Original Research Article

ARE THE NEW INDIAN STATES ECOLOGICALLY SECURED, ECONOMICALLY EFFICIENT AND SOCIALLY EQUITABLE?

(ASSESSMENT USING THE SUSTAINABLE LIVELIHOOD SECURITY INDEX FRAMEWORK)

ABSTRACT

Sustainable Livelihood Security Index is one of the efficient and flexible framework to analyze a territory's sustainable security encompassing the social equity, ecological security and economic efficiency heads. The focus of this study is to look into the sustainability of three newly formed states in the year 2000: Chhattisgarh, Uttarakhand and Jharkhand in the three heads mentioned. In the social equity index all the states are performing equally well. In the case of ecological security, the state of Chhattisgarh is performing way ahead of Uttarakhand and Jharkhand. The economic efficiency head is leaded by Jharkhand, followed by Chhattisgarh in the second and Uttarakhand in the third. The results of the study can be utilized to formulate policies and frameworks to enrich the sustainable security of livelihoods in the respective states.

KEY WORDS: Sustainability, Livelihood, Efficiency, Economic, Security

JEL CODES: O13; O44; P25; P48; Q28

INTRODUCTION

India witnessed a drastic change in the year 2000. Three new states were formed after separation from their parent states, namely, Chhattisgarh separated from Madhya Pradesh, Uttarakhand separated from Uttar Pradesh, Jharkhand separated from Bihar. The demand for separate states was prevalent since long. All the states newly formed are rich in mineral resources as well as natural resources. They have grown after separation, may it be socially, ecologically or economically. When Madhya Pradesh was undivided, the demand on the basis of caste distinctiveness kept on accumulating for a separate state and finally in the year 2000, the government gave the approval for the separate state. Likewise, Uttarakhand was separated due to its cultural distinctiveness. The pandits of Uttar Pradesh demanded a separate land (now Uttarakhand) for keeping the religious practice moving without any diversions. The locals or tribals of Bihar (now Jharkhand) were in consistent demand for the new state, where, they can have the governing power, they can avail their rights, they can move freely, they are not ruled instead they are rulers, tribal dominance is there so that their existence can prevail. And this demand was satiated by the then government and the new stated named Jharkhand came into existence in the year 2000. Though the state is facing government instability but has economically grown. The SLSI framework adopted in this paper is capable in measuring the Social aspect, Ecological aspect, Economic aspect of the three states and we can relatively compare their performances in the three segments. The framework adopted in this analysis by was adopted by *Sajjad et al., (2003)* in which an assessment of Spatiotemporal Variation in agricultural sustainability of Vaishali district of Bihar has been carried out using the Sustainable Livelihood Security Index framework. The agricultural sustainability was measured at the block level. Many problems were figured out from the analysis and accordingly the policy measures and programs required for curbing the hindrances were suggested. *Singh and Hiremath (2009)* adopted the same measure to analyze the districts of Gujarat. *Ghabru et al., (2017)* adopted SLSI framework in the analysis of agricultural sustainability in Gujarat. *Kumar et al., (2015)* used the SLSI approach for planning holistic development in Karnataka and came up with policies for the state's betterment.

A work by, *Debnath et al., (2013)* measuring the fish sustainability in Tripura, where fish is the main source of food, found that integrated pig and fish farming, integrated duck and fish farming proved to be more economical in fish cultivation as the excreta of pigs and ducks proved to be 70% digestible by fish which in turn saved the cost of feeding them. *Hatai and Sen (2008)* used the sustainable livelihood security framework in analyzing the sustainability of livelihood in Orissa and found that the poverty-stricken regions and the regions with more population and unequal distribution of resources were performing very low in the index. *Buragohain et al., (2014)* carried out the study using the same framework in analyzing the agricultural sustainability in Assam. *Mutahara et al., (2016)* used the SLSI framework to measure the sustainability of coastal area of Bangladesh in case of natural calamities. The results drawn from the study can be applied to many more areas. *Pandey et al., (2017)* evaluated the climate change vulnerability of Himalayan communities and their potential to adapt to these changes, through assessing their perceived reactions and counter actions to climate change. The study was conducted by proposing two indices i.e., Climate Vulnerability Index (CVI) & Current Adaptive Capacity Index (CACI) and both these indices included the five forms of capital leading to sustainable livelihood. The data for the study was collected from two areas i.e., Area away from district headquarter (ADH) and Area near to district headquarters (NDH). The results showed that overall ADH households had greater vulnerability than NDH households.

