Spat. Inf. Res. (2020) 28(2):257–272
https://doi.org/10.1007/s41324-019-00286-w

Evaluating the quality of living (QOL) of the households in Dandakaranya region, India: a well-being approach

Arijit Das[1] · Manob Das[1] · Rejaul Houqe[1]

Received: 19 May 2019 / Revised: 27 July 2019 / Accepted: 30 July 2019 / Published online: 17 August 2019

Abstract This paper mainly deals with the pattern of Quality of Living (QOL) in terms of availability of various basic services and amenities in Dandakaranya region of India. To measure state of living in this region, a Composite Index (CI) was developed based on census data 2011. In order to assess clear cut scenario of district level regional disparity, different indices such as Human Capital Index (HCI), Financial Capital Index (FCI), Physical Capital Index (PCI) and Housing Index (HI) have been used and districts were categorized on the basis of Composite Score Value. The results of the research study show that there is a huge inter-state and inter-districts disparity in terms of basic services and amenities in Dankaranya region. The districts falling in Andrapradesh shows better conditions in terms of basic services and amenities as compared to the districts located in Chhatishgarh and Odisha respectively. In districts like Sukma (Chhatishgarh), Koraput (Odisha), Bijapur (Madhyapradesh), there are least availability of basic services and amenities. The study suggests that the backward districts need an urgent improvement in most of the indicators to enhance the better living condition of the households. This study may also assist the planners and policy makers to implement effective measures to upgrade quality of living.

✉ Manob Das
dasmanob631@gmail.com

Arijit Das
arijit3333@gmail.com

[1] Department of Geography, University of Gour Banga, Malda 732103, West Bengal, India

Keywords Regional disparity · Backward region · Dandakaranya · HCI · Well-being

1 Introduction

The well-being is a multidimensional aspect [1] which is largely influenced by factors such as health, living conditions of the households etc. [2]. In recent decades, the research studies have been conducted to assess the well-being or quality of life of the people on the basis of the Gross Domestic Production (GDP) [3]. But it was realized that the measure of well-being or the quality of life on the basis of the per capita income (PCI) and its related measures are not sufficient [4–10]. The absolute scenario of any region analysis cannot be measured by applying traditional measures of quality of living (QOL). In this context, socio-economic measures are necessary along with GDP to assess the complete scenario of well-being or quality of life of the people. In this research study, the quality of life of the people living in Dandakaranya region has been assessed by applying a number of material well-being indicators. The research on the assessment of well being has measured significantly and it has achieved international interest in recent decades. The planners, policy makers and researchers have paid keen interest at large extent because well-being is one of the integral part of development at all levels and only per GDP cannot be used as effective measures or indicator for well-being assessment and as it was mentioned earlier that per capita GDP cannot used as most representative measure for well-being or quality of life of the people [11]. Before discussion on the assessment on the well-being of the people, it is necessary to highlight the distinction between subjective and objective well-being of the people [12]. The subjective well being of the people

is measured with the help of human perception, mental satisfaction and feelings of the people which is mostly linked with psychology of an individual [13–15]. On the other hand, objective well-being of the people is measured with the help of material condition of the people such as economic status, living conditions of the people, educational status etc. [16–18] which largely affect the quality of life of the people. The objective well-being is measured with the help of observable factors. In this study research, the objective well-being of the people has been measured observable material factors such as housing conditions, availability of basic services and amenities to the households.

The regions with better pull-off capacity tend to develop at a faster pace, while the lagging regions lag further behind. In India also there are some particular pockets of economic development (such as western and southern) and other region remains backward for a long time (such as Uttarpradesh, Bihar, Chhatishgarh etc.) Many studies have identified the problem of uneven development of Indian states and suggested suitable interventions to reduce the unevenness of regional disparities. It was argued by many researchers that some states such as Maharashtra, Punjab, Haryana, and Gujarat are growing by 7–10% as compared to others region [19–22]. A numbers of researchers studied about Quality of Living and made attempts to identify the component of QOL and compares various geographical areas such as cities, states and nation by means of QOL. In addition to the researcher, international organizations such as UNDP (1994), UN and Overseas Development council (1996) developed own measures for QOL. In this study, Quality of Living of the Households was assessed based on the Composite Score (CS) under four major domains. Therefore, such studies may be a significant source to the planners and policy makers to implement required measures to promote the quality of living of the households living in this backward region. In Dandakaranya region, most of the people are tribal and the region are called 'central tribal belt' of India. In this region literacy rate is very low than the other region of India, thus illiteracy is one of the important leading factors that affect the overall pattern of regional development and quality of living of the households (Table 1).

In this regard, measuring of quality of living condition of the households living in Dankaranya region is important. For the assessment the quality of living of the households, the present study tries to address some specific objectives. These objectives are (1) to assess the pattern of quality of living of in Dandakaranya region. (2) to examine regional disparity in terms of quality of living (3) to quantify the availability of basic amenities and services to the HHs respectively.

Table 1 Selection of major domains and indicators used in this study

Domains	Variables ID	Name of variables	Explanation
Human capital index (HCI)	LP	Literate people	% Percentage of literate people
	FLP	Female literate people	% of female literate people
	MLP	Male literate people	% of male literate people
	MW	Main worker	% of main worker
Financial capital index (FCI)	BS	Banking service	% of HHs having Banking service
	S/M	Scoter/moped	% of HHs having scoter/moped
	MF	Mobile facilities	% of HHs having mobile facilities
	C/L	Computer/laptop	% of HHs having computer/laptop
	TV	TV	% of HHs having TV
Physical capital index (PCI)	DW	Drinking water	% of drinking water within premises
	ElEC	Electricity	% of electricity
	LAT	Latrine	% of latrine within premises
	DS	Drainage system	% of closed drainage system
	LPG/PNG	LPG/PNG	% of LPG/PNG facilities
Housing index (HI)	CH	Census house	% of good condition of census house
	PH	Permanent house	% of HHs living in permanent house
	OH	Own house	% of HHs living in own house
	BB/CB	Burn bricks/cement block	% of wall material with burn bricks/cement block
	CM	Concrete material	% of roof which concrete material

2 Materials and methods

2.1 Study area

The Dandakaranya region is located in the central-east part of India. Geographically the region lies between 17°15′–20°30′ north latitudes and 18°15′–84°0′ east longitude. The Dandakaranya belt covers three states Chhattisgarh, Odisha, and Andhra Pradesh. It includes Kanker, Narayanpur, Baster, Kondagaon, Bijapur, Dantewada, and Sukma district of Chhattisgarh; Koraput, Kalahandi, Nuapada, Nabarangpur, Rayagada district of Odisha and some CD blocks of Andhra Pradesh, these are Eastern Godavari District (Chodavaram and Yellavaram CD blocks), Vishakhapatnam District (Chintapalle, Paderu CD block),Vizianagar gram (Salur and Parvati-purom CD block). The region is almost a well-demarcated physical unit and characterized by dominant plateau. The Abujmar hills in the west Eastern Ghats in the east, the Chhattisgarh basin in the north, Andhra plateau in the south and eastern coastal plain towards the east.

The region is drained by mainly two rivers such as Mahanadi, Godavari river and its tributaries. The riverine region provides fertile alluvial soil and the people of this region are basically involved with subsistence agriculture. The agriculture is not developed than another state of India such as Punjab, Haryana, Uttar Pradesh, Andhra Pradesh etc. The Dandakaranya region is rich in flora and fauna with thick forest and many Perennial River and mineral resource rich area's wealth consists of valuable minerals like iron, corundum, limestone, bauxite, mica, copper, uranium, granite, dolomite and others minerals and valuable forest wealth, abundant water, wide terrain but this region is lack of industry. This region have been some industries, these are not suitable for development of this region. The Dandakaranya Development Authority (DDA) are 13 sections in the project, namely, project headquarters, zonal administration, agriculture and animal husbandry, construction, irrigation, transport, industrial, forestry, medical and health, education etc. for development in this region (Fig. 1).

