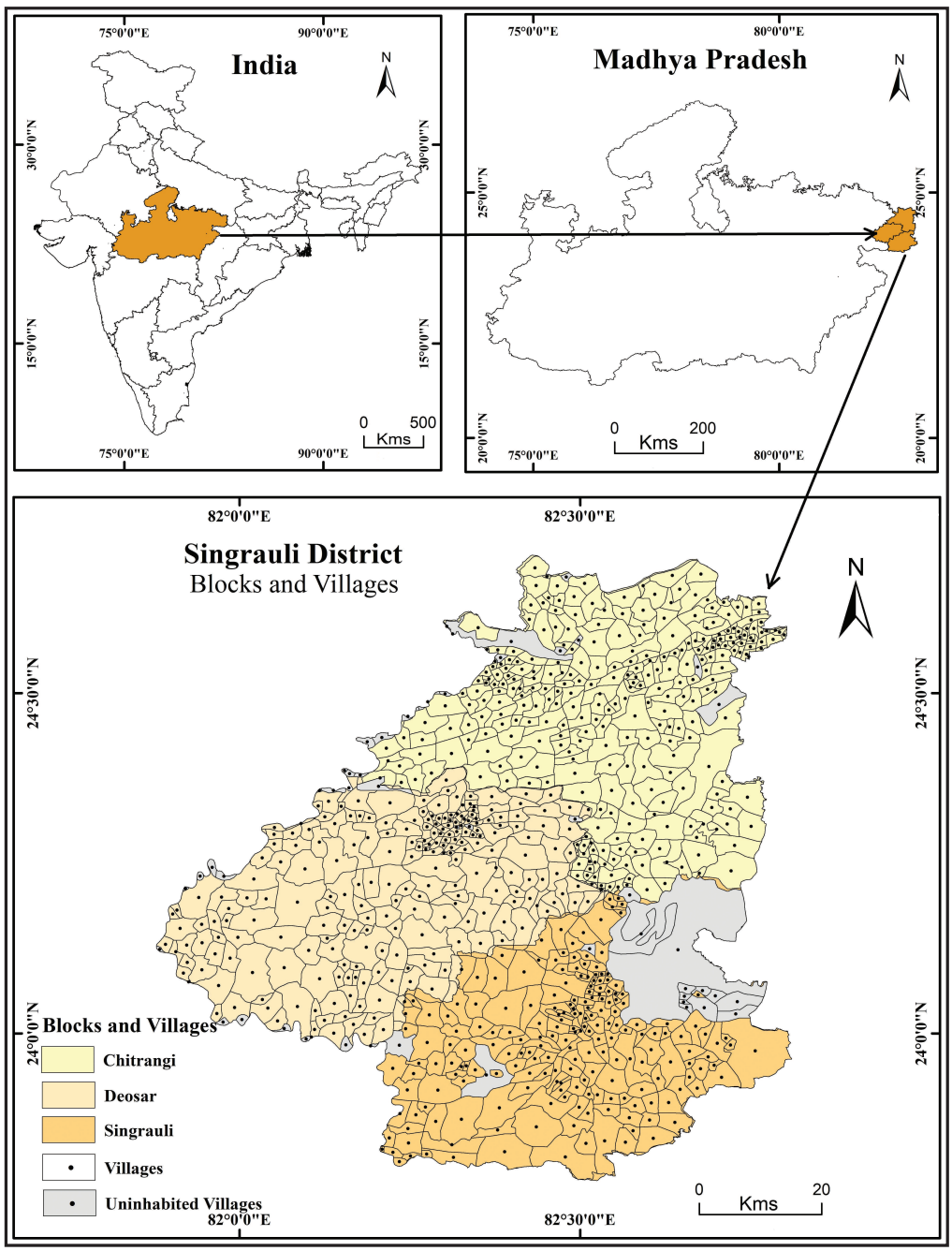
India
75°0'0"E
90°0'0"E
30°0'0"N
15°0'0"N
N
0 500
Kms
Madhya Pradesh
80°0'0"E
25°0'0"N
20°0'0"N
0 200
Kms
Singrauli District
Blocks and Villages
82°0'0"E
82°30'0"E
24°30'0"N
24°0'0"N
Blocks and Villages
Chitrangi
Deosar
Singrauli
Villages
Uninhabited Villages
0 20
Kms