You and Zhang (2016) investigated the sustainable livelihood of rural farmers in China and identified the existence of the conditions necessary for sustainable development using the fuzzy comprehensive method. In study of multi-dimensional poverty of China, *Liu and Xu (2016)* adopted the sustainable livelihoods framework developed in *the UK by the Department for International Development (DFID*) and the study of multidimensional poverty helped in identification of deprived dimensions and helped the government in policy formulation for poverty reduction. *Pulselli et al., (2005)* in their study have calculated the Index of Sustainable Economic Welfare (ISEW) for the Province of Siena, Central Italy. The item-by-item analysis demonstrates that ISEW could compliment GDP in a society where the environmental and social problems are becoming relevant.

Praharaj et al., (2014) in their study of Sustaining Livelihood Security with Village Cluster Approach for Resource Conservation found that half of the world population is food insecure globally and are deprived of proper nutrition which reflects the high magnitude of vicious cycle of agriculture production systems which are the source of livelihood in the rural areas. The cluster approach leads to joint management of resources and facilitates the proper allocation and reduces the misuse and inequality in resource distribution. *Lindenberg (2002)* in his assessment of Developing World's Household Livelihood Security at the Family and Community Level used the Household Livelihood Security approach to measure the progress. Unlike the Sustainable Livelihood Security Index approach the Household Livelihood Security approach focuses on the progress at the family and community level rather than focusing on big territorial region. *Bohle, (2009)* in his paper of Evolution and Application of Sustainable Livelihood Security put forward the benefits and ease of using the sustainable livelihood security framework in analyzing the development of a specific territory. Policies can be formulated on the basis of churned output from Sustainable Livelihood Security approach. This is widely used because of its flexibility and easy to use methodology. In this world the thing that matters is what the vulnerable themselves value as sustainability and security.

These three newly formed states have been selected for this analysis because of their growing population, growing inequality, improper resource management, heavy industrialization, rapid urbanization, etc. These states have emerged as earning good from their natural resources and mineral resources. In case of Uttarakhand, the state has been growing with its tourists and pilgrimage places aiding to the economy. And the main point of selecting these three states is the time of formation is same for all the states and they almost lie in the same geographical region.

DATA AND METHODOLOGY

Secondary data of the three states have been collected for the comparative analysis based on SLSI framework. For the state of Chhattisgarh, the variables considered for calculation of social equity index are, Sex Ratio, Female Literacy Rate (data collected from: Census India, 2011), Treated Source of Water, Laterine Facility, Lighting through Electricity (data collected from: Household Series Table, Census India, 2011). For calculation of ecological security index, data for percentage of forest cover was collected from Chief Commissioner of Forest, Chhattisgarh, data for percentage of Barren and Unutilized Land was collected from Ministry of MSME, Government of India. The economic efficiency index was calculated using, Average Productivity of Fruits and Vegetables, Average Yield Rate of Wheat and Paddy, Percentage of Net Sown Area to Total Area obtained from Commissioner Land Records, Chhattisgarh.

For the state of Uttarakhand, the variables considered for calculation of social equity index are, Sex Ratio, Female Literacy Rate (data collected from: Census India, 2011), Treated Source of Water, Laterine Facility, Lighting through Electricity (data collected from: Household Series Table, Census India, 2011). For calculation of ecological security index, data for percentage of forest cover was collected from Ministry of Environment, Government of India, 2005. Data for percentage of Barren and Unutilized Land was collected from Agriculture Cooperation and Farmers Welfare. The economic efficiency index was calculated using, Average Productivity of Fruits and Vegetables, Average Yield Rate of Wheat and Paddy, Percentage of Net Sown Area to Total Area obtained from Indiastat.

For the state of Jharkhand, the variables considered for calculation of social equity index are, Sex Ratio, Female Literacy Rate (data collected from: Census India, 2011), Treated Source of Water, Laterine Facility, Lighting through Electricity (data collected from: House Listing and Housing Census, 2011). For calculation of ecological security index, data for percentage of forest cover was collected from Indiastat. Data for percentage of Barren and Unutilized Land was collected from Directorate of Statistics and Evaluation

Jharkhand, 2006. The economic efficiency index was calculated using, Average Productivity of Fruits and Vegetables, Average Yield Rate of Wheat and Paddy, Percentage of Net Sown Area to Total Area obtained from Directorate of Statistics and Evaluation Jharkhand, 2006.