2.2 Data source

The present study was conducted based on two major sources of secondary data namely (1) PCA Primary Census

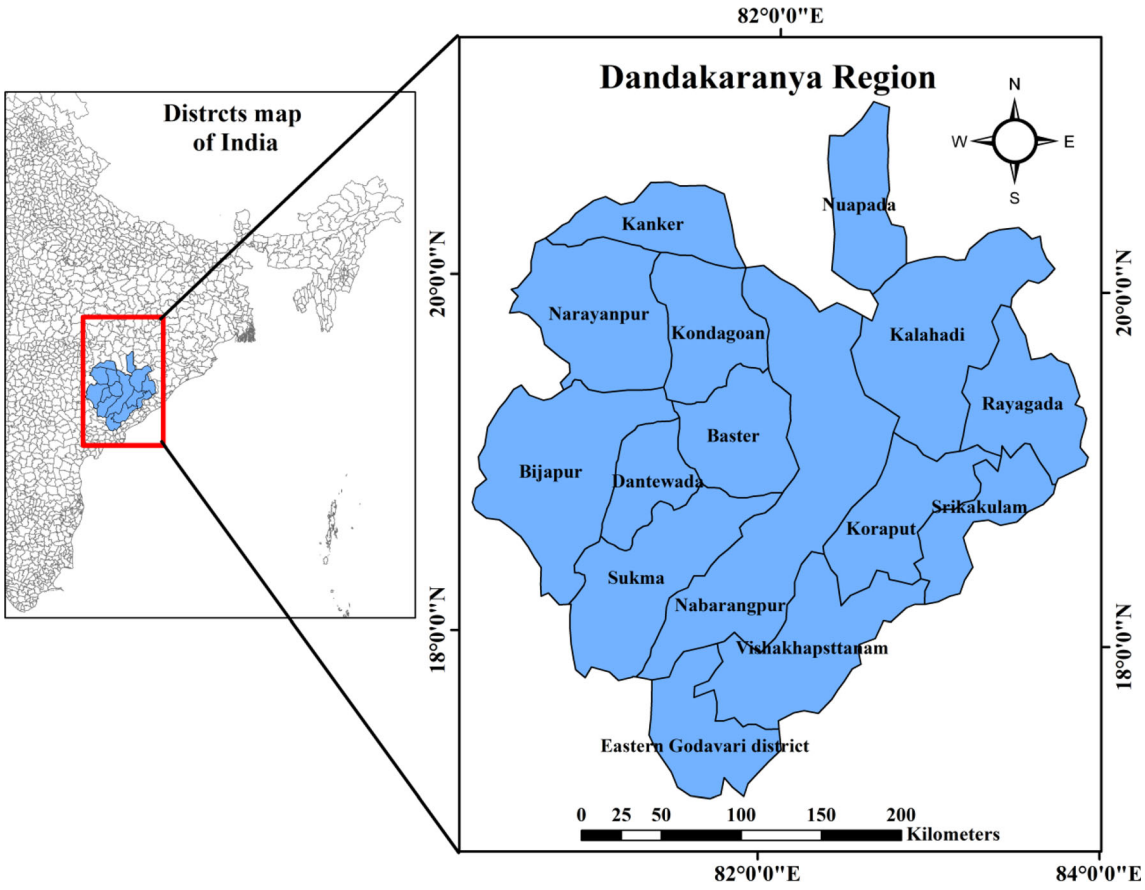

Fig. 1 Location map of the study area (Dandakaranya Region)

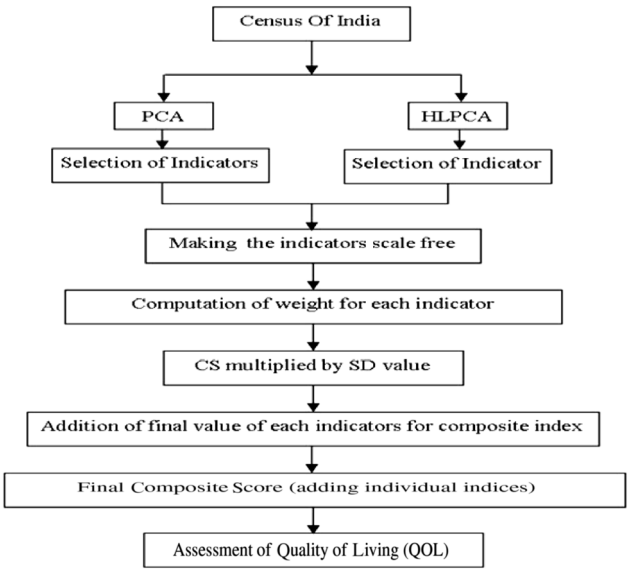

Fig. 2 Methodological framework regarding data source

Abstract, 2011) and (2) HLPCA (House Level Primary Census Abstract, 2011) respectively. Primary Census Abstract, 2011 was used to collect various kind of socio-economic data such as educational level (literate, illiterate population), participation in different economic activities (such as cultivators, agricultural labour etc.). On the other hand, House Level Primary Census Abstract, 2011 was used for extracting data regarding basic amenities and basic services such as hosing condition, housing structure, drinking water facility, latrine facility, availability of banking facility etc. Therefore, PCA and HLPCA are one of the major sources of data to assess the development as well as deprivation at different levels. In this study PCA and HLPCA data sets were used to examine the pattern of regional development across districts of Dandakaranya region through the construction of composite indices (Fig. 2).

2.3 Selection of domains and indicators

An attempt is made to identify the regional disparities of Dandakaranya region and further to identify the backward/disadvantages districts of Dandakaranya region in terms of different socio-economic parameters, four domains (Human Capital Index, Financial Capital Index, Physical Capital Index, Housing Index) were taken into consideration to construct composite index. Different types of basic amenities and services related indicators such as good condition of census house, electricity, HHs having banking service, HHs having scoter/moped, HHs having T.V, drinking water within premises, closed drainage system, LPG/PNG facilities, HHs having permanent house, roof which concrete materials etc. were collected from HLPCA. On the other hand, socio-economic indicators such as literacy rate, worker population related data were collected from Primary Census Abstract, 2011 respectively (Fig. 3).

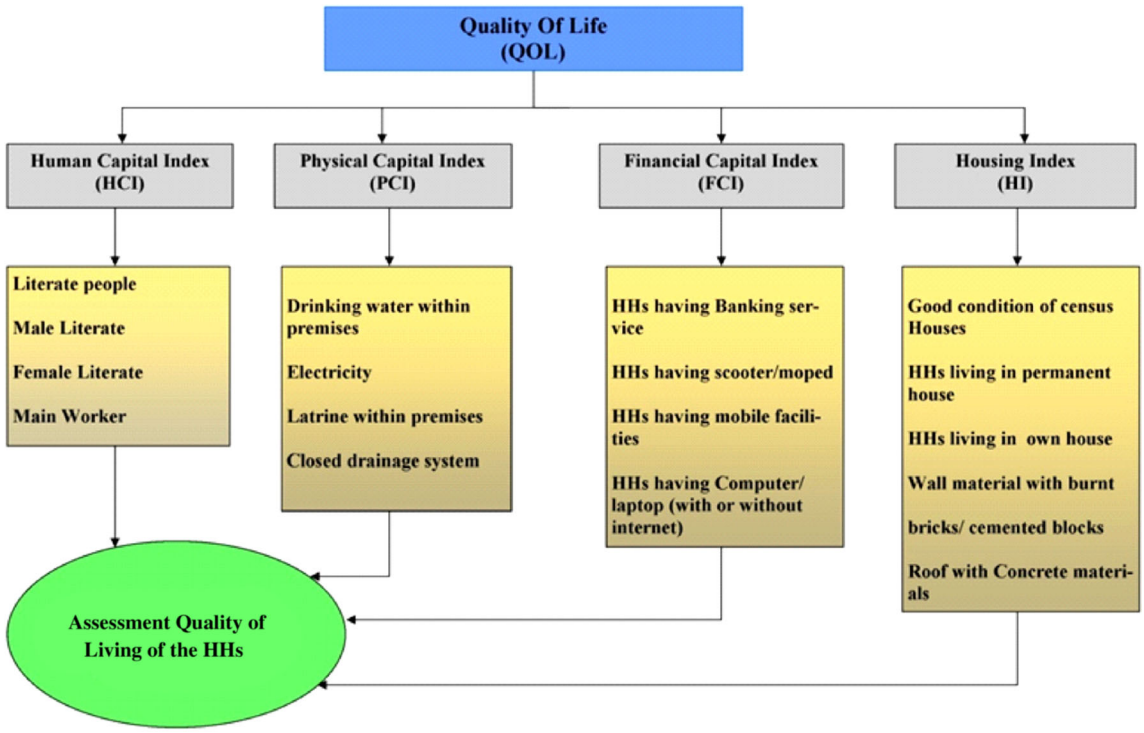

Fig. 3 Flow chart regarding domains and indicators

2.4 Methodology

2.4.1 Standardization of the indicators

Standardized is a unit free process of various variable data that makes it possible to estimate a sample size when an investigator cannot obtain information about the variability of the outcome variable. It also simplifies comparison between the effect sizes of different variable. In order to eliminate such effects, data with different scales typically should be standardized or normalized so that they do not adversely affect cluster results [23, 24]. This study uses 19 variables under 4 dimensions. All four dimension are limited to the interval of (0, 1), by applying the following general standardized formula, each reflecting the performance in the corresponding development aspect. The problem of standardization was confronted using two equations, one linear increasing and one linear decreasing therefore; all the values of matrix are transformed into numbers between 0 and 1 with 1 considered the most desired value. The variables data standardised for using following equation:

$$Xid = \frac{OBval - MINval}{MAXval - MINval} \quad (1)$$

where X_{id} is the Range Equalization Method, OB_{val} stands for the actual value of the ith district; MIN_{val} is represent the minimum value of ith district and MAX_{val} is represent the maximum value of ith district.