**Fig. 1**

**Table 1**
**Singrauli District: Services with their Weightage Score**

| Sector | Services | Weightage Score |
|---|---|---|
| Education | Primary School | 01.08 |
| | Middle School | 02.03 |
| | Secondary School | 07.13 |
| | Higher Secondary School | 13.72 |
| Maternal and Health | Anganwadi Centre | 01.16 |
| | Primary Health Sub-centre (PHS) | 08.66 |
| | Integrated Child Development Scheme (ICDS) | 09.44 |
| | Dispensary (D) | 48.47 |
| | Primary Health Centre (PHC) | 66.09 |
| | Veterinary Hospital (VH) | 66.09 |
| | Maternity and Child Welfare Centre (MCW) | 90.87 |
| | Family Welfare Centre (FWC) | 145.40 |
| Telecommunication | Post Office (PO) | 11.92 |
| | Sub Post Office (SPO) | 15.47 |
| | Telephones (Landlines) | 31.61 |
| | Post and Telegraph Office (PTO) | 45.44 |
| | Internet Cafes/Common Service Centre (CSC) | 121.17 |
| Transportation Network | Pucca Roads | 01.38 |
| | Connected to Major District Road (MDR) | 02.83 |
| | Connected to State Highway (SH) | 05.39 |
| | Bus Service (Public and Private) | 05.72 |
| | Connected to National Highway (NH) | 25.07 |
| | Railway Stations (RS) | 55.92 |
| Banking | Self-help Group (SHG) | 01.44 |
| | Public Distribution System (PDS) Shop | 02.58 |
| | Agricultural Credit Societies | 24.24 |
| | Co-operative Banks | 33.05 |
| | Commercial Banks | 42.76 |
| Marketing | Weekly Hatt | 08.87 |
| | Agricultural Marketing Society | 25.07 |
| | Mandis/Regular Market | 26.93 |

Source: Compiled by Authors.

values of other facilities have been calculated. The list of 31 services taken up in this study and their weightage scores has been given in Table 1. Amongst all the services, Family Welfare Centre (FWC) has obtained the highest weightage score of 145.40, which means that this service is available only in a few settlements.

Aggregate Service Score (ASS) of a settlement has been obtained by adding the sum of the service score values of all the services available in that settlement. To determine the Mean Service Score (MSS) for the district as a whole, the ASS of all settlements have been added and the sum has been divided by the total number of settlements in

the study region.

The CS of each settlement has been calculated with the help of following formula already used in several studies (Webb, 1959; Mishra and Sharma, 2007; Sharma, 2021):

$$CS = ASS/MSS$$

where CS is the Centrality Score, ASS is the Aggregate service score, and MSS is the Mean service score value of all the settlements.

Further, Sturges (1926) method ($K=1+3.3\log N$) in which K is the number of class intervals and N is the number of items, has been applied for determining the number of classes on the basis of the total number of observations (here applied for total 727 villages with base value of 1000). According to this formula, the total number of classes in the current dataset is four. Therefore; on the basis of the CSs; all the settlements have been arranged in descending order and divided into four classes of hierarchical order i.e., RGCs, Rural Growth Points (RGPs), Rural Service Centres (RSCs) and Central Villages (CVs).

## Results and Discussion

### Hierarchical Order of Rural Settlements

The categorization of rural settlements has been done into four-tier hierarchical order (Table 2). The study area has a total of 744 settlements, out of which 727 are inhabited and 17 are uninhabited. On the basis of the CS, the highest category of settlements recording CS more than 10.00 have been designated as RGCs and settlements with CS value less than 1 have been considered as CVs. The CVs contain a few lower order services with the capacity to serve just their own population.

### Rural Growth Centres (RGCs)

The settlements recording CS of more than 10.00 are designated as RGCs. RGCs are the first and highest order of rural growth centres. Five settlements have emerged as RGCs. These are Sarai (19.70), Chitrangi (17.73), Bargawan (16.24), Khutar (12.89), and Naudiya Abad (11.61). These RGCs are providing the highest-order of services to the surrounding area than other hierarchical levels of settlements. The Sarai, Bargawan and Naudiya Abad RGCs are from Deosar block, while Chitrangi is from Chitrangi block and Khutar is from Singrauli block. These centres are located in the south and south-western parts of the district (Fig. 2). Sarai (RGC) has emerged as the highest level of service centre in the study area on account of providing higher order of educational, health, marketing, banking and postal services and agricultural credit societies. Similarly, Chitrangi, Bargawan, Khutar, and Naudiya Abad RGCs are also offering almost the same services, but slightly less in number. RGCs have the potential to provide agricultural

**Table 2**
**Singrauli District: Hierarchical Order of Rural Centres**

| Centrality Score (CS) | Hierarchical Order | No. of Villages |
|---|---|---|
| Above 10.00 | Rural Growth Centres (RGCs) | 05 |
| 6.00 - 10.00 | Rural Growth Points (RGPs) | 10 |
| 1.00 - 5.00 | Rural Service Centres (RSCs) | 165 |
| Below 1.00 | Central Villages (CVs) | 547 |
| **Total** | - | **727** |

Source: Compiled by Authors.