Many more variables could also have been considered but they are dropped due to unavailability of adequate data. *Saleth (1993a,)* has discussed the indicators of sustainable development at the global level. *Saleth (1993b)* has given an empirical illustration of an indexing approach for checking the status of the agro-climatic sub-zones of India. *Swaminathan (1991)* has enlightened on the pathway to sustainable agriculture and how the future generations can get the benefits out of it. The methodology adopted in this paper was proposed by *Swaminathan (1991)* to check whether the necessary conditions essential for the attainment of sustainable livelihood security (SLS) are present in a given region or ecosystem is known as the sustainable livelihood security index (SLSI), which has three components:

a) Social Equity Index (SEI) represented by variables, Sex Ratio, Treated Water Source, Laterine Facility, Lighting through Electricity, Female Literacy Rate. It measures how socially equitable a territory is.

b) Ecological Security Index (ESI) represented by variables Percentage of Forest Cover, Percentage of Barren and Unutilized land of total land available land.

c) Economic Efficiency Index (EEI) represented by variables such as Average productivity of Fruits, Vegetables and Spices, Average Yield Rate of Wheat and Paddy and Percentage of Net Sown Area to total area.

To operationalize the concept of SLS within the context of SD, *Saleth and Swaminathan (1993)*, propounded the following propositions:

Let SLS_{ij} be the index for the i^{th} component of SLSI related to the j^{th} entity (districts in a state context) and let X_{ij} be the value of the variable representing the i^{th} component of SLSI related to the j^{th} entity. Then the index for the i^{th} component of SLSI of the j^{th} entity can be calculated as follows:

$$SLSI_{ij} = \frac{X_{ij} - \min j X_{ij}}{\max j X_{ij} - \min j X_{ij}} \qquad \text{where, } i=1,2\ldots\ldots..., I \qquad \text{Eqn (D1)}$$

where, j=1,2……..., J

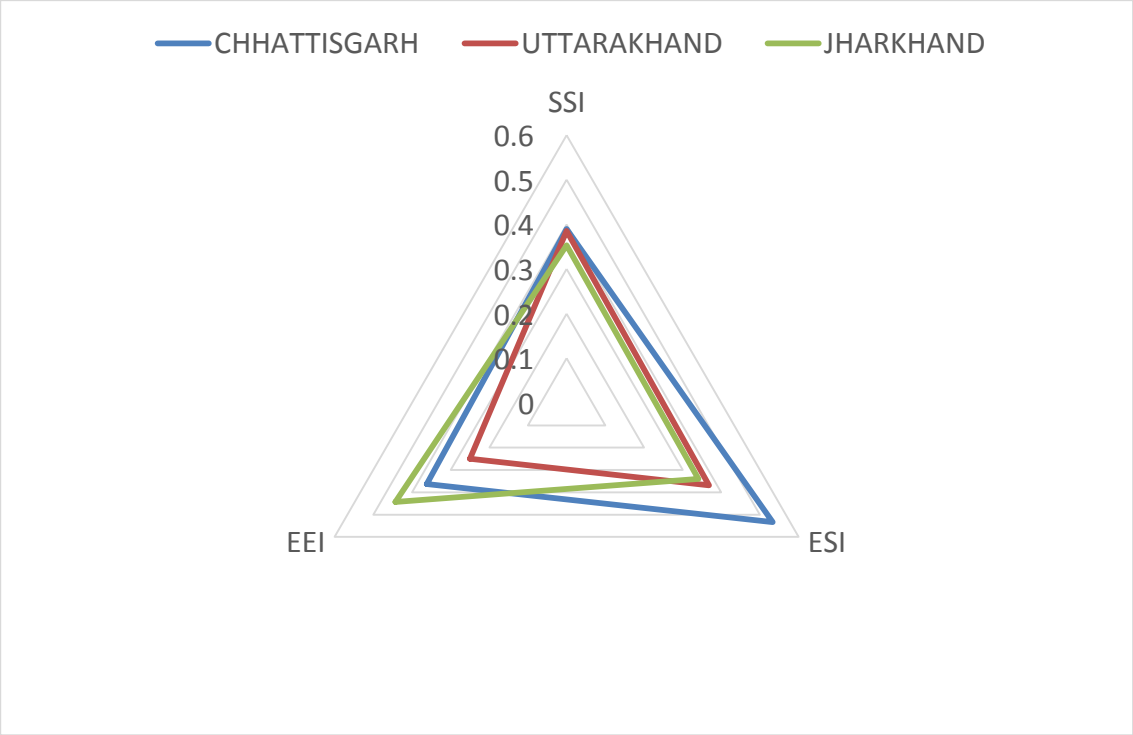
$$SLSI_{j} = \frac{\sum_{i=1} a_{ij} SLSI_{ij}}{I} \qquad \text{where, } i=1,2\ldots\ldots..., I \qquad \text{Eqn (D2)}$$