2.4.2 Principal component analysis (PCA)

Principal Component Analysis (PCA) is a multivariate statistical technique which is widely used to summarize the entire datasets and for computational simplicity [25]. A number of researchers used PCA to construct composite indices to measure the well-being of the people [26–31]. In this research study also, PCA was used to reduce the dimensionality and for developing a composite index to assess. Principle Component Analysis (PCA) therefore imparts information on the most important parameters, explaining the whole data set while permitting data reduction with the least amount of loss of original information; it is a potent method for pattern detection that attempts to explain the variance of a huge set of intercorrelated variables and convert them into a smaller set of independent (uncorrelated) variables [32]. PCA is multivariate statistical techniques used to reduce a large number of variables into a smaller number of dimensions. PCA are computationally easy and also avoids many problems associated with the traditional methods, such as aggregation, standardization, and non-linear relationships of variables affecting socioeconomic inequalities [33]. For the construction of composite index, the weightage for each considered variable was computed with the help of Principal Component Analysis (PCA). The first principal component (PC1) score coefficient was used as weight because it explains maximum percentage of variance.

2.4.3 Developing a composite index

In the study, researcher made an attempt to identify the backward district through the application of a composite index approach. The most important advantage of using composite index is that it includes comprehensiveness, multidimensionality as well as help to reduce of indicator [34]. Composite Development Indicator (CDI) which is a multidimensional concept of development used in this research work considering four major domains such as Human Capital Index (HCI), Financial Capital Index (FCI), Physical capital Index (PCI) and Housing Index (HI).

$$HCI = \frac{(CSc1 \times SDv1) + (SCc2 \times SDv2) \cdots SCnx \times SDn.x}{N} \quad (2)$$

$$HI = \frac{(CSc1 \times SDv1) + (SCc2 \times SDv2) \cdots SCnx \times SDn.x}{N} \quad (3)$$

$$PCI = \frac{(CSc1 \times SDv1) + (SCc2 \times SDv2) \cdots SCnx \times SDn.x}{N} \quad (4)$$

$$FCI = \frac{(CSc1 \times SDv1) + (SCc2 \times SDv2) \cdots SCnx \times SDn.x}{N} \quad (5)$$

where HI, HCI, PCI and FCI are the individual index; SC_{cI} is the component score coefficient; SD_{vI} is the Standardized value of the indicator and N is the number of indicators considered for computation of each index respectively.

The Composite Index was computed with the help of the following equation:

$$CIx = \frac{(\sum HI + \sum PCI + \sum FCI + \sum HCI)}{Nind} \quad (6)$$

where CI_x is the Composite Index: HI, HCI, PCI and FCI are the final output of the individual index and N_{ind} is the number of indices. Here, composite index is nothing but average of HI, FCI, PCI and HCI

2.4.4 Software used

In this present study, SPSS software (version 22) was used for Principal Component Analysis (PCA) and spatial

mapping of the region was performed with the help of ArcGIS (version 10.3).

3 Results

3.1 Regional disparity in Dandakaranya Region

3.1.1 Availability of basic amenities to the households

In Dandakaranya average 10.95% households have drinking water within their premises (2011). In Srikakulam district of Dandakaranya region, 21.6% households have drinking water within facility premises ranks first and the Bijapur district ranking lowest where only 4.9% households have drinking water within premises (Table 2). In this region only 10% HHs have drinking water facility within premises in 9 districts such as Narayanpur (8.8), Kondagaon (8.62), Baster (8.94), Bijapur (4.9%), Sukma (5.3%), Vishakhapatnam (6.9%), Kalahandi (8.5), Nuapada (7.4%), Nabarangpur (7.4).

Electricity facilities also show a wide regional variation. In Dandakaranya only 41.58% HHs was electrified and the highest electricity facility was recorded in Srikakulam district (87.55%) and lowest electricity facility was found in Nabarangpur (12.6%). From the overall spatial distribution of electricity over the region, it was documented that in few districts electricity facility was satisfied. In most of districts of the region, electricity facility is poor (below 50%) such as Narayanpur (34.6%), Kondagaon (43.2%), Baster (46%), Bijapur (24.8%), Dantewada (38.08%), Sukma (35.5%), Koraput (25.4%), Kalahandi (22.2%), Nuapada (27.5%), Nabarangpur (12.6%) and Rayagada (27.2%) respectively.

3.1.2 Availability of assets to the household

Assets are stock of resources which are accumulated and hold over the time and it provides for future consumption and source of security against contingencies. Assets of households clearly determine household poverty as well as living quality. Besides, intra-household assets ownership within the members of households was also an indirect approach to estimate intra-household inequality [35]. Different scholars categorize assets from different perspectives. It may be financial and non-financial [36] or human, social, natural, physical and financial assets [37]. Among these, the modern gadgets of households such as computers/laptops with and without internet connection and mobile phones are newly introduced. The Dandakaranya region HHs having was only 34.22%; the highest and lowest Banking service were found in Srikakulam district (52%) and Sukma (22.83%) respectively. In this region 34.22% HHs having scoter/mope (highest in Kanker district and lowest was in Sukma district. HHs having mobile facilities in this region was only 19.38%. in terms of the availability of the mobile facility, Srikakulam ranks highest (43.15%) and Bijapur district ranks lowest. From the overall result it was visualized that in Dandakaranya region, the availability of modern gadgets such as laptop/Computer, mobile and TV is poor.

Table 2 Availability of basic amenities of household (%). *Source*: Census of India, 2011

	Average	Maximum	Minimum
Basic amenities			
Drinking water within premises (%)	10.95	Srikakulam (21.6)	Bijapur (4.9)
Electricity	41.58	Srikakulam (87.55)	Nabarangpur (12.6)
Latrine within premises	11.06	Srikakulam (32.1)	Nuapada/Nabarangpur (0.6)
Closed drainage system	3.00	Srikakulam (18.85)	Bijapur (0.4)
LPG/PNG facilities	8.65	Srikakulam (31.7)	Bijapur (2)
Assets			
HHs having Banking service	34.22	Srikakulam (52)	Sukma (22.83)
HHs having scoter/moped	8.72	Kanker (16.10)	Sukma (5.13)
HHs having mobile facilities	19.38	Srikakulam (43.15)	Bijapur (8)
HHs having computer/laptop	3.26	Kalahandi (5.1)	Baster (1.64)
HHs having TV	19.08	Srikakulam (52.15)	Bijapur (8.4)
Housing Conditions			
Good condition of census house	42.76	Srikakulam (66.9)	Kalahandi (21.9)
HHs living in permanent house	27.81	Srikakulam (71.9)	Bijapur (6.4)
HHs living in own house	90.7	Kondagaon (95.74)	Srikakulam (81.1)
Wall material burn bricks	23.6	Srikakulam (67.65)	Bijapur (6.1)
Roof which concreate materials	9.63	Srikakulam (57.1)	Bijapur (1.8)

3.1.3 Housing condition of the households

Housing condition of the households is not satisfactory in this backward region because of relatively bad condition of living of the households. The result shows that good condition of census house was low only 42.76%, highest was in Srikakulam district (66.9%) and lowest iwas in Kalahandi district (21.9%). The condition of census houses is not good in districts of Dandakaranya region as the average good condition of census houses were approximately 58%. In this region most the HHs having their no permanent house for living as average number of HHs living in permanent house was 27.81% and HHs living in permanent house was highest in Srikakulam (71.9%) district and lowest was in Bijapur (6.4%) district. On the other hand, most of the HHs in this region lived in their own house. In this region, 90.7% HHs having their own house.

The wall material with burn bricks was highest in Srikakulam district (67.65%) and lowest in Bijapur (6.1%) and 23.6 percent of the HHs having wall materials with burn bricks over the entire region. The HHs having roof constituted highest in Srikakulam (57.1%) and lowest in Bijapur (1.8%) district. From the data analysis it was clear that the housing condition in this backward region was poor.

To examine the relationship among various variables selected for study, correlation was computed. The correlation matrix shows the relation between all variables.

The Table 3 represents variable's maximum, minimum, mean, coefficient of variation and standard deviation value. In Dandakaranya region minimum literacy rate was recorded in Sukma district (34.81%), the maximum literacy rate was found in Kanker district (74.8%) and average literacy rate was 52.88% in this region. The male and female literacy rate was minimum in the Sukma district and the maximum was Kanker district. Over the entire region average male literacy rate was 63.0% and female literacy rate was 42.99% respectively. The percentage of HHs having banking service was minimum in sukma district (22.83%) and maximum was in Srikakulam district (52.29%) respectively. So it was clear that the Dandakaranya region banking service facility was not satisfactory (Tables 4, 5, 6).