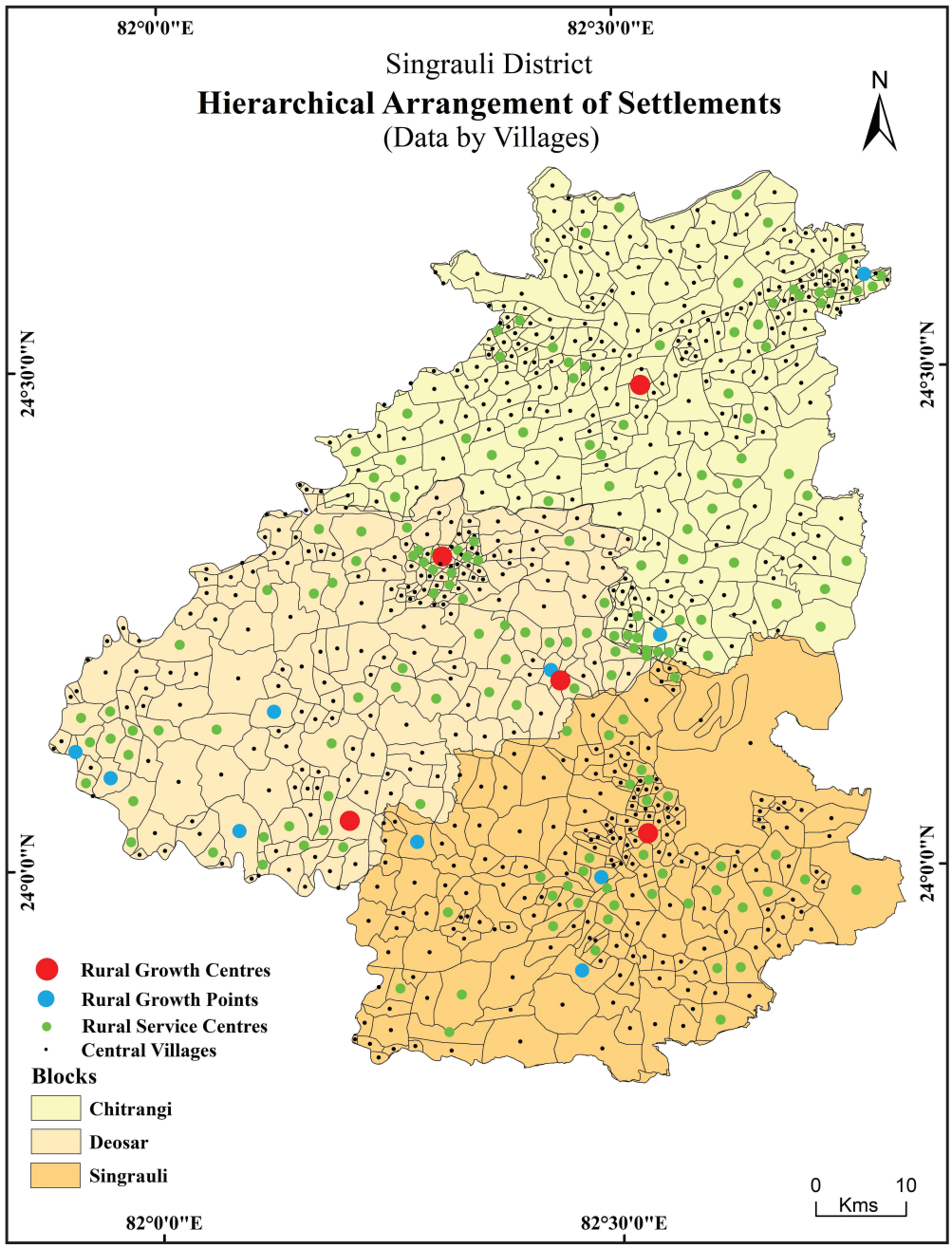
82°0'0"E
82°30'0"E
Singrauli District
Hierarchical Arrangement of Settlements
(Data by Villages)
N
24°30'0"N
24°0'0"N
Rural Growth Centres
Rural Growth Points
Rural Service Centres
Central Villages
Blocks
Chitrangi
Deosar
Singrauli
0
10
Kms

Fig. 2

inputs like fertilisers, insecticides and machinery. RGCs have also grown as small-scale household industrial hubs. These centres also have facilities for agricultural marketing and storing agricultural goods as well as agro-processing plants.