where, j=1,2……..., J

the numerator in (D1) measures the extent by which the j^{th} entity did better in the i^{th} component of SLSI as compared to the entity showing the worst performance in that component, and the denominator indicates the range (i.e. the difference between the maximum and the minimum values of the variable representing a given component). Having calculated the $SLSI_{ij}$ for all the components (i = 1,2, . . ., I) and all the sample entities (j = 1,2, ..., J), the composite index, which measures the overall performance of a given entity ($SLSI_j$), can be calculated as a weighted average of all the component indices [$SLSI_{ij}$ (i = 1,2, ….., I)]. The a_{ij} in (D2) denotes the weight assigned to the i^{th} component of SLSI of the j^{th} entity and has the property that: $a_{1j} + \ldots + a_{ij} = 1$. If a_{ij} is identical for all i and j and is equal to 1, it means that equal weights is being assumed. In SLSI ranking the district with least SLSI value is ranked first followed by districts with subsequent higher values.

RESULTS

Figure D.1 State wise diagrammatic representation of Social Equity Index, Ecological Security Index, Economical Efficiency Index.



Social Equity Index:

In this study, social equity index calculation considers sex ratio, female literacy rate, treated water sources, lighting through electricity and laterine facility. If we consider Chhattisgarh, its performance in treated water source is much above the national average (0.44) and above Uttarakhand and Jharkhand. The SCs of the state even have the above average performance. But in laterine facility the state lags behind Uttarakhand and Chhattisgarh. The sex ratio in all the 3 states is almost equal. Socially, all the states are more or less performing equally at around 0.36 average index value.

Ecological Security Index:

Chhattisgarh is leading the index followed by Uttarakhand. Jharkhand is performing near to Uttarakhand. All the states have good ecological belt, but, the tribals in Chhattisgarh are aware of its uses and benefits and are always in security of the forest cover. The Jharkhand is endowed with mineral resources. The extraction of mineral resources leads to deforestation and decreased forest cover making it the least performer. The tourist places and pilgrimages in Uttarakhand is attracting the visitors from round the globe leading to government's investment in hospitality sector. This construction and building works requires spaces, for which the forests are being cleared leading to low performance in sustainable ecological security.

Economic Efficiency Index:

Economically all the states have grown after the separation. Jharkhand is the top performer in this segment with abundance in mineral resources present followed by Chhattisgarh in the second place and Uttarakhand in the third place. The investment by government or investment by foreign countries has great significance in economic growth of Jharkhand and this investment is due to the availability of mineral resources. The net sown area, average productivity, average yield rate is higher in Jharkhand as compared to Uttarakhand and Chhattisgarh, making it the leader amongst the three.

CONCLUSION

Only the variable considered in this analysis are not responsible for the growth of the states but the natural resources and mineral resources the states are in possession play a key role in the economic growth and its sustainability. Socially all the states are better off and have grown only after separation. Government should make policies in order to protect the forest cover and secure the ecological sustainability. The new educational

institutes have aided to the social as well as economic growth of the states. If the state of Jharkhand is considered, IIM Ranchi, NLU Ranchi, St. Xavier's College, Ranchi, Birla Institute of Technology, Ranchi, etc. have been producing human resources and in turn they are aiding to the economy of the state. The development of tourist places in Uttarakhand has supported the state in a best way after separation. If the sustainable livelihood's security is considered, all the state government should frame policies in order to make the state socially equitable, ecological secure and economically efficient.