In this study research, the housing condition of the households was also assessed. In Dandakaranya region approximately 42% of households having good condition of census house. The percentage of good condition of census house was maximum and minimum in Srikakulam district (66.9%) and Kalahandi district (21.9%) respectively. The detail of housing condition of the households was presented in Table 7. From the overall study of the

Table 3 Pearson correlation matrix

Variables	LP	FLP	MLP	MW	BS	S/M	MF	C/L	TV	DW	Elc	L	DS	LPG/ PNG	CH	PH	OH	BB/ CB	CM
LP	1																		
FLP	0.99	1																	
MLP	0.98	0.94	1																
MW	0.44	0.54	0.31	1															
BS	0.65	0.65	0.64	0.34	1														
S/M	0.73	0.72	0.72	0.35	0.69	1													
MF	0.63	0.60	0.64	0.48	0.63	0.53	1												
C/L	0.23	0.22	0.24	0.27	0.24	0.55	0.43	1											
TV	0.63	0.68	0.54	0.83	0.59	0.46	0.82	0.43	1										
DW	0.74	0.78	0.66	0.69	0.77	0.82	0.75	0.51	0.84	1									
Elc	0.61	0.68	0.51	0.91	0.55	0.43	0.57	0.20	0.85	0.70	1								
LAT	0.53	0.62	0.40	0.87	0.52	0.50	0.47	0.17	0.79	0.77	0.89	1							
DS	0.29	0.30	0.26	0.56	0.54	0.33	0.84	0.40	0.82	0.67	0.59	0.60	1						
LPG/ PNG	0.40	0.43	0.35	0.69	0.57	0.42	0.86	0.54	0.92	0.76	0.72	0.68	0.96	1					
CH	0.28	0.38	0.14	0.88	0.40	0.23	0.28	0.10	0.68	0.54	0.88	0.88	0.50	0.59	1				
PH	0.51	0.49	0.50	0.38	0.38	0.21	0.81	0.39	0.74	0.55	0.38	0.28	0.68	0.70	0.14	1			
OH	0.29	0.35	0.21	0.70	0.46	0.42	0.69	0.68	0.85	0.76	0.60	0.63	0.83	0.91	0.59	0.65	1		
BB/CB	0.46	0.42	0.50	0.20	0.45	0.26	0.87	0.33	0.63	0.51	0.24	0.14	0.70	0.66	0.04	0.93	0.54	1	
CM	0.40	0.43	0.35	0.61	0.59	0.29	0.88	0.31	0.89	0.70	0.66	0.63	0.96	0.94	0.51	0.76	− 0.79	0.76	1

Table 4 Descriptive statistics of the variables

Variables ID	Minimum	Maximum	Mean	SD
LP	34.81 (Sukma)	74.8 (Kanker)	52.88	9.61
FLP	25.74 (Sukma)	65.77 (Kanker)	42.99	9.92
MLP	44.06 (Sukma)	84.1 (Kanker)	63.04	9.61
MW	45.68 (Nabarangpur)	86.17 (Srikakulam)	61.04	12.84
BS	22.83 (Sukma)	52.29 (Srikakulam)	34.22	10.36
S/M	5.13 (Bijapur)	16.1 (Kanker)	8.72	2.72
MF	8.00 (Bijapur)	43.25 (Srikakulam)	19.38	8.19
COM/LAP	1.64 (Kondagaon)	5.1 (Koraput)	3.26	0.94
TV	8.33 (Bijapur)	52.15 (Srikakulam)	19.018	11.64
DW	4.90 (Bijapur)	21.6 (Kanker)	10.954	5.24
Elc	12.6 (Vishakhapatnam)	87.55 (Srikakulam)	41.58	21.26
LAT	0.60 (Nuapada)	32.1 (Srikakulam)	11.0627	9.94
DS	0.23 (Sukma)	18.85 (Srikakulam)	3.006	4.69
LPG	2.00 (Bijapur)	31.7 (Srikakulam)	8.6567	7.46
CH	21.9 (Kalahandi)	66.9 (Srikakulam)	42.7693	13.88
PH	6.4 (Bijapur)	71.9 (Srikakulam)	27.8127	18.38
OH	81.1 (Srikakulam)	95.74 (Nuapada)	91.0787	4.21
BB	6.1 (Bijapur)	67.65 (Srikakulam)	23.4653	17.38
CM	1.8 (Bijapur)	57.1 (Srikakulam)	9.6327	13.61

Table 5 Ranking of districts based on the composite score (CS)

Rank	Districts	HCI	Districts	FCI	Districts	PCI	Districts	HI	Districts	CS
1	Kanker	0.265	Srikakulam	0.066	Srikakulam	0.090	Kondagaoan	0.193	Kanker	0.557
2	Srikakulam	0.205	kanker	0.053	Kanker	0.052	Nuapada	0.189	Srikakulam	0.453
3	Godavari	0.187	Koraput	0.035	Godavari	0.040	Kalahandi	0.184	Kondagaoan	0.417
4	Kalahandi	0.144	Rayagada	0.035	Dantewada	0.038	Baster	0.180	Kalahandi	0.411
5	Nuapada	0.135	Dantewada	0.031	Vishakhapatnam	0.029	Bijapur	0.171	Nuapada	0.406
6	Kondagaoan	0.129	Godavari	0.029	Koraput	0.025	Sukma	0.168	Baster	0.391
7	Vishakhapatnam	0.121	Vishakhapatnam	0.024	Baster	0.023	Nabarangpur	0.156	Godavari	0.382
8	Baster	0.117	Kondagaoan	0.022	Rayagada	0.020	Narayanpur	0.150	Vishakhapatnam	0.319
9	Dantewada	0.097	Kalahandi	0.021	Narayanpur	0.017	Kanker	0.130	Narayanpur	0.316
10	Koraput	0.096	Nuapada	0.020	Kondagaoan	0.015	Rayagada	0.112	Rayagada	0.299
11	Narayanpur	0.094	Baster	0.017	Sukma	0.010	Vishakhapatnam	0.106	Dantewada	0.286
12	Rayagada	0.090	Nabarangpur	0.013	Kalahandi	0.009	Godavari	0.088	Nabarangpur	0.283
13	Nabarangpur	0.067	Narayanpur	0.012	Nuapada	0.008	Dantewada	0.082	Bijapur	0.274
14	Bijapur	0.040	Bijapur	0.005	Bijapur	0.005	Koraput	0.082	Koraput	0.267
15	Sukma	0.023	Sukma	0.003	Nabarangpur	0.004	Srikakulam	0.043	Sukma	0.249

housing condition of the households, it was noticed that the housing conditions of the households in this region are also not satisfactory.

3.2 Inter district disparity in Dandakaranya region

In this section of the paper, a comparative analysis was examined among different districts of the region based on the indices selected for the study. In case of housing condition of the households, it was found that housing conditions were relatively good in some districts like Kondagaoan, Nuapada, Kalahandi. To assess the financial status of the households, financial capitals (such as scooter/moped, mobile, computer/laptop etc.) was taken into consideration. The results of the study show that maximum percentage of financial capitals was available in Srikulam

Table 6 Inter-districts disparity of Dandakaranya Region

Rank	District	HCI	District	FCI	District	PCI	District	HI	District	CS
AndraPradesh										
1	Srikakulam	0.205	Srikakulam	0.066	Srikakulam	0.09	Vishakhapatnam	0.106	Srikakulam	0.453
2	Godavari	0.187	Godavari	0.029	Godavari	0.04	Godavari	0.088	Godavari	0.382
3	Vishakhapatnam	0.121	Vishakhapatnam	0.024	Vishakhapatnam	0.029	Srikakulam	0.043	Vishakhapatnam	0.319
Chhattisgarh										
1	Kanker	0.265	Kanker	0.053	Kanker	0.052	Kondagaon	0.193	Kanker	0.557
2	Kondagaon	0.192	Dantewada	0.031	Dantewada	0.038	Baster	0.18	Kondagaon	0.417
3	Baster	0.117	Kondagaon	0.022	Baster	0.023	Bijapur	0.171	Baster	0.391
4	Dantewada	0.097	Baster	0.017	Narayanpur	0.017	Sukma	0.168	Narayanpur	0.316
5	Narayanpur	0.094	Narayanpur	0.012	Kondagaon	0.015	Narayanpur	0.15	Dantewada	0.286
6	Bijapur	0.04	Bijapur	0.005	Sukma	0.01	Kanker	0.13	Bijapur	0.274
7	Sukma	0.023	Sukma	0.003	Bijapur	0.005	Dantewada	0.082	Sukma	0.249
Odisha										
1	Kalahandi	0.144	Koraput	0.035	Koraput	0.025	Nuapada	0.189	Kalahandi	0.411
2	Nuapada	0.135	Rayagada	0.035	Rayagada	0.02	Kalahandi	0.184	Nuapada	0.406
3	Koraput	0.096	Kalahandi	0.021	Kalahandi	0.009	Nabarangpur	0.156	Rayagada	0.299
4	Rayagada	0.09	Nuapada	0.02	Nuapada	0.008	Rayagada	0.112	Nabarangpur	0.283
5	Nabarangpur	0.067	Nabarangpur	0.013	Nabarangpur	0.004	Koraput	0.082	Koraput	0.267

Table 7 Classification of district based on composite score value

Composite Score (CS)	Level of Quality of Living (QOL)	No. of districts	Name of the districts
< 0.30	Low	6	Rayagada, Dantewada, Nabarangpur, Bijapur, Koraput, Sukma
0.30–0.40	Medium	4	Baster, Godavari, Vishakhapatnam, Narayanpur
> 0.40	High	5	Kanker, Srikakulam, Kondagaon, Kalahandi, Nuapada

district followed by Kankar, Koraput etc. There was also huge disparity across districts in terms of availability of basic assets in this region. The condition of Srikulam district was good enough in terms of availability of basic services such as drinking water, banking services, latrine facility etc. followed by Kankar, Godavari, Dantewada etc. respectively. In this research study, ultimately a composite index was computed to rank the districts based on the contribution of each and every index (Figs. 4, 5, 6, 7).