**Rural Growth Points (RGPs)**

The RGPs are the second highest tier of central villages that provide lower order services to their surrounding areas as compared to RGCs. This category includes 10 villages, with a range of CS falling between 6.00 and 10.00. These RGPs are Mahuagaon (9.75), Bakra (8.37), Niwas (7.14), Jhara (6.52), Barhawatola (6.19) of Deosar block; Khanua Nawa (8.90), Rajmelan (6.32), Mada (6.23) of Singrauli block and Kasar (7.57) and Lamsarai (7.39) of Chitarangi block. Except for Lamsarai, all other RGPs are located in the southern and south-western parts of the study region (Fig. 2). These parts of the study area have appropriate geographical conditions for the development of large size settlements with regular surface structure, sufficient groundwater for irrigation and plenty of fertile soil. These centres provide middle to higher order services like secondary and higher secondary schools, primary health centre, veterinary hospital, maternity and child welfare centre, telephones (landlines) and post and telegraph office. RGPs are connected to major district roads and state highways network. These centres also have agricultural credit societies, co-operative banks, agricultural marketing societies and regular agricultural markets to serve their own population as well as the population of surrounding lower order settlements. Mahuagaon of Deosar block has been approaching CS equivalent to RGCs (9.75) due to the availability of all levels of schools, dispensaries, family welfare centres, postal services, connectivity to state and national highways, cooperative banks, Self-help Groups, regular agricultural markets and agricultural credit societies. Hence, Mahuagaon is also functioning almost equivalent to RGCs in the study area.

**Rural Service Centres (RSCs)**

This hierarchical category of settlements includes 165 rural settlements which have recorded CS ranging between 1.00 to 5.00 and accounts for 22.69 per cent of the total villages of the district. The third order hierarchy of RSCs includes 64 villages of Chitrangi block, 59 villages of Deosar block and 42 villages of Singrauli block (Table 3). Although RSCs rely on higher order settlements for higher order services, these centres also offer services of lower hierarchy to the surrounding lower order CVs. These RSCs have services such as a middle school, a dispensary, Integrated Child Development Scheme (ICDS), post office, and sub-post office to serve their own population as well as the lower order villages. RSCs have bus service facility that connects them to major district roads, allowing residents to access public distribution system (PDS) shops, agricultural credit societies and weekly haat markets located at RGPs.

**Central Villages (CVs)**

The lowest level of the rural settlement hierarchy is known as central villages or rural centres having a CS value less than 1.00. Most of the villages (547 in number) fall in this lowest hierarchical class of rural settlements. About 75 per cent rural settlements of the district fall in this category. Among these, 233 villages are from Chitrangi block, 223 villages are from Deosar block and 204 villages are

**Table 3**
**Singrauli District: Block-wise Hierarchical Distribution of Rural Centres**

| CD Block | RGCs | RGPs | RSCs | CVs | No. of Villages |
|---|---|---|---|---|---|
| Chitrangi | 1 | 2 | 64 | 233 | 300 |
| Deosar | 3 | 5 | 59 | 156 | 223 |
| Singrauli | 1 | 3 | 42 | 158 | 204 |
| **Total** | **5** | **10** | **165** | **547** | **727** |

Source: Compiled by Authors.

from Singrauli block (Table 3). Most of the CVs have less than 500 residents. These centres have limited services like availability of a primary school, Anganwadi centre, primary health sub-centre (PHS) and self-help group to serve their own population. The CVs have to rely on surrounding higher-order centres for majority of their needs. This highlights that most of the CVs, lack even the most basic services and have to depend on higher-order centres which increases the cost of goods and services. Thus, the villages in this category are still struggling to get access even to the basic requirements.

**Conclusions**

Based on the services available, the study has identified the hierarchical order of rural settlements in the Singrauli district of Madhya Pradesh. It has been observed that the base of the hierarchical pyramid of rural settlements is much wider, with the largest concentration of settlements in the lowest category accounting for a three-fourth share of the villages. There are only 5 RGCs and 10 RGPs in the district to provide higher level of services to all the lower order settlements. Sarai (RGC) has emerged as the highest service centre due to the concentration of higher order services. Among the RGPs, Mahuagaon of Deosar block has come close to RGCs due to the availability of many services similar to RGCs. The lower order settlements (RSCs and CVs) account for 97.93 per cent of total villages, which are far away from the RGCs and RGPs to avail the middle or higher order services. These centres are mostly located in the southern and south-western parts of the district, with the highest concentration being in the Chitrangi block. Majority of CVs are totally dependent on the higher order service centres, even for their basic needs. The people of these lower order settlements are still struggling to access most of the basic amenities and services. The present study of service-based centrality of rural settlements is of immense significance for micro-regional planning, particularly in allocating various services in an appropriate order of the rural settlements. In this way, the rural people of the region can be offered sufficient services with the least possible expenditure of time, money and effort.

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