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APPENDIX (A)

Table A.3 Index Values of Social Equity Indicators for the districts of Chhattisgarh

Districts	**Sex Ratio**	**Treated Water Source**	**Laterine Facility**	**Lighting by Electricity**	**Female Literacy Rate**
Koriya	0.19	0.12	0.10	0.76
Surguja	0.18	0.16	0.48	0.34	0.50
Jashpur	0.67	0.02	0.09	0.09	0.71
Raigarh	0.42	0.15	0.25	0.40	0.81

Korba	0.02	0.27	0.28	0.27	0.79
Champa	0.33	0.12	0.21	0.46	0.77
Bilaspur	0.05	0.63	0.64	0.71	0.73
Kabeerdham	0.51	0.05	0.08	0.20	0.45
Rajnandgaon	0.85	0.28	0.29	0.37	0.91
Durg	0.55	0.97	0.85	0.84	1
Raipur	0.2	1	1	1	0.89

	9				
Mahasamund	0.89	0.07	0.17	0.28	0.74
Dhamtari	0.76	0.15	0.18	0.19	0.97
Uttar Bastar Kanker	0.69	0.02	0.11	0.14	0.76
Bastar	1	0.16	0.23	0.21	0.33
Narayanpur	0.47	0	0	0	0.22
Dakshin Bastar Dantewada	0.29	0.07	0.06	0.05	0.03
Bijapur	0.9	0	0	0	0

	5				

Source: Self calculated by author.

Table A.4 Index Values of Ecological Security and Economic Efficiency Indicators for the Districts of Chhattisgarh

Districts	**% Forest Cover**	**% Barren & Unutilized Land**	**Avg. Productivity (Fruits, vegetables & Spices)**	**Avg. Yield Rate (Wheat, Paddy & Maize)**	**% of Net Sown Area to Total Area**

					e a
Koriya	0.88	0.53	0.33	0.09	0.18
Surguja	0.55	0.41	1	0.06	0.08
Jashpur	0.41	0.64	0.83	0.43	0.60
Raigarh	0.44	0.59	0.78	0.40	0.54
Korba	0.70	0.77	0.15	0	0.24
Champa	0	0.86	0.29	1	1
Bilaspur	0.42	0.54	0.65	0.48	0.3

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Kabeerdham	0.47	0.65	0.17	0.19	0.65
Rajnandgaon	0.39	0.57	0.22	0.20	0.62
Durg	0.02	0.67	0.23	0.38	0.20
Raipur	0.35	1	0.22	0.37	0.13
Mahasamund	0.27	0.77	0.14	0.46	0.82
Dhamtari	0.74	0.72	0.24	0.94	0.56
Uttar Bastar Kanke	0.6	0.71	0.05	0.43	0.4

r	3				4
Bastar	0.70	0.47	0.40	0.30	0.20
Narayanpur	0.14	0	0	0.33	0
Dakshin Bastar Dantewada	0.71	0.48	0.10	0.34	0.12
Bijapur	1	0.05	0.02	0.50	0.07

Source: Self calculated by author.

APPENDIX (B)

Table B.3 Index Values of Social Equity Indicators for the districts of Uttarakhand

Districts	**Sex Ra**	**Treated Water**	**Laterine Fac**	**Lighting by Elect**	**Female Literac**

	tio	**Source**	**ility**	**ricity**	**y Rate**
Uttarkashi	0.30	0.07	0.02	0.05	0.03
Chamoli	0.54	0.13	0.08	0.12	0.64
Rudra Prayag	0.90	0.04	0.02	0.04	0.51
Tehri Garhwal	0.76	0.24	0.20	0.29	0
Dehradun	0.08	1	1	1	1
Garhwal	0.86	0.33	0.26	0.39	0.64
Pithoragarh	0.54	0.16	0.15	0.21	0.63
Bages	0.8	0.0	0.03	0.03	0.4

hwar	1	2			4
Almora	1	0.25	0.21	0.26	0.49
Champawat	0.39	0	0	0	0.39
Nainital	0.21	0.43	0.49	0.48	0.92
Udham Singh Nagar	0.15	0.26	0.72	0.80	0.22
Haridwar	0	0.86	0.76	0.88	0.23

Source: Self calculated by author.