3.3 Inter-state disparity in Dandakaranya region

In earlier section of this research study, the regional variation of availability of basic services and amenities were assessed. The result shows that there were disparities in the availability of basic services and amenities. On the other hand, there was also huge disparity across states The districts located in Telengana state avails good availability of basic services and amenities as compared to other states. In Telengana state, Srikulam district ranked highest in terms overall performance followed by East Godavari and Vishakapattanm districts. There were six districts included in Dandakaranya region that showed variation in terms of the availability of financial capitals, basic services and amenities across the districts. In Odisha, Kalahandi ranked highest in terms composite score values followed by Nuapada, Rayagada, Nabarangpur and Koraput respectively. Although Kalahandi district ranked highest in Odisha but this district ranked 5th all over the region. In Chatishgarh, both highest and lowest ranking districts were located i.e. Kanker and Sukma respectively. In Kanker district, households have maximum percentage of scoter/moped (16.1%), highest percentage households having drinking water facility within premises (21.6%). The households having maximum percentage computer/laptop (5.1%) and HHs having highest percentage of their own house (95.74%) were recorded in Koraput and Nuapada districts located in Odisha. The results also revealed that the district Sukma, the availability of basic services and amenities were very poor as it ranked lowest in case of availability of maximum basic services and amenities (Fig. 8).

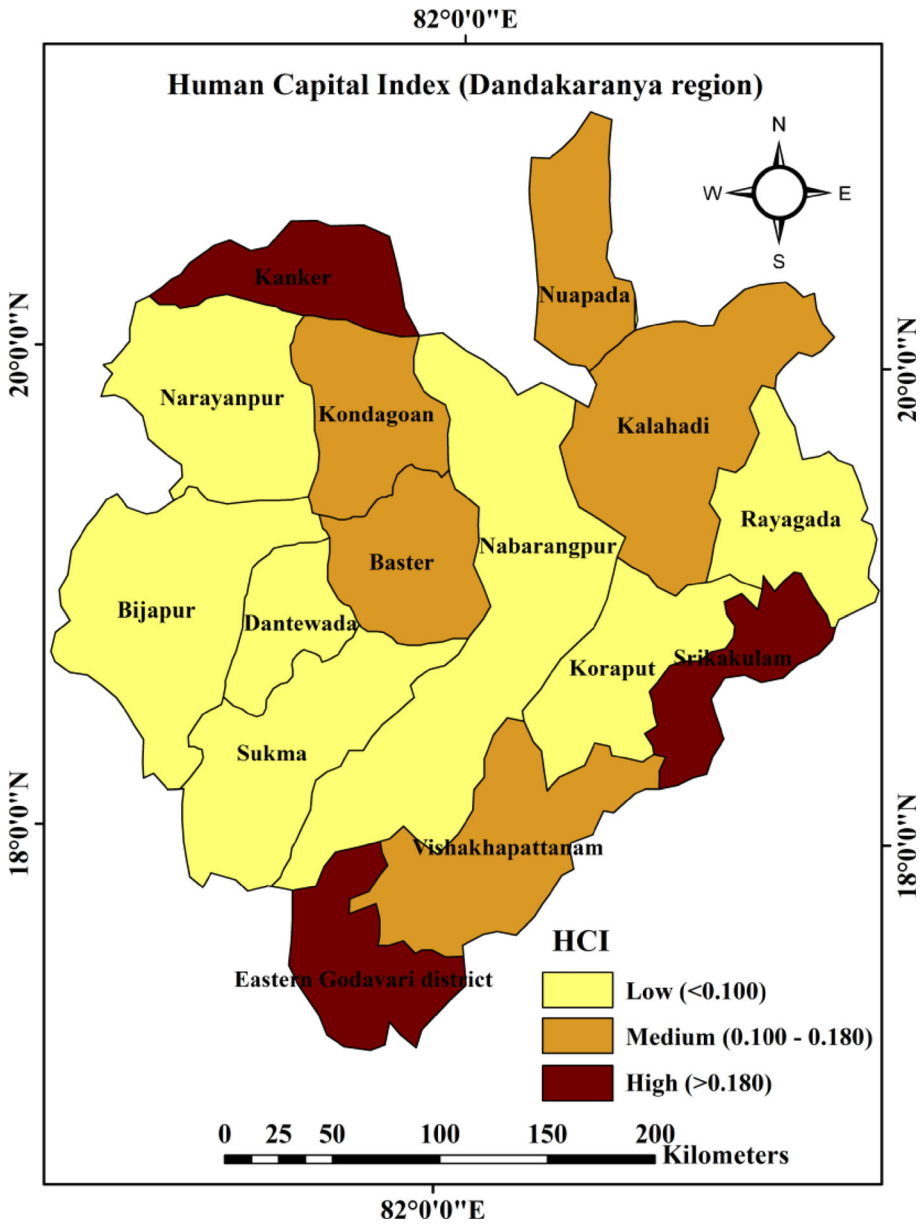

Fig. 4 Spatial distribution of districts of Human Capital Index (HCI)

3.4 Level of disparity in Dandakaranya region

In this part of the research study, the districts were categorized on the basis of the composite score values attained by the districts. On the basis of composite score value, the districts were classified into three categories namely- high, medium and low to examine the quality of living. As per as composite score value, it was observed that five districts occupy high quality of living, four districts hold medium quality of living and six districts rank low quality of living respectively. There only one district of Telengana state that belongs to high quality of living conditions namely Srikakulam. On the other hand, in Odisha and Chhatishgarh, two districts out of five and six districts belong to high quality of living condition of the households respectively. There are three districts in Odisha and Chhatishgarh which belonged to very low quality of living condition of the households. In these districts, quality of living of the households was very poor and the availability of basic services and amenities were not satisfactory to the households. The classification of the districts based on the composite score value were presented in Table 7.

4 Discussion

Regional disparity in terms of socio-economic condition in India is major challenges to the planners and policy makers. Why a particular region is lagging behind? –this is the basic question to the researchers. It is obvious that regional

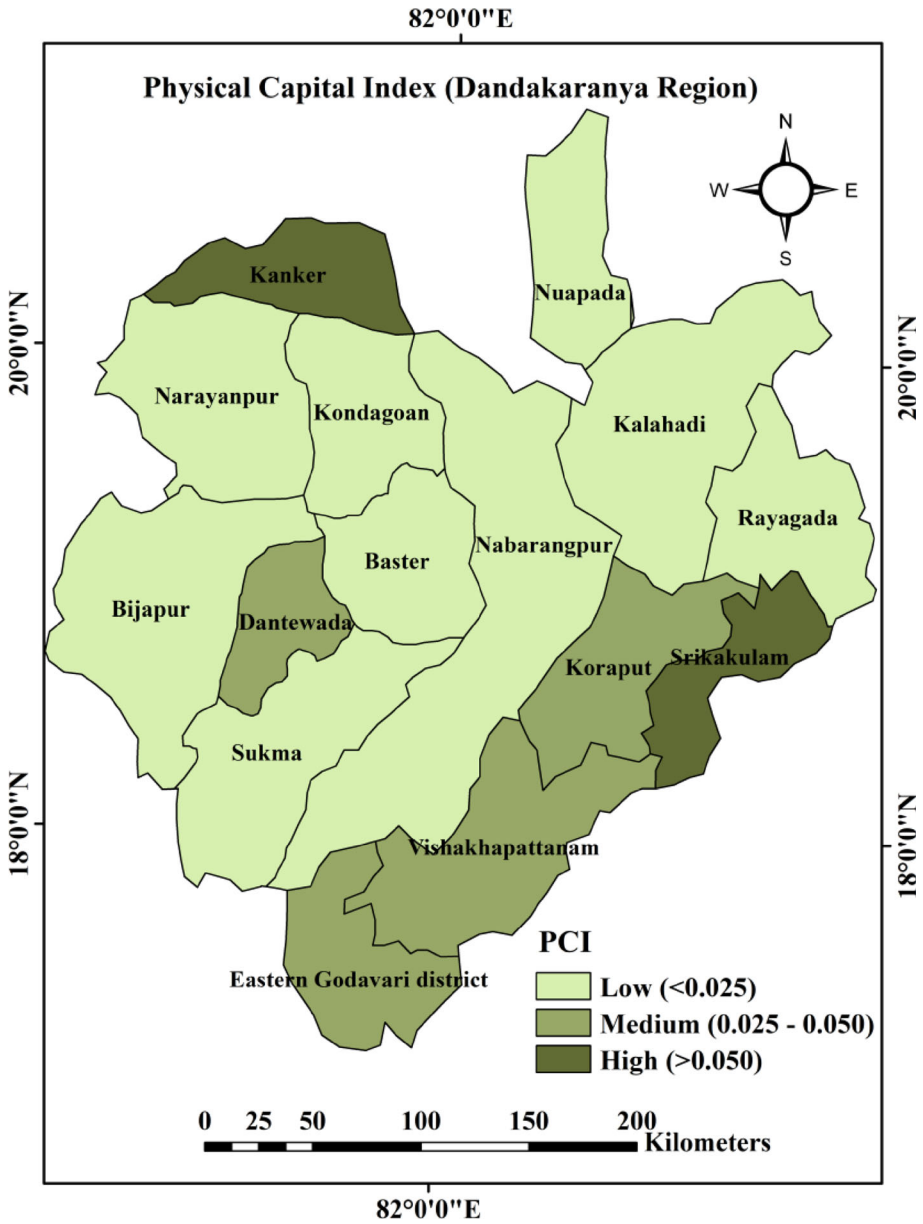

Fig. 5 Spatial distribution of districts of Physical Capital Index (PCI)

disparity exist not only in developing country like India rather in developed nations also. But it is more absolute in developing countries. In India regional disparity exists not only among states but also there is intra-state disparity (such as disparity among districts) in various aspects of quality of life. Therefore, assessment and monitoring of regional disparity in and among various levels plays a crucial role to the planner to adopt proper and effective incentives for the well-being of the population and improvement the quality of life of the households. Various researchers tried to explore the pattern of regional disparity in India at different scales using various social and economic indicators. In most of the cases educational status of the people was used as one of the dominant indicators to assess the living condition of the households and gap of literacy rate between male and female leads to disparities across the region [38]. One of the basic reason of regional disparities in India are non- availability of basic services and amenities such as electricity, gas, water supply, transport and communication, banking service, ownership of dwelling and agriculture. There is a huge disparity in distribution pattern of such basic services and amenities that causes regional in India [39]. In many research studies it was documented that basic services and amenities largely influence overall pattern of human development which was assessed by UNDP and these are the most important aspects of human life [40–44]. Kurian [45] studied regional disparities applying various basic components of human life and concluded social as well human development are largely determined by the public investment in various social sectors. But in India, public

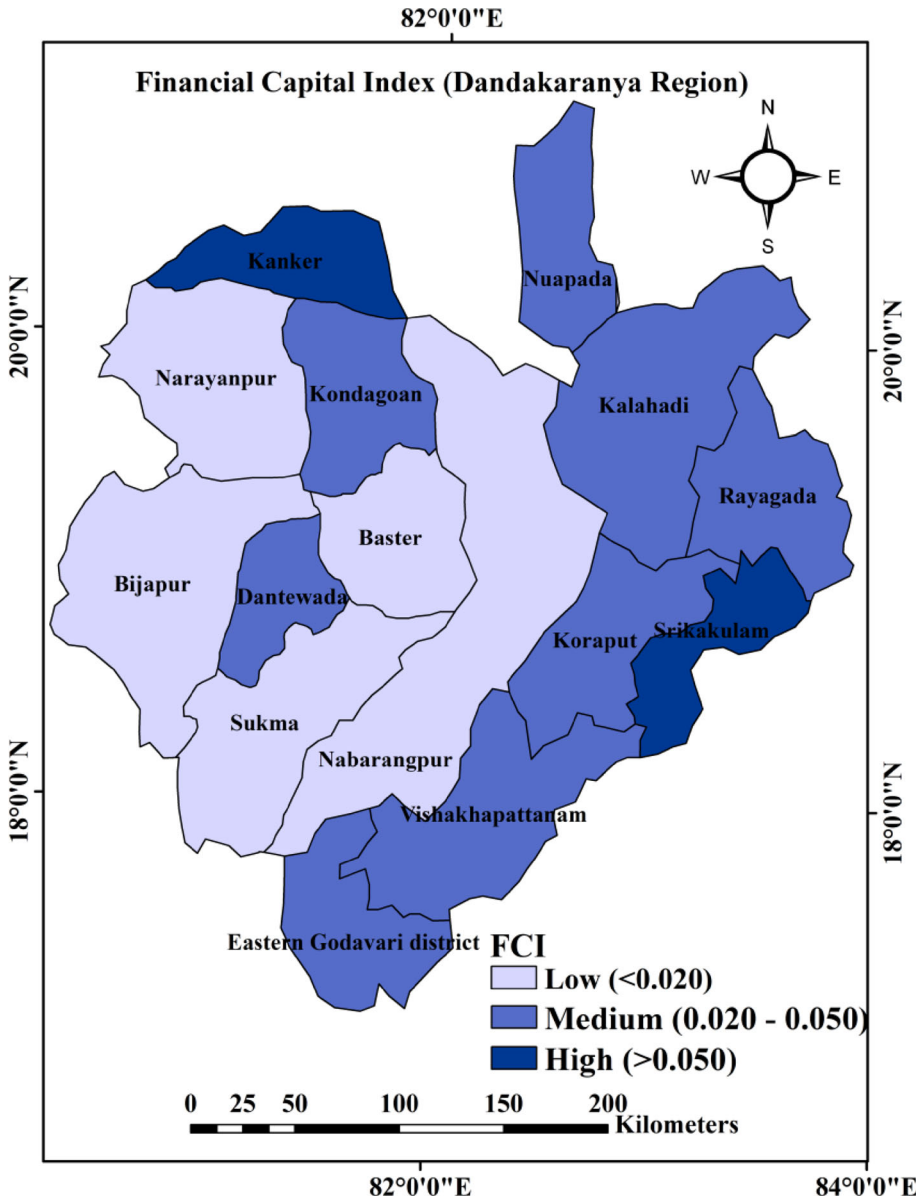

Fig. 6 Spatial distribution of districts of Financial Capital Index (FCI)

investment in various sectors of economy largely varies and it remains maximum in industrially advanced states or some selected growth poles of the country. Reena Kumari [46] examined the regional disparity of two most backward states in India across districts of Uttapradesh and Bihar and the results of this research study showed that only weak institution, political instability are not responsible for poor socio-economic backwardness rather poor human development are also responsible for low quality of living in this states. Ramphul Ohlan [47] tried to assess the pattern of regional disparity in terms of socio-economic development across districts in India and the result of the study showed southern region of India is much developed as compared to northern and central region. In this study, all the states were located in central India and results also similar as the performance of the states are very poor in terms of quality of living condition of the households. Ripudaman Singh [48] assessed the regional disparity in terms of level of development across the districts in India through a composite index and the result of the study research showed that most of the districts of Uttarpradesh (45 districts), Bihar (36 out of 37 districts), Chatishgarh (12 districts out of 16) and Odisha (19 districts) revealed very low level of development. in this research study also most districts belonged to Chatishgarh and Odisha shows very low quality of living condition of the households. A state level analysis of disparity in terms of socio-economic development was measured by Debasis Neogi [49] in north-east India and tried to show disparity in different aspects such as health, education and socio-economic conditions. K Rajalakshmi [50] conducted a research study

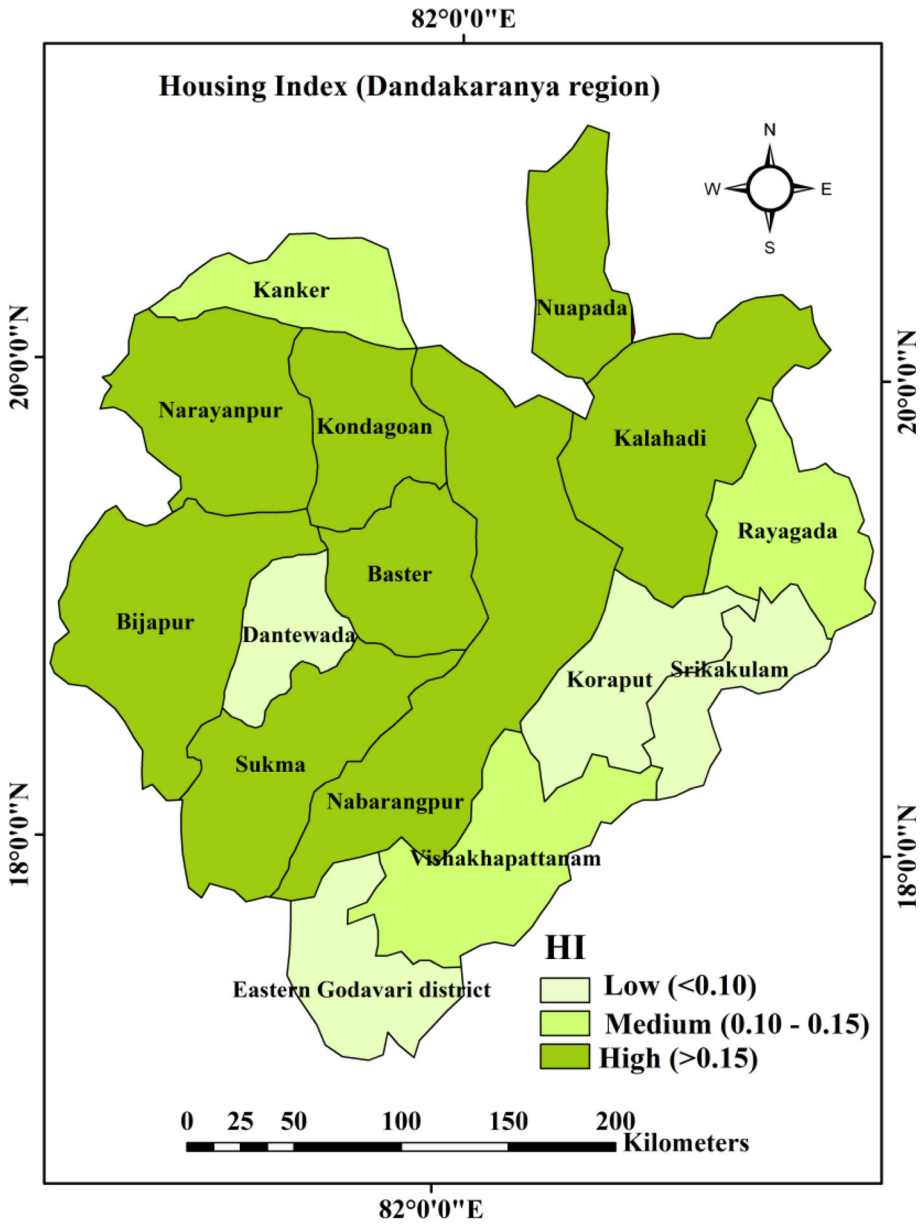

Fig. 7 Spatial distribution of districts Housing Index (HI)