Table B.4 Index Values of Ecological Security and Economic Efficiency Indicators for the districts of Uttarakhand

Districts	% Forest Cover	% Barren & Unutilized Land	Avg. Productivity (Fruits, vegetables & Spices)	Avg. Yield Rate (Wheat, Paddy & Maize)	% of Net Sown Area to Total Area
Uttarkashi	0.34	0.13	0.68	0.02	03
Cham	0.	0.54	0.02	0.0	0

oli	2 3			2	
Rudra Prayag	0.68	1	0	0.01	0.111
Tehri Garhwal	0.72	0.04	0.23	0.05	0.211
Dehradun	0.58	0.32	1	0.08	0.200
Garhwal	0.78	0.15	0.24	0.05	0.200
Pithoragarh	0.14	0.12	0.29	0.06	0.055
Bageshwar	0.78	0.07	0.05	0.03	0.133
Almo	0.5	0.22	0.59	0.0	0.

ra	6			6	4 2
Champawat	0.86	0.08	0.41	0	0.18
Nainital	1	0.14	0.70	0.12	0.14
Udham Singh Nagar	0	0	0.26	1	1
Haridwar	0.09	0.03	0.17	0.20	0.85

Source: Self calculated by author.

APPENDIX (C)

Table C.3 Index Values of Social Equity Indicators for the districts of Jharkhand

Districts	**Sex Ratio**	**Treated Water Source**	**Laterine Facility**	**Lighting by Electricity**	**Female Literacy Rate**

Bokaro	0.14	0.73	0.62	0.79	0.75
Chatra	0.46	0.05	0.07	0.05	0.35
Deogha r	0.17	0.05	0.22	0.52	0.42
Dhanba d	0	1	0.76	1	0.88
Dumka	0.71	0.04	0.06	0.15	0.31
Garhwa	0.27	0.04	0	0	0.26
Giridih	0.36	0.08	0.09	0.28	0.30
Godda	0.30	0.04	0.08	0.08	0.13
Gumla	0.88	0.04	0.07	0.07	0.57
Hazarib agh	0.40	0.13	0.29	0.64	0.68
Jamtara	0.47	0	0.06	0.29	0.43
Koder ma	0.43	0.08	0.22	0.58	0.47
Latehar	0.60	0.02	0.09	0.23	0.30
Lohard aga	0.64	0.04	0.18	0.27	0.64
Pakur	0.	0	0.07	0.08	0

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Palamu	0.20	0.05	0.14	0.10	0.43
Paschimi Singbhum	1	0.22	0.11	0.39	0.21
Purbi Singbhum	0.42	0.86	1	0.94	0.98
Ranchi	0.42	0.49	0.79	0.70	1
Sahibganj	0.45	0.05	0.19	0.05	0.10
Saraikela Kharsawan	0.49	0.26	0.31	0.70	0.56
Simdega	0.92	0.02	0.03	0.04	0.72

Source: Self calculated by author.

Table C.4 Index Values of Ecological Security and Economic Efficiency Indicators for the districts of Jharkhand

Districts	**% Forest Cover**	**% Barren & Unutilized Land**	**Avg. Productivity (Fruits, vegetables & Spices)**	**Avg. Yield Rate (W**	**% of Net Sow**

				heat, Paddy & Maize)	**n Area to Total Area**
Bokaro	0.31	0.40	0.19	0	0
Chatra	1	0.13	0.17	0.47	0.23
Deoghar	0.09	0.14	0.43	0.16	0.72
Dhanbad	0	1	0.22	0.69	0.41
Dumka	0.04	0.21	0.31	0.93	0.92
Garhwa	0.69	0.17	0.03	0.06	0.34
Giridih	0.45	0.20	0.28	0.30	0.37
Godda	0.08	0	0.37	1	1
Gumla	0.11	0.37	0.25	0.82	0.87
Hazaribagh	0.65	0.43	0.17	0.68	0.43
Jamtara	0.65	0.62	0.30	0.46	0.90

Koderma	0.49	0.28	0.17	0.53	0.27
Latehar	0.04	0.26	0.13	0.46	0.47
Lohardaga	0.66	0.19	1	0.57	0.72
Pakur	0.61	0.42	0.30	0.59	0.93
Palamu	0.25	0.31	0.13	0.08	0.47
Paschimi Singbhum	0.23	0.12	0.09	0.33	0.73
Purbi Singbhum	0.23	0.33	0	0.45	0.34
Ranchi	0.11	0.37	0.44	0.48	1
Sahibganj	0.66	0.19	0.43	0.58	0.54
Saraikela Kharsawan	0.61	0.46	0.08	0.34	0.71
Simdega	0.15	0.14	0.19	0.61	0.59

Source: Self calculated by author.