in 2013 regarding regional disparities and variables such as per capita income, technology, agriculture, industry, banking, power, education, health and sanitation, transport and communication were used to assess regional disparity. From the result of this research study it was concluded that main causes of regional disparities conclude the gap of education between urban and rural area, high male participation in education than the female, luck of educational development in rural area and luck of agricultural development, credit, technology etc. B Dasgupta [51] made an attempt to classify the districts on the basis of the degree of development using correlation matrix and principal component analysis (PCA) and result of this study revealed there is lagging of basic services to the households. Das and Mistri [52] performed a study across the states using household quality of living index (HQLI) based on census data and the results of the study showed that the housing quality of living is low in states like Uttarpradesh, Chhatishgarh, Odisha etc. The availability of basic services and amenities is very low in these states to the households which are the main cause of low quality of living of the households.

5 Social welfare and policy implementation

From the result of the research study, it can be stated that this study may assist the policy makers and planners to implement as well as design social welfare programmes and schemes to eliminate the regional disparities in terms of Socio-economic Status (SES) and living condition of the

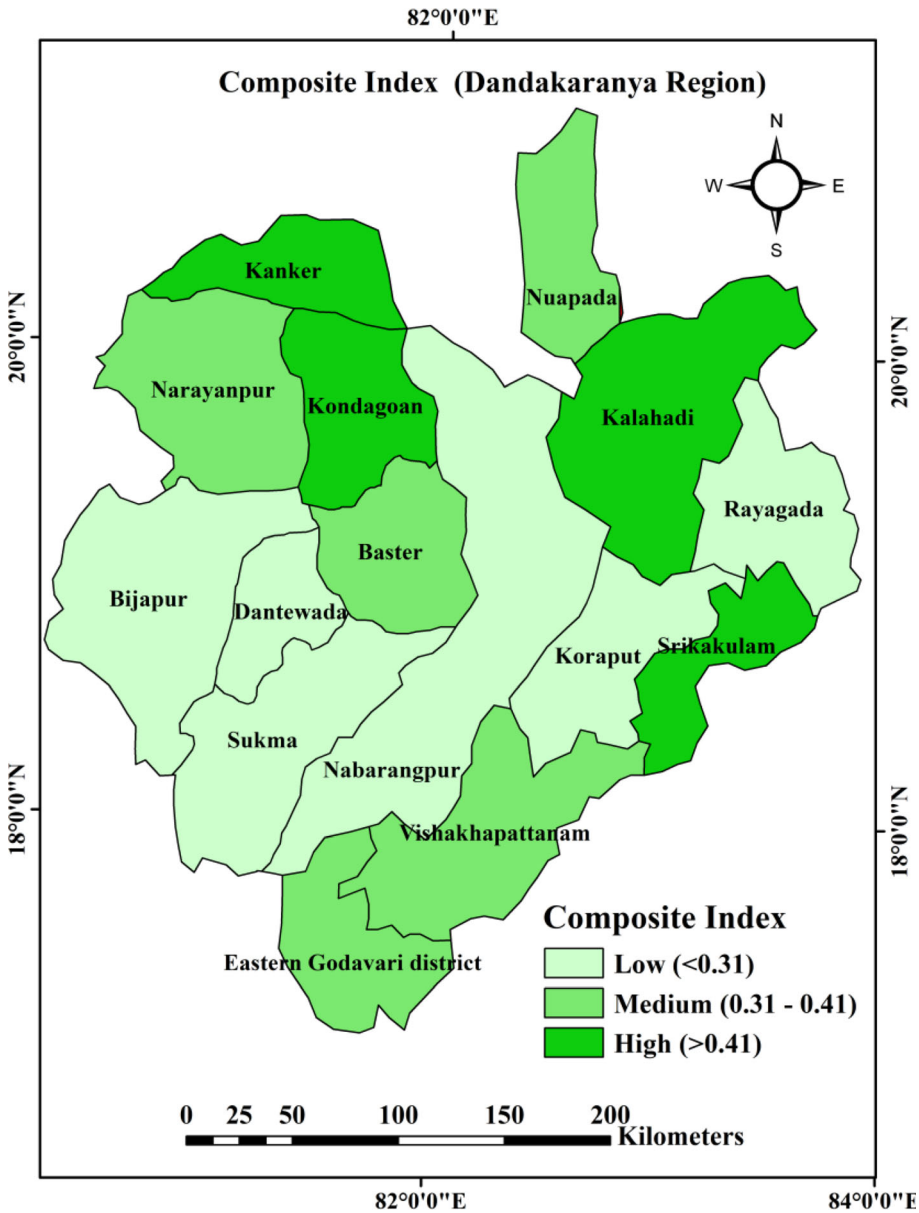

Fig. 8 Spatial distribution of districts based on Composite Score (CS)

households. In doing so, central as well as state government must design effective social and family welfare programmes to promote the quality of life of the households of the backwards region. A number of family and social welfare schemes and programmes have been implemented during Modi's government to build a sustainable family and social welfare. Few example of those welfare schemes and programmes are - Deen Dayal Upadhya Gram Yojana (2015) to electrify the rural India; Swaach Mission Abhiyan (2014) to maintain open defection and solid waste management; Jan Dhan Yojana (2014) to connect all people with banking services; Sansad Adarsh Gram yojana (2014) to develop villages socially and culturally; Prime minister Ujjawala Plan (2016) to provide LPG connection to BPL households etc. respectively.

In regards, it is important to note that only implementation of family and social welfare programmes and schemes are not enough until the benefits of those programmes and schemes reaches to the people. In fact, people should have the capability to consume the benefits of the govt schemes. There are many poor households who are prepared to take the govt. services but they are failed to continue the services due to their socio-economic backwardness of the HHs. Firstly, For example, LPG cylinders and ovens that are provided to BPL HHs through the Prime Minister Ujjawala plan (2014), are sold to open market as many poor HHs having no capability to continue the services. Secondly, only proving banking services to the people is insignificant until the people are economically strong. Therefore, capacity oriented family and social

welfare schemes and programmes are necessary for improving the standard of living of the people.

To improve the quality of the living of the households, some solution or recommendation can be suggested such as (a) family and social welfare schemes and programmes must be implemented (b) proper emphasis should be given on the maintenance as well as evaluation of the implemented family and social welfare schemes as most of time planning and policies are just implemented, no further assessment is evaluated. (c) result of the study research showed that the availability of the basic services and amenities is relatively poor in some selected districts namely Sukma, Koraput, Bijapur, Dantewada etc. Therefore, special attention should be paid on poor districts. (d) The overall result of study research showed that there is disparity in terms of the availability of the basic services and amenities which affect the quality of living of the HHs. The result also showed that the districts spread over three states are identical in terms of the quality of living. The policy makers and planners should highlights the basic intervention of the poor districts and state govt. should be convinced to implement proper development agenda for enhancing the quality of living of the HHs. In addition to this, preferential planning strategies should be developed due to narrow down the disparity in terms of the QOL in poor districts. Lastly, policies and planning strategies should be implemented such a way so that it can fulfil the requirements or needs of the poor districts or region.

6 Conclusion

The basic aim of this study is to identify of regional disparities in terms of quality of living condition of the households of Dandakaranya region. To assess quality of living condition of the households, multivariate statistical and Principle Component Analysis (PCA) was used. From the results is visualized that most of the districts of Danharanya region are lagging behind in term s of basic services and amenities. From the result of the study it is necessary to adopt effective steps to reduce the regional disparities and to build a sustainable quality of living. In India, in most of the research studies regional disparities in terms of development and quality of living was analysed across states and districts levels. In a very few studies emphasis was given to study of backward region of India. This research study definitely assist the planners and policy makers to focus o this region The results of the study research shows that the districts located in Andrapradesh perform better as compared to the other districts located in Odisha and Chhatishgarh respectively. Thus it is obvious that the households of the districts like Sukma, Koraput, Bijapur, Nabarangpur, Dantewada etc. having very poor condition of quality of living. Therefore, the central government and state government should make adequate attempts to implement multipurpose policy for development of backward districts of Dandakaranya region so that living condition of the households may be improved and their life can be secure economically. One of the major limitation of this study is the selection of districts boundary of states as not all the boundary falls under Dandakaranya region. In this case, the edge districts were considered as whole and data was collected from Census of India, 2011.

Acknowledgements The authors would like to express their sincere gratitude to Office of the Register General & Census Commissioner, India (Ministry of Home affairs, GoI) for providing the district-level data. The authors would like to thank to the Editor-in-Chief, Dr. Jung-Sup Um and the respected three reviewers for their critical review and constructive suggestions to enrich this research article. I (Manob Das) am also thankful University Grants Commission (Ref-3238/ (NET-JULY2016), New Delhi, India to provide financial support to conduct this research as Junior Research Fellowship at University of Gour Banga.

Compliance with ethical standards

Conflict of interest Authors declare that there is no conflict of interest in respect to research, authorship as well as publication of this research article.

References

1. Fleurbaey, M., & Blanchet, D. (2013). *Beyond GDP: Measuring welfare and assessing sustainability*. Oxford: Oxford University Press.
2. Sen, A. (1985). Well-being, agency and freedom: The Dewey lectures 1984. *The Journal of Philosophy, 82*(4), 169–221.
3. Stiglitz, J., Sen, A. K., & Fitoussi, J. P. (2009). The measurement of economic performance and social progress revisited: Reflections and overview.
4. Liao, P. (2009). Parallels between objective indicators and subjective perceptions of quality of life: A study of metropolitan and county areas in Taiwan. *Social Indicators Research, 91*(1), 99–114.
5. Malkina-Pykh, I. G., & Pykh, Y. A. (2008). Quality-of-life indicators at different scales: Theoretical background. *Ecological Indicators, 8*(6), 854–862.
6. Brian, K. (2015). *OECD insights income inequality the gap between rich and poor: The gap between rich and poor*. OECD Publishing.
7. Rahman, T., Mittelhammer, R. C., & Wandschneider, P. R. (2011). Measuring quality of life across countries: A multiple indicators and multiple causes approach. *The Journal of Socio-Economics, 40*(1), 43–52.
8. Rojas, M. (2011). The 'Measurement of economic performance and social progress' report and quality of life: Moving forward. *Social Indicators Research, 102*(1), 169–180.
9. Self, A. (2017). Quality of life measurement and application to policy: Experiences from the UK office for national statistics. *Social Indicators Research, 130*(1), 147–160.
10. Slottje, D. J. (1991). Measuring the quality of life across countries. *The Review of Economics and Statistics, 73*(4), 684–693.

11. Boarini, R., Kolev, A., & McGregor, A. (2014). Measuring well-being and progress in countries at different stages of development.
12. Ihsan, N., & Aziz, B. (2019). A multidimensional analysis of quality of life: Pakistan's context. *Social Indicators Research, 142*(1), 201–227.
13. Chen, Z., & Davey, G. (2009). Subjective quality of life in Zhuhai City, South China: A public survey using the International Wellbeing Index. *Social Indicators Research, 91*(2), 243–258.
14. Kingdon, G. G., & Knight, J. (2006). Subjective well-being poverty versus income poverty and capabilities poverty? *The Journal of Development Studies, 42*(7), 1199–1224.
15. Selim, S. (2008). Life satisfaction and happiness in Turkey. *Social Indicators Research, 88*(3), 531–562.
16. Pasha, G. A., & Ahmed, N. (1999). Pakistan's ranking in social development: Have We always been backward? *The Pakistan Development Review, 38*(4), 739–754.
17. Siddiqui, R. (2008). *Income, public social services, and capability development: A cross-district analysis of Pakistan*. Islamabad: Pakistan Institute of Development Economics.
18. Zorondo-Rodríguez, F., Gómez-Baggethun, E., Demps, K., Ariza-Montobbio, P., García, C., & Reyes- García, V. (2012). What defines quality of life? The gap between public policies and locally defined indicators among residents of Kodagu, Karnataka (India). *Social Indicators Research, 115*(1), 441–456.
19. Dreze, S. (1997). *Indian development: Selected regional perspectives*. Oxford: Oxford University Press.
20. Parker, B., & Kozel, V. (2007). Understanding poverty and vulnerability in India's Uttar Pradesh and Bihar: A Q-squared approach. *World Development, 35*(2), 296–311.
21. Shand, R., & Bhide, S. (2000). Sources of economic growth: Regional dimensions of reforms. *Economic and Political Weekly, 35*(42), 3747–3757.
22. Raychaudhuri, A., & Haldar, S. K. (2009). An investigation into the inter-district disparity in West Bengal, 1991–2005. *Economic and Political Weekly, 44*(26/27), 258–263.
23. Miller, J. G., & Roth, A. V. (1994). A taxonomy of manufacturing strategies. *Management Science, 40*(3), 285–304.
24. Ketchen, D. J., & Shook, C. L. (1996). The application of cluster analysis in strategic management research: An analysis and critique. *Strategic Management Journal, 17*(6), 441–458.
25. Krishnakumar, J., & Nagar, A. L. (2008). On exact statistical properties of multidimensional indices based on principal components, factor analysis, MIMIC and structural equation models. *Social Indicators Research, 86,* 481–496.
26. Biswas, B., & Caliendo, F. (2002). A multivariate analysis of the human development index. *Indian Economic Journal, 49,* 96–100.
27. Lai, D. (2003). Principal component analysis on human development indicators of China. *Social Indicators Research, 61,* 319–330.
28. McGillivray, M. (2005). Measuring non-economic well-being achievement. *Review of Income and Wealth, 51,* 337–364.
29. Wong, K. M. (2012). Well-being and economic development: A principal components analysis. *International Journal of Happiness and Development, 1,* 131–141.
30. Haq, R., & Zia, U. (2013). Multidimensional wellbeing: An index of quality of life in a developing economy. *Social Indicators Research, 114,* 997–1012.
31. Ferrara, A. R., & Nisticò, R. (2014). *Measuring well-being in a multidimensional perspective: A multivariate statistical application to Italian regions*. Working Paper, 6. Dipartimento di Economia, Statistica e Finanza, Università della Calabria.
32. Singh, K. P., Malik, A., Mohan, D., & Sinha, S. (2004). Multivariate statistical techniques for the evaluation of spatial and temporal variations in water quality of Gomti River (India)—a case study. *Water Research, 38*(18), 3980–3992.
33. Vyas, S., & Kumaranayake, L. (2006). Constructing socio-economic status indices: How to use principal components analysis. *Health policy and planning, 21*(6), 459–468.
34. Saisana, M., & Tarantola, S. (2002). *State-of-the-art report on current methodologies and practices for composite indicator development* (p. 214). Ispra, Italy: European Commission, Joint Research Centre, Institute for the Protection and the Security of the Citizen, Technological and Economic Risk Management Unit.
35. Gammage, S. (2006). *A menu of options for intra-household poverty assessment*. Washington: USAID.
36. Booysen, F., Van Der Berg, S., Burger, R., Von Maltitz, M., & Du Rand, G. (2008). Using an asset index to assess trends in poverty in seven Sub-Saharan African countries. *World Development, 36*(6), 1113–1130.
37. Serrat, O. (2008). The sustainable livelihood approach. Knowledge Salutation, Asian Development Bank. Retrieved 12 October 2011.
38. Kiran, M. D., & Devi, S. (2017). Regional disparities in socio-economic development in post reform era: A study of Indian economy. *International Journal of Engineering Technology Science and Research, 4*(9).
39. Chowdhury, S. (2014). Regional disparity in India–A study of three decades using a comparable database. In *IARIW 33rd General Conference Rotterdam, the Netherlands, August* (Vol. 2430, p. 2014).
40. Carlucci, F., & Pisani, S. (1995). A multiattribute measure of human development. *Social Indicators Research, 36*(2), 145–176.
41. Lind, N. C. (1992). Some thoughts on the human development index. *Social Indicators Research, 27*(1), 89–101.
42. Lind, N. C. (1993). A compound index of national development. *Social Indicators Research, 28*(3), 267–284.
43. Lind, N. (2004). Values reflected in the human development index. *Social Indicators Research, 66*(3), 283–293.
44. Noorbakhsh, F. (1998). The human development index: Some technical issues and alternative indices. *Journal of International Development: The Journal of the Development Studies Association, 10*(5), 589–605.
45. Kurian, N. J. (2000). Widening regional disparities in India. *Economic and Political Weekly, 35*(7), 538–550.
46. Kumari, R. (2014). Growing regional disparity in Uttar Pradesh: Inter-district analysis. *Artha Vijnana, 56*(3), 339–360.
47. Ohlan, R. (2013). Pattern of regional disparities in socio-economic development in India: District level analysis. *Social Indicators Research, 114*(3), 841–873.
48. Singh, R. (2015). Regional disparities in post reform India. *Modern Geografia, 1,* 41–68.
49. Neogi, D. (2010). Disparity in socio-economic development and its implications on communal conflicts. *International Journal of Human and Social Sciences, 5*(5), 303–310.
50. Rajalakshmi, K. (2013). Growing regional disparities in India's development. *International Journal of Educational Research and Technology, 4*(3), 47–55.
51. Dasgupta, B. (1971). Socio-economic classification of districts: A statistical approach. *Economic and Political Weekly, 6*(33), 1763–1774.
52. Das, B., & Mistri, A. (2013). Household quality of living in Indian states: Analysis of 2011 Census. *Environment and Urbanization Asia, 4*(1), 151–